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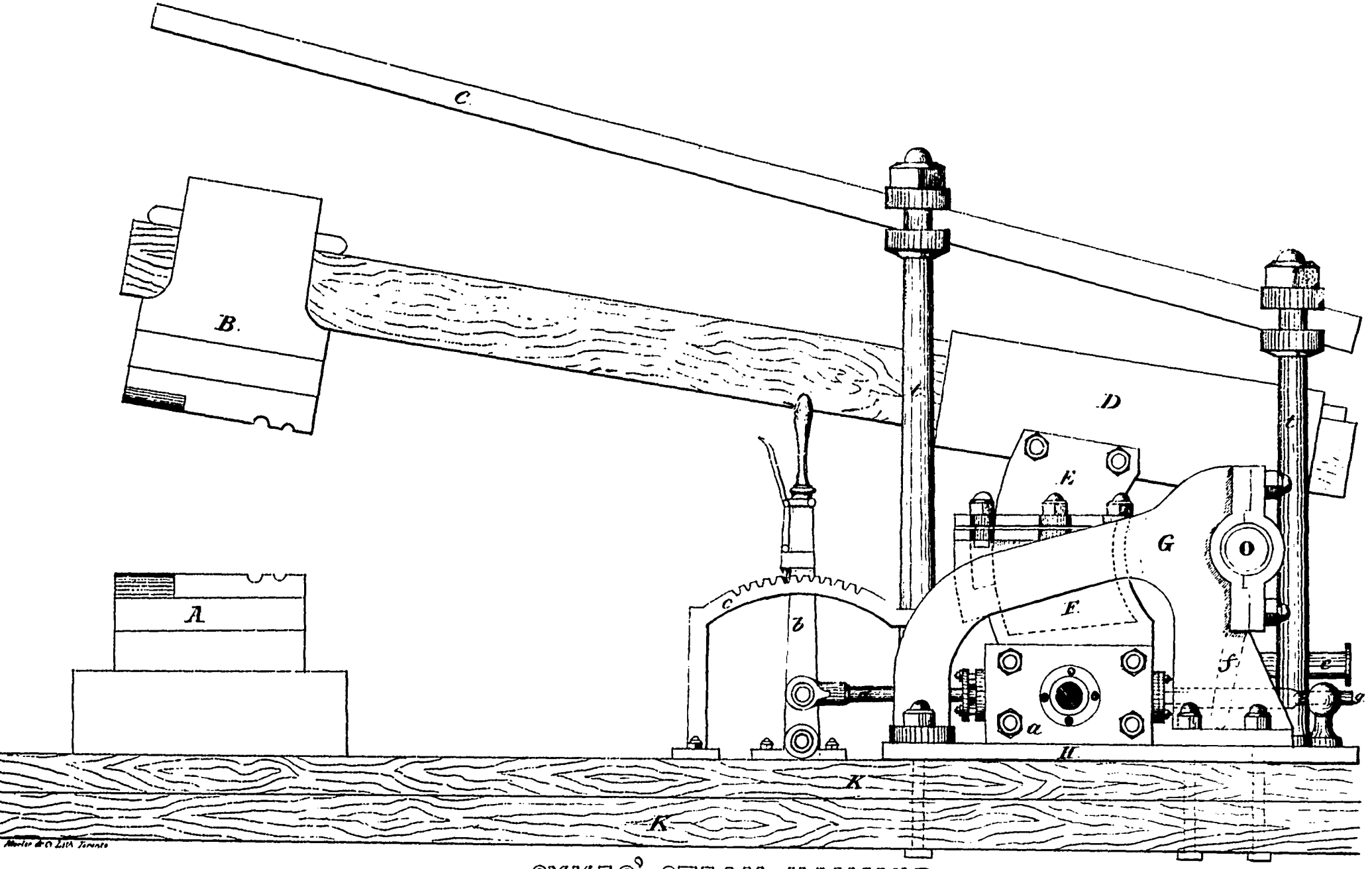

SYKES' STEAM HAMMER.

The Canadian Journal.

TORONTO, MAY, 1854.

Memoranda of Vesuvius and its Neighbourhood.

By the Rev. Henry Scadding, D.D., Cantab. Read before the Canadian Institute, March 25th, 1854.

Those who have visited Saratoga will perhaps remember the High-Rock Spring. It has its name from the circumstance that its water, containing much lime in solution, has formed a mound of calcareous matter some five feet high, with a well-defined central throat, up which the fluid column in former times ascended. This conical hillock must have had its beginning from the water in the first instance rising with force through the surface of the soil, and depositing a sheet of calcareous matter. The same process going on from year to year, minute strata accumulated, until the present altitude of the mound was attained. The falling of a tree then caused a fracture in the mass, since which occurrence the water, instead of flowing over the top, has found a lateral outlet.

We compare indeed small things with great, and slight with enormous energy; but the High-Rock Spring may serve to illustrate the manner in which volcanic hills are formed. An aperture is found, in a fissure we will suppose, in the crust of the earth; fluid matter is forced up from below, and, as it spreads itself out around the orifice from which it issues, it becomes solid: another ejection takes place: another thickness swells the dimensions of the growing mound: the process is repeated, until, in a succession of years, or in some instances in a few hours, a mountain is accumulated. A central channel is preserved, up which fresh matter still ascends, except when the energy below diminishes or a side-vent is opened.

All the mountain chains upon the globe, indeed, were probably thrown up by the force which we still see active in volcanoes. But with the majority of mountain chains there does not appear to have been any explosion. The elastic gases have lifted the superincumbent strata without forcing for themselves a passage. In many regions of the globe, semi-fluid granite just protruded itself through long fissures in the overlying deposits, and became *set*—a ponderous ocean at the time, in some localities at least—tending to depress and perhaps cool the uprising mass.

The mountains which we call volcanoes have, especially in regard to their upper portion and cone, grown by the accretion of ejected volcanic substances. In some volcanoes these ejections continue to take place from the original orifice or crater; in others, the interior force has become diminished, so as to be capable of thrusting the molten fluid only up to a certain point, where it continues in a state of ebullition either visible to the eye, or concealed by a crust of solidified lava; in others, lateral openings are formed at points below the ancient crater; and in others, the volcanic energy seems to have worn itself out.

Of the last class are the extinct volcanoes of Auvergne and Velay in France, of Catalonia in Spain, of the Eifel district in Germany:—of the next to the last are Ætna, the Peak of Teneriffe, and Cotopaxi:—of the next preceding, Kirauea in Hawaii is an example:—and of the first mentioned numerous class, Vesuvius, the mountain in respect to which I am about to offer a few memoranda, is a type.

Vesuvius, as compared with other active volcanic mountains, takes a low place, being only 3947 feet in height, while Antisana, in South America, the highest active volcano on the globe, is 19,137 feet high.

But although Vesuvius is one of the humblest of volcanic mountains, it has from many circumstances received peculiar attention. It is conveniently accessible to European observers. It is situated in the midst of a region rich in associations mythic and historic, unrivalled for physical beauty, and altogether strongly attractive to every imaginative and thoughtful person who has it in his power to visit foreign lands.

It is a memorable moment when, on waking in the morning and finding the steamer in which you have been travelling still and at anchor, you are told that you are in the Bay of Naples. You hasten to the deck. You take an excited survey of the widely-sweeping panorama which overwhelms the eager eye. Ships in crowds are near you, and craft with the obliquely-set latine yard-arms. Boats are moving silently on the surface of the iridescent water, which is giving back from the eastern heavens the kindling glories of the rising sun. Sailors are rowing ashore: you hear the regular creak of the row-locks as they work their oars, contrary to custom, with their faces towards the bow. Fishermen are paying out their long nets, hand over hand, indulging at the same time in a low chant-like song. In front of you, terrace rises above terrace of cheerful habitations, crowned with monastic edifices and massive fortifications. Behind you are castles and encircling moles—one bearing a colossal figure with hand upraised to bless (St. Januarius)—another sustaining a lanterna or pharos-tower, whose light still gleams down towards you along the surface of the water, though the day comes on apace. To add to the excitement of the scene—drawing again on the incidents of a morning indelibly impressed on my own recollection—a royal salute is fulminated from the castle on the left, which is no sooner ended, than responsively from another in the far distance on the right, a similar series of explosions takes place, each detonation following late after the quick scintillation of the flash, making the deck on which you stand to shake, and reverberating finely among the hills. Be it understood that the King has had an additional Prince born within the palace which you see yonder near the shore, and a festival of sixteen days has been proclaimed—sixteen days which, every morn and every eve, are to be signalized by similar stunning demonstrations, by illuminations also, and reviews and music, and whatever else may constitute a Neapolitan holiday.

But of all the objects which attract the attention as you gaze around the grand panorama before you, two mountains, side by side, close upon the right, isolated, of purple hue, and well-defined from base to summit, rivet at last the eye. On the morning already referred to, the glow of daybreak had outspread itself immediately behind them. The planet Venus was splendidly conspicuous vertically over them, looking as if she had been a meteor, shot up and and held suspended at the culminating point. And there she remained beautifully visible for a considerable time after the surrounding constellations had "paled their ineffectual fires" before the expanding sun. Over the easternmost of the two mountains rested what appeared at the moment to be a dark cloud, varying considerably in form, looking in shade quite black in parts, and occasionally rolling up pitchy volumes, like the smoke issuing from the great funnel of an Atlantic steam-ship when fresh coal is being put on below, the whole mass becoming at last magnificently fringed with fiery gold, as the sun gradually emerged from behind it and pierced its murky folds. These twin-mountains together form Vesuvius.

I observe in the ancient, so-called classic maps, that the name

attached to the basin which we call the Bay of Naples is "Crater." The old observers had taken notice that there was in this locality a connected system of volcanic vents, and that Vesuvius, Volture, the Solfatara of the Phlegræan fields, Avernus, Ischia, Stromboli, with Ætna itself, were but minor formations on the lip of a gigantic flue for the escape of the elastic gases, whose egress by their former channel the influx of the Mediterranean had checked. In that old appellation—"Crater"—have we not also a lingering reminiscence of a huge upheaval, and consequent oscillation of ocean, of which tradition spoke—when perhaps the Aral parted company with the Caspian, and the Caspian with the Black Sea, and all three with the Baltic,—when the Black Sea no longer formed a continuous expanse with the Mediterranean,—when Thessaly became dry land, and Pelion fell from Ossa,—when the Red Sea ceased to receive the Jordan, and the valley of the Nile, the Mediterranean,—when the mountain chain which had previously linked the continents of Europe and Africa together was ruptured, and Atlantis, not all a fable, sank beneath the deep?

But be this as it may, Vesuvius is one of a system of volcanic vents, either open or for the present obstructed, which it is interesting to trace in this neighbourhood;—with which system are doubtless connected also the extinct volcanoes of the Albano hills, near Rome, the Solfatara on the road to Tivoli, and the Lago di Bracciano, to the north-west of Rome.

The base of Vesuvius is now encompassed on two sides by railways. The one to the north-east runs to Capua, and is ultimately to reach Rome. The other to the south-east is completed, I believe, now to the ancient port of Brundisium. The south-eastern road has "stations" at Herculaneum and Pompeii, and by this route many persons proceed from Naples to Resina, where the ascent of Vesuvius is usually commenced. But although to travellers in the United States of America the idea of rushing by rail to Rome, Syracuse, and Troy is sufficiently familiar, the tourist who is desirous of keeping his mind in harmony with the past, whose veritable relics he is about to contemplate, will certainly do well to prefer the old public road. By taking this route to Pompeii, you also have the advantage of witnessing a succession of animated scenes of popular life, the whole line of road being an almost continuous suburb of Naples, and swarming with inhabitants. Here will be seen crowds, who, in their sun-burnt, copper-coloured skins, scantiness of dress, showiness of rude ornament, and want of productive occupation, will strike the Canadian who has visited Caughnawaga, Manitoualning, or the Sault, as—Indians, of a rather superior class. In your way out, too, by this route, you will be sure to meet or pass numbers of those non-descript, characteristic vehicles of the neighbourhood, the country caleches, made so brilliant with gay paint and bright brass, in respect to which one is constrained to wonder (first) how fourteen or more passengers—embracing motley groups of peasants, soldiers, ecclesiastics, monks, women, children, and infants in arms—can be placed within them, or slung on to them—for slung on many literally are in nets hanging down behind,—and (secondly) how the one diminutive horse or mule manages to whirl them along as, decked with little flags, streaming ribands, jingling bells, and glittering gear, he merrily does. You will have an opportunity of calling, if you feel inclined to do so, at one of the innumerable maccaroni manufactories which—at Torre del Annunciata, for example—line the street, where almost every house looks like a chandlery of farthing rushlights, the pipes of the popular esculent suspended in the open air on countless rows of long rods to dry, resembling in colour and diameter that once celebrated article. Within, you can examine the process, which will not fail to interest, by which the farinaceous dough of which this staple food of the neighbourhood consists is forced into the various shapes of maccaroni, vermicelli, fedelini, ribands, sheets, and the minute little discs resembling the green seeds of the hollyhock, so abundantly to be met with in Neapolitan soups.

At Torre del Greco you can descend from your carriage and examine the lava, which here in vast sheets has found at various times its way into the sea. In 1794 it destroyed the principal portion of this town by passing through it in a stream 1200 feet wide, and of a thickness varying from 12 to 40 feet, advancing into the Mediterranean a distance of 380 feet. The desolation occasioned by this, and another later fiery flood (1806), is still fresh to the eye. The disintegrating force of the atmosphere has not yet had time to dissolve the rocky surface into soil, which ultimately heals the wounds of earth, and obliterates all scars. The colour of the solid mass is here a dark bluish gray, reminding one of our familiar Kingston limestone when newly quarried. Here, and everywhere along the drive out from Naples, the lava is seen turned to useful account. Houses are built of it; the streets are paved with it; the heaps of metal piled by the way-side for the purpose of repair are composed of the same omnipresent substance.

But in noticing what may be seen at Torre del Annunciata and Torre del Greco I have gone beyond Resina, where, as I have said, the ascent of Vesuvius is usually commenced. In practice, indeed, I believe, persons generally do pass through Resina, visiting Pompeii first, and taking Vesuvius in their return. But inasmuch as "Vesuvius and its neighbourhood" is *my* subject, I hasten to despatch the mountain first, and reserve what I have to say on its neighbourhood for the second division of my paper.

Deposited, then, at Resina, you procure horses and a guide. An unromantic carriage-drive has been constructed, by which a considerable portion of the mountain may be circuitously ascended. A more interesting mode of ascent is by a rough bridle-path on horseback. Taking this route, you proceed up a sort of water-course, passing over bare lava which shelves backwards by great flights of broad irregular steps. At first on the right and left are vineyards and gardens, till you approach a rather level portion of the mountain, where stand the place of refreshment called the Hermitage and an Astronomical Observatory—not the scene of the discoveries of De Gasparis—*that*, one gazes at with interest close to Naples itself. At this point vegetation ceases, or has been destroyed over the upper portions of the *southern* and western flanks of the mountain, and the far outskirts of the cone begin to present some rather startling evidences of the desolating power of volcanoes. The whole apex of the mountain rises solemnly before you, apparently a pile of solid lava—of lava which bears very visible marks of having flowed down from the crater above in broad outspreading cataracts. Its furrowed, rutty look is like the surface of one of our unmacadamized back-streets after a sudden frost. Here and there you see where the descending ponderous fluid has met in its course with some solid mass of anterior date, and has coiled heavily around it, leaving great sluggish circular ripples, set fast for ever. You start from Resina very buoyantly; you are carried gaily along on your willing nag. The brilliancy of earth, air, and sky fills the mind with a sort of child-like glee. But as you approach the base of the cone, a sobriety comes over the spirit. Like the child advanced onwards into manhood, you find that you have entered a rather stern region, and that nothing short of hard work will enable you to overcome its difficulties.

Arrived at length, after two hours and a half, at the Atrio del Cavallo, near the base of the cone, you dismount. You take a rough scramble up a wild desolate ravine underneath the precipitous walls of Monte Somma, the north-westerly summit of Vesuvius; you notice the stratified layers of the ancient lava, and the

buttress-like dykes of subsequent and apparently harder lava jutting out from the semi-circular escarpment of this, the original gigantic crater of the volcano of the pre-historic times; and after satisfying your curiosity as well as the time will admit, you return and begin the ascent of the cone.

The place chosen for this exploit is a part built up, so to speak, with closely-packed fragments of lava and slag, between the interstices and among the prominences of which you insert your feet, to the certain disruption of only moderately strong shoes. The whole inclination of Vesuvius, were it uniform from Resina to the lip of the crater, would be only about thirteen degrees. Up to the base of the cone it is still less; but the cone itself is inclined at an angle of forty-three degrees. The perpendicular height of the cone is about 1000 feet; so that it can easily be conceived that the physical labour of ascending it—to a person not accustomed to climb—is for the time extremely painful. It requires, indeed, many "corragios" from the guide, and some assistance from a looped strap which he throws over his shoulder for you to lay hold of, to enable you to persevere.

While toiling thus sorely up this steep, I began to be convinced that the good Franks of yore really did mean by their word "travail" what some etymologists have asserted. To get "trans vallum"—beyond the wall—to scale the precipitous flank of some old Roman camp, was doubtless to their warriors some such task as this—a difficulty memorable enough, certainly, to be embodied in a term.

At length, after numerous rests, and after a lapse of perhaps an hour and a half, you find yourself on the comparatively level platform which leads to the lip of the great crater. The desire accomplished is found to be truly sweet on such an occasion, and the propensity to be noisily elated is quite overpowering. A strong wind blowing in our direction, sweeping down over us a huge column of vapour, which completely obstructs the vision, obliges us several times still to halt in our ascent of the final gently inclined plane.

At last we are on the brink of the great crater, and we find ourselves looking down into a gigantic and tolerably sooty-looking flue, up which from unknown mysterious depths are rolling volumes of what in the distance seems smoke, but which is, in fact, steam —steam carrying up with it a variety of choking gases. The whole breathing apparatus becomes immediately painfully affected, and we are reminded of the sensation suddenly experienced when one passes the nostrils over the edge of some great vat where fermentation is going on. The reverberation of a shout directed by the guide or yourself down into the undefined abyss is sufficiently awe-inspiring. Its effect can in some degree be conceived by imagining how a shout would sound when directed into a hollow cask one thousand feet in diameter.

The view obtained in every direction from this position is in the highest degree interesting and exciting. The Appenines form the background of the picture, a congeries of secondary and tertiary formations, exhibiting in their retiring ranges phase after phase of the finest aerial colouring. On one side you look down upon a city, pre-eminently of the living, ever on the stir and outwardly joyous—the syren-city, a sight of which its inhabitants fondly say might reconcile a man to the relinquishment of life. On another side, in solemn and instructive contrast, you see cities of the dead —historic fossil beds—mines not yet exhausted by the student and philosopher. Around you, on the left and right, are Capri, Ischia, Procida, Miseno, Baiæ, names summoning up images of beauty and long trains of shadowy forms and events. Yonder is Posilipo, the "grief-dispelling," the favourite haunt of the poet who, before the Christian era, sang the praises of this region, and whose tomb now consecrates that height. Before you, far and wide, lies the tideless sea, a household word throughout the world, whose name recalls the ideas with which the old cosmographers vainly tried to satisfy inquiring minds—whose serene surface, stretching to the distant south and west, still now as of yore reflects and sets off to best advantage the never tiring, because sublime pageantry attendant on the demise of each successive day.

After traversing a portion of the rim of the great crater,—its whole circumference is 5624 feet,—holding firmly the arm of the experienced guide, you begin to clamber obliquely down into the interior of the orifice. Your feet sink deep in black pulverized lava or sand. You observe underneath the surface everywhere beautiful primrose-coloured sulphur, perpetually deposited here, I am informed, from the constantly ascending hydro-sulphuric acid gas. You observe the stratification of the successive accumulations on the cone. Everything is sensibly hot to the touch. At the direction of your conductor, you thrust your hand into various holes and crevices, and you are fain to draw it out again as quickly as possible—the heat either remaining from the eruption of 1850, or maintained by the continual ascent of hot vapour from below.

After descending some yards, what with the increasing gloom, the oppressive heat, the obscurity of the undefined depth on the left, the boisterous rush of air every now and then from above, blinding and choking you with steam, the adventure seems—to a novice at least—to be sufficiently beset with terrors; and one is not sorry when it is at last determined to re-ascend without actually setting foot on the floor of the crater, one hundred and fifty feet below.

The place chosen for the descent of the cone is wholly diverse from that just now described in my account of its ascent. Conceive one of those great earth-works which in so many directions are now advancing across our Canadian valleys for railway purposes. Imagine the perpendicular height of the part where the labourers are shooting down load after load of loose soil to be one thousand feet, and the inclination of the slope to be precisely the angle at which the material will remain at rest:—you have then an idea of the part of the cone where tourists go down from the summit of Vesuvius. This side is of course selected from its being composed, not of closely-packed masses of slag and lava, but of pulverized volcanic matter.

Linking yourself firmly to your guides' arm, you plunge fearlessly off. You take strides which seem miraculous. The material in which you plant your heels goes down along with you and after you. You have only to take care that nothing arrests the action of your feet;—any obstruction might send you centrifugally forwards. Everything being in your favour, you are of course at the bottom in an incredibly short space of time. I remarked just now on the never-to-be-forgotten painful exhaustion produced in the ascent of this cone: its descent is equally memorable for the exhilarating and quickening effect which it has on personages even of the gravest carriage.

At the foot of the cone the patient ponies are waiting. After satisfying a number of noisy applicants who claim to have rendered you service, you mount, and, accompanied by men carrying torches—for it is now dark night—you amble gently down to Resina. From thence you drive into Naples. Your mind throughout the day has been receiving impressions which are to endure for life, and it has become in an extraordinary degree excited. You feel and welcome the calming influence of the quiet stars that burn above you, and which recall the kindred splendours of your own far-distant skies.

The first recorded eruption of Vesuvius is that of A.D. 79, when Herculaneum, Pompeii, and Stabiæ were overwhelmed. It is supposed that by this explosion the upper portion of the mountain was considerably reduced in its dimensions. Strabo, the geographer, about the year A.D. 25, describes it as a truncated cone covered with vegetation nearly to its summit. Its configuration, as it then presented itself to the eye from Naples, can easily be imagined by supposing the circle of which Monte Somma is a segment to be continued all round, and the line of the present inclination of the mountain on the south-east side to be produced from the slight rise called Pedamentina until it meets this circle, the axis of the whole cone remaining the same as it is now. The portion which we thus in imagination supply, is supposed to have been broken down by the weight of the lava which accumulated in the crater after the re-awakening of the volcano in A.D. 79.

The north-eastern side of Somma is to this day a smiling slope of vineyards, gardens, farm-houses, and villages. In the days of Strabo, the south-western slopes presented a similar scene. The poet Virgil, who, as I have already said, was familiar with this Campanian coast, and has celebrated in his verse its most striking localities, does not fail to notice Vesuvius; but he does not give us to understand that he was aware of its volcanic character. From Strabo, however, we learn that it was known to be volcanic. Plutarch, in his life of Crassus, mentions a curious use to which the crater in its quiescent state was once put. Spartacus, the Gladiator, who, in B.C. 73, headed a formidable insurrection against the Roman government, entrenched himself here with his forces, after his defeat by Crassus. The swordsman had doubtless defended himself in many an arena before, but in none on so grand a scale as this. Besieged by the prætor Clodius, who thought it simply sufficient to watch the entrance to the crater—the ravine to which I have already referred as existing between Somma and the present cone—Spartacus and his men let themselves down over the precipices by means of the wild vines which grew there, and suddenly and successfully attacked their assailants in the rear.

The poet Martial, who saw the mountain a few years after the desolating eruption of A.D. 79, records the lamentable change which had taken place in its appearance. "These heights," he says, "Bacchus loved more than his own Nysa; here the rustic Satyrs held their dances; Venus preferred the spot to Lacedæmon; here Hercules himself had sojourned; but now everything lies prostrate beneath fiery floods and melancholy scoriæ."

It may be here stated that the name Vesuvius—which by Roman writers is variously written Vesevus, Vesvius, Vesbius—is said by Neapolitan scholars to have been given to the mountain by the Phœnicians, who, at periods prior to the old Greek foretime, formed settlements along the Italian coasts. Its Syriac form was *Vo-seveev*, "the place of flame." Similarly, *Herculaneum* has been derived from *Horoh-kalie*, "pregnant with fire;" *Pompeii* from *Pum-peeah*, "the mouth of a furnace;" and *Stabiæ* from *Seteph*, "overflow."

In the remarks which I now offer on Pompeii, I simply speak of the place as one of the accessories of Vesuvius. To do justice to Pompeii, in an archæological point of view, would require a separate paper. It is well known that this city was not overwhelmed with molten lava, but by showers of sand, ashes, scoriæ, and mud. The persons who lost their lives on the occasion, when compared with the population, were few. The great majority had time to make their escape. To those who first carefully examined the mass as it lay upon the various houses, it was manifest that there had been disturbances in its parts, showing that, after the catastrophe, some of the inhabitants returned to recover their effects. The exterior walls of the town, with their gateways and low turrets, are finely disclosed. Towards their base very ancient work is occasionally seen—resembling, in the arrangement of the ponderous irregular masses, the so-called Pelasgic style. In their upper portions a curious mixture of material occurs—of stone with brick-work, carefully stuccoed to resemble stone. Blocks are observed with inscriptions in Oscan—the words and letters appearing reversed, after the manner of types set up. To a Canadian, who is generally too well acquainted with "burnt districts," the interior of Pompeii has at the first glance the familiar look of a town recently devastated by fire. Bare roofless walls of no great altitude are standing about in all directions. Forests of pillars, perfect and imperfect, supply, in some quarters, the place of the chimneys, which, isolated or in stacks, are with us so conspicuous after a conflagration. The ruins, however, do not look black and fire-scathed. The compact pavement of the streets is composed of blocks of ancient lava of irregular shapes, laid together after the manner of the old Via, resembling somewhat, on the surface at least, the memorable flagging which formed our first attempt at trottoir-making in Toronto. Along the top of some of the walls, rows of modern tiles have been placed for protection by the Neapolitan Government. Upon the exterior of the walls along the streets you see inscriptions laid on with a sort of red paint—the names of the owners of the houses or of persons whom the owners desired to honour as patrons. Upon the walls of the Basilica—or Court-house, as we should say—idle persons, standing about, have scratched their autographs. I have taken down one—that of *C. Pumidius Dipilus*, who, more than eighteen centuries ago, thought it worth while thus publicly to record the fact that "he was here on the 7th day of October, B.C. 77," as we should now write the date. "C. Pumidius Dipilus, hoie fuit ad nonas Octobreis, M. Lepid., Q. Catul. Cos." The little stones which compose the mosaics on the floors of the larger houses—exhibiting the originals of many of our oil-cloth and carpet patterns—are lava cut up into small blocks. The ancient frescoes on the interior walls—the prototypes of several styles of modern room-paper—are now much faded, though their designs are still clear. Whenever any objects of art and domestic use are unearthed in the excavations which are still occasionally made, they are deposited for safety in the Museo Borbonico in Naples. This museum, which is one of the most interesting in Europe, ought to be well studied by those who desire to have a clear idea of the ancient Græco-Italian life. Here you see a thousand things in the shape of utensil and ornament, personal and domestic, which show that the old Campanians were men like ourselves, influenced by the same tastes, wants, and weaknesses. Among innumerable objects of interest, I remember a charred loaf of bread—baked, of course, nearly eighteen centuries ago—bearing the baker's name (Cranius) legibly stamped upon it.

Thirteen years before the final catastrophe, we learn from Tacitus that the luxurious repose of Pompeii had been disturbed by a terrible earthquake. At the time of the last disaster, the inhabitants had just regained confidence to set about the repairs which had been rendered necessary. It is curious to observe in several quarters the partially new work. In the Forum, for example—the Public Exchange of the city—new lengths in the shafts of the fluted columns, resting on more ancient bases, are to be seen. On the ground are lying portions of columns nearly ready to be put up. Here stone-cutters' tools were found scattered about, as they had been left by their owners. Pillars in Pompeii, however, are not everywhere of stone; many are of brick, stuccoed. Indeed I was rather surprised to find in Rome, as well as here, how largely brick and stucco enter into the material of ancient

buildings. Pompeii was situated at the mouth of the Sarnus; and most of the streets which have been uncovered, ran down to the edge of the sea westward from the entrance of the river. But the accumulations of volcanic substances have thrust off both the river and the sea—the former half a mile, the latter two miles, from their ancient places. Up every street, as you look towards the north-west, Vesuvius closes the vista—still showing, by his ever restless column of steam, how capable he is of again rousing up his destructive energies. About two-thirds of the city still remain unexcavated. Where the excavations cease, you can approach and examine the perpendicular sections of the whole mass of accumulated material. You observe immediately that numerous showers of volcanic matter have descended since A.D. 79.

Near the Amphitheatre, the different strata with their thicknesses may be traced as follows, beginning with the surface:—(1) Black sparkling sand (recent), 3 inches; (2) Vegetable mould, 3 feet; (3) Brown incoherent tuff, 1 foot 6 inches; (4) Small scoriæ and white lapilli, 3 inches; (5) Brown earthy tuff, 9 inches; (6) Brown earthy tuff, with lapilli, 4 feet; (7) Layer of whitish lapilli, 1 inch; (8) Grey solid tuff, 3 inches; (9) Pumice and white lapilli, 3 inches:—in all, 10 feet 4 inches (Lyell). Another observation, where the thickness is 20 feet, gives the arrangement of the strata as follows, beginning from below:—Separating the whole into five parts—the first three consist of pumice-stone in small pieces, resembling a light white cinder, and covering the pavement to the depth of 12 feet: the next portion, composed of six parts, begins with a stratum of small black stones, 3 inches in thickness; to this succeeds a thin layer of dry mud; upon this lies another stratum of little stones, of a mixed hue, in which blue predominates; then comes a second stratum of mud, separated from a third by a thin wavy line of mixed blue stones: this completes the fourth portion; while the fifth or highest division consists entirely of vegetable earth or decomposed volcanic matter (Gell). In the neighbourhood of Pompeii you see large fields of the cotton-plant, which about here reaches its northern limit in Europe. On leaving the inn near the ruined city, I was taken by surprise by being presented with a bouquet of bursting cotton-pods and flowers, accompanied by a salute upon the hand—the graceful offerings of a handsome peasant to whom during the day I had given a few baiocchi for some little service rendered.

Herculaneum is situated nine English miles to the westward of Pompeii. It was overwhelmed, as is well known, with material more solid than that which came down upon the latter city. And sheets of fluid have flowed over its site since its first obliteration. So that now the excavations have to be made as in a quarry of solid rock, to a depth varying from 70 to 112 feet. Care is taken, when any additional building has been opened and searched, to throw back the material into its former place—lest the superincumbent mass, on which the present town of Resina is built, should break through. Consequently, the parts which you are enabled to examine are limited. With the aid of torches, the shape and dimensions of the theatre—capable of accommodating 8,000 persons—can be well made out, where it is a curious thing to see the capitals of pillars embedded, like ammonites or portions of the mastodon, in almost solid rock. From Herculaneum have been derived some of the most interesting of the objects in the Museo Borbonico in Naples. In a villa here were found the striking statues of Æschines and Agrippina, authentic busts of Plato, Socrates, Demosthenes, Scipio Africanus, Seneca, and others, with beautiful bronzes—some of them made to look life-like by the insertion of glass eyes. But its most interesting relics are the papyri-rolls, resembling brown charred sticks, two inches in diameter, and from six to eight inches long. Some of them—displayed now under convenient glass-cases—have been successfully unrolled and decyphered. But the regretted decades of Livy and History of Sallust are desiderata still. No works of importance have been discovered, with the exception, perhaps, of a treatise by Epicurus, entitled "De Natura."

Stabiæ, overwhelmed also in A.D. 79, and situated under a portion of the modern town of Castellamare, four English miles eastwards from Pompeii, has ceased to be examined. Having been reduced to ruins by Sulla in the course of the Marsic war, B.C. 91, it is not supposed to be so rich in relics as the two towns which have been excavated. Oplontis, a small Roman village, overwhelmed with its more distinguished neighbours, was cut into during the construction of the Western Railway from Naples, about two miles eastward from Herculaneum; a few mosaics and sculptured animals were found.

(*To be continued.*)

On the Establishment of a System of Simultaneous Meteorological Observations, &c., throughout the British North American Provinces.

By Major R. Lachlan of Montreal. Read before the Canadian Institute, March 18th, 1854.

Conceiving it to be the duty of every well-wishing member of the Canadian Institute, whether residing in Toronto or at a distance, to take every available opportunity to contribute his mite, however humble it may be, to its literary and scientific treasury, I offer no apology for venturing to draw its attention towards two highly interesting philosophical objects which I have long had at heart, and which, if zealously undertaken and perseveringly carried out, would not only be most creditable to the Institute, as valuable contributions to the advancement of science, but even prove very beneficial to our rapidly improving country.

I allude, in the first place, to the institution of a well organized chain of daily *simultaneous* meteorological observations, at a number of well selected stations all over Canada, with Toronto for its centre, to be connected with a similar arrangement to be invited to be set on foot in each of the Lower Provinces, and so conducted as to be readily united with the extended system of Meteorological Registers already in operation in the United States, under the fostering auspices of the Government and the various philosophical associations of that country. I advert, in the second place, to the establishment of a similarly simultaneous record of the rise and fall of the great Canadian Lakes, throughout their whole extent.* Of which more hereafter.

Having so far hinted at the mere outline of the undertaking contemplated by me, I may perhaps be permitted, though at the risk of prolixity, to advert by way of further preliminary, to the simple and inexpensive means by which I had *originally* proposed to accomplish my objects, while I at the same time frankly acknowledge these to fall short of the scientific standard to which we may now reasonably aspire, with the Provincial Magnetic Observatory and the Canadian Institute for our guides.

I proceed, then, to observe that it is more than ten years since I first ventured to propose to Dr. Cragie of Hamilton, a well known excellent meteorological observer and recorder, whose name I rejoice to see lately enrolled as a member of the Insti-

* See Notes appended to the annexed Tables, No. 2.

tute—the following brief and imperfect outline of what I then wished for, as being the most unpretending, or, at least, most natural way of connecting myself with the undertaking *now* proposed, and at the same time evincing the long-continued interest I have taken in its object.

"You will perceive (I observed in a letter to Dr. C.) in my late Discourse,* a wish expressed by me for a *simultaneous* set of comparative meteorological diaries being kept in different parts of the country, with the view of ascertaining the various shades of *climate* in different quarters; and I had it in contemplation to invite the co-operation of several gentlemen, either individually or through the medium of the various existing philosophical societies in the accomplishment of the object; and, among others, I looked particularly to the then unknown keeper of the Ancaster Register, Dr. C. As circumstances have turned out, however, I now at once frankly avail myself of the opportunity of giving you an outline of what I would suggest, and shall be glad to be favored with your opinion on the subject.

"I would propose that the different Registers should be all kept in the same form, and include the variations of the barometer as well as of the thermometer; but I fear this would not be so easily accomplished, from there being so few barometers in this country. Those, however, who possess no barometer might leave the column for that instrument blank, and I would wish the registry to be at the same hours, and at least at four daily periods; and that a column should be allotted for the direction of the winds; and also that the weather column should include, among other et-ceteras, the wind's rates, and any temporary extra variations of either barometer or thermometer. The form would accordingly be as follows:—

"Meteorological Register kept at ————.

Date.	Thermometer.				Barometer.				Winds.		Weather, &c.
	6 a.m.	9 a.m.	2 p.m.	9 p.m.	6 a.m.	9 a.m.	2 p.m.	9 p.m.	a.m.	p.m.	

The thermometer at each place to be of course exposed to the same aspect, *i. e.*, the north. A Rain Table could also be kept separate. But to ensure uniformity, the size and form of all the rain guages should be the same, and the entries made in exactly a similar way, which may be easily pre-arranged. If you should approve of the above, let me know, and I will prepare a sketch of the thing in time to be submitted to our little society at our next quarterly meeting, with the view of entering into a correspondence with the different philosophical societies on the subject."

No sooner had I proposed the above than I became persuaded that, with very little additional trouble, another interesting philosophical object which I had equally long had at heart could be readily connected therewith—namely, a daily Register of the fluctuations in the level of the great Lakes, so as, in a reasonable number of years, to set at rest not only the disputed existence of the *traditional septennial flux* and *reflux* of their waters, but also the extent of the better known *annual* variations in their level; at the same time that the facts gradually recorded would either tend to confirm or demolish a theory long entertained by myself, that, though there is no regularly recurring flood in any of our Lakes, and far less a simultaneous septennial flood in them all, there is a tendency to irregular independent floods in each; or, in other words, that it may be at the flood in one Lake, while it is at the ebb in another. As, however, I propose laying the results of my accumulated notes on this interesting subject before the Institute in a connected form, at some future time, I forbear further alluding to it at present than as a debateable philosophical question, well worthy of being more fully investigated, and which I therefore propose incorporating with the suggested system of meteorological observations.

With regard, then, to the latter and principal branch of the subject, I would further observe, that having, about a year ago, when President of the Natural History Society here, had occasion to correspond with our late distinguished President, Capt. Lefroy, I availed myself of the opportunity for adverting to my old favourite project, and expressing a hope that it might at last be happily carried into effect under his scientific auspices, with the lines of electric telegraphs acting as magically powerful assistants!—a hope in which I was about the same time encouraged by another talented meteorological observer, Dr. Smallwood of St. Martins,† as well as by Judge McCord. But I found that I was unfortunately too late; as Captain Lefroy informed me that "he was then busy preparing to leave Canada, and that it would therefore be out of his power to co-operate, as he should otherwise have been delighted to do, in any extended meteorological scheme." He, however, frankly "referred me for information on so desirable a subject to the report of the British Association for 1851 (p. 320); and also to that of the American Association for the same year, for an account of what was doing in this way in the United States;" and he further suggested "that the Natural History Society could not do better than invite a communication from the Smithsonian Institution at Washington, as to what they wished to be effected in Canada, and express a wish to co-operate." Captain Lefroy at the same time observed that "he greatly desired to see extensive observations organized in Canada, but that it must be a work of time; and that the acquisition and comparison of the instruments alone would take a season; and also that there should be a station at least every 100 miles from E. to W., and from N. to S., on the line of the Ottawa. With regard, also, to the expense, he considered that about £10 per station would be sufficient, exclusive of publications, to furnish barometer, wet and dry thermometer, rain guage, and wind vane, &c.

To this encouraging quotation from Captain Lefroy's characteristically frank, though hurried valuable hints, I regret to add that, though I have lately been enabled to refer to the proceedings of the American Association alluded to by him, as will be found evinced in some apposite extracts therefrom, I have as yet been unable to meet with the report of the British Association; and also that, during the time I continued to fill the office of President of the Natural History Society, I unfortunately never felt myself in a sufficiently encouraging position to attempt to carry out Captain Lefroy's suggestion for opening a communication with the Smithsonian Institution. It will, therefore, be for the Canadian Institute to consider whether that creditable leading step shall be taken by it, should my project be deemed worthy of adoption; and to enable it to judge, it now remains for me to state my own unpretending ideas on the subject, and then leave the matter for mature deliberation by a special committee at as early a day as may be convenient.

* The discourse alluded to will be found appended to a small Pamphlet, which I take the liberty of transmitting herewith, as further evidence of my having been a humble well-wisher to the advancement of useful knowledge.

† It is alike due to Dr. Smallwood and Captain Lefroy to state here, that the following were the terms in which the former expressed himself in a letter, dated 12th January, 1853:—"I will aid and assist you to the best of my abilities, and go heart and hand in any plan you may adopt, more especially under the masterly guidance of Captain Lefroy, who, from his great scientific acquirements, will give one and all full confidence in any plan of proceeding he may suggest."

1st. It appears to me that both branches of the undertaking, though resting on a philosophical foundation, are so decidedly and essentially of a useful and beneficial *public* character, that the Government should liberally bear a part in promoting them; but that, *as done in the United States*, that should be limited to the expense of furnishing a set of well-adjusted instruments for each station of observation, and otherwise evincing its readiness to promote the execution of the work by authorizing all such public officers as harbour-masters, lighthouse-keepers, and collectors of customs, as it may be desirable to invite to act as local observers to give their valuable assistance. 2dly. That the Commander of the Forces should also be solicited to aid the undertaking, by authorizing all medical officers in charge of military hospitals to furnish the Institute with a copy of the Meteorological Record transmitted by them periodically to the Inspector-General of the Medical Department of the Army in London. 3dly. Nor should the expectation of the very valuable co-operation of the Governor of the Hudson's Bay territory be overlooked. In addition to which powerful public support, I would, 4thly, respectfully invite the co-operation of every University and College, and other educational institutions, as well as of every association for the advancement of knowledge, throughout the Province, whether known by the more dignified titles of literary and scientific, or the less imposing though highly influential names of Mechanics' Institutes, or agricultural, mercantile, or other literary associations; in short, every public or private individual of known philosophical and observant repute in suitable parts of the country; among all whom, I am persuaded, an efficient corps of zealous and accurate *volunteer* observers would ere long be enrolled, that would do equal justice and credit to the undertaking. Nor need we stop there; for, as elsewhere hinted, I am convinced that it only requires to place our patriotic object in a proper point of view to induce the public-spirited directors of our now wide-spread lines of electric telegraphs to add also, to a reasonable extent, their gratuitous valuable co-operation in the laudable undertaking.

What, then, it may now be asked, are the great public benefits expected to be derived from the proposed arrangement? And what is the system of observations to be adopted? As regards the more important meteorological branch of the subject, I am fortunately able to reply, that instead of presuming on any fancied merits in my own unscientific predilections and observations as accumulated from year to year, I am prepared to adduce the far more authoritative language of the American Association for the Advancement of Science, which has for some years been so ably emulating the noble example in our own loved fatherland, as recorded at their great meeting at Albany in 1851, at the instance of their zealous associates, Professor Guyot of Cambridge, Massachusetts, and Doctor Hough of New York.

On that occasion the former of these gentlemen read a paper on the progress of the system of meteorological observations conducted by the Smithsonian Institution, and the propriety of its immediate extension throughout the whole North American continent and West Indies, in the course of which he showed the importance of these observations to a thorough knowledge of meteorology, and circulated plates and sheets prepared for the direction of observers, and exhibited the instruments provided by that Association, as well as printed tables exemplifying the results which had been obtained in one place, from observations taken three times a day, at 6 A.M., 2 P.M., and 10 P.M., of the meteorological state of the atmosphere, as follows—the phases of the moon; the barometrical indications; the height of the thermometer; the direction of the wind; the state of the psychrometer; the force of the vapour; humidity; state of rain-guage; state of the clouds; plants in flower; migration of birds; and various other notices. The Professor also observed that there were but fifty places as yet established, and pointed out various other wide-spread positions at which observations ought to be taken, ranging from the mouths of the Columbia to the St. Lawrence, from San Francisco to Washington, from the Gulf of California to the Rio-del-Norte, from the Pacific across the plateau of Mexico to the West Indies, from the Isthmus of Tehuantepec at Nicaragua Lake, at the plateau of Costa-Rica, and at the Straits of Panama to Chagres.*

Following up the same interesting subject, Dr. Hough, in another article on the meteorological observations carried on in the State of New York, from 1825 to 1850, observed—*what is well worthy of attention and imitation in British America*—that in the year 1825, the Regents of the University of New York, following the example of the Federal Government in its instructions to the commandants of its various military posts, issued orders to the several academies subject to its visitation, requiring them to cause meteorological observations to be made after a specified form and with instruments furnished to them for that purpose. These observations, like the foregoing, embraced three daily records of the thermometer, with the direction of the wind and the appearance of the sky, as clear or cloudy in the forenoon and afternoon: a record of the rain guage, and such observations on storms, meteors, auroras, and the progress of vegetation, &c., as might be deemed worthy of note; and that this system of observations was maintained with more or less regularity for twenty-four years by sixty-two literary institutions; and the results, published annually in the reports of the Regents, had been acknowledged, both in the United States and in Europe, as valuable contributions to the science of meteorology; but were discontinued in 1849, to give place to the present thorough and efficient course of observations.

Dr. Hough then observed that these twenty-five years' observations, though without value in determining the extent and progress of storms and the various atmospherical vicissitudes indicated by the delicate instruments now in use, were invaluable in establishing the laws of climate, the mean temperature, depth of rain, and general character of the weather, &c., and that he had in consequence undertaken the labour of reducing the entire series of these records, with the intention of offering the results, when completed, to the State Legislature for publication; and therefore solicited the Association to refer the examination of the details already prepared to the meteorological committee, with the view of their expressing an opinion of their merits, and recommending them, if thought worthy of it, to the favourable notice of the Government.†

The meteorological committee accordingly undertook this duty and concluded their labours by not only reporting favourably, but also recommending the appointment of a special committee to memorialize Congress in behalf of the immediate extension of the system of meteorological observations now under the Smithsonian Institution; and that the Secretary of the Treasury should provide the means; and further recommending the selection of fifty additional stations (similarly supplied with instruments); and also, after (as will be found quoted nearly verbatim below) enumerating the various benefits to be expected from a wide-extended system of scientific observations, proposing to supply

* See Report of the Proceedings of the American Association, held at Albany in 1851, pp. 167-8.

† See Report of the Proceedings of the American Association, held at Albany in 1851, pp. 171-2.

the primary stations with a full set of instruments carefully compared and of uniform construction (as tested and graduated by the Smithsonian Institution), consisting of a thermometer, barometer, hygrometer, rain and snow gauge, and wind-vane or anemometer; and also to cause *hourly* observations to be made at six or eight stations, and three times a day at all others; and concluded their resolutions by proposing to enlist in the good cause, not only their own Government and Surgeon General, but also the Canadian Government and the Hudson Bay Company, and suggesting that Kingston and the Manitoulin Islands should be selected as Canadian stations.

"We expect (observed the committee)* to derive from systematic observations [such as proposed] a thorough knowledge of the climate in all its relations, and of its variations in the same and in different localities. The mean temperature of points is to be determined with carefully verified instruments, similar to each other, similarly placed, and observed under the same rules and conditions; the lines of equal mean temperature will result; and the variations at different seasons will be shewn; the limits of vegetation will be found; and the areas of climate adapted to the cereals; the parallels within which wheat, Indian corn, &c., may be profitably cultivated, and (which present results so different from those found to exist in the eastern continent of Asia) will be accurately determined; the degree of dryness and moisture will be ascertained; as also the amount of rain and of evaporation—questions not only bearing on the health and comfort of man, but on his attempts to facilitate communications by canals, and the improvement of rivers, and on the means of avoiding and controlling floods and freshets. The number of days of rain, the number of clear and cloudy days, and the amount of loss of the sun's effect by cloudiness will be determined. The direction and force of the wind, and the system of winds prevailing in different parts of the country and at different seasons of the year. The mean pressure of the air and its variations will be shewn by the barometer; from which important data in regard to the relative height of points may be obtained, giving the general topographical features of the country, and serving as a recommendation in distant parts of it, for proposed railroads or common roads. The progress of waves of pressure, either connected with storms or with the ordinary fluctuations of the atmosphere, will be ascertained. All periodical phenomena will be studied in connection with these observations—the flowering of plants and trees, the ripening of grains and fruits, and the migration of animals. The frequency and intensity of the borealis will be determined, and its singular variations, in passing from north to south and from east to west, will be studied. The direction of the motion, the frequency and intensity, and other circumstances actuating on thunder-storms will be ascertained. From these observations will result a knowledge of the law of storms in its full developement, and its application ascertained; so important to the farmer and navigator—so interesting to the man of science—and so desirable to be known by every one who travels on our lakes or rivers, and extensive and sometimes stormy coasts. The line of telegraphs will be rendered available for observation on the subject, more complete than any which have been hitherto practicable; and while they will enable us to determine the laws of storms, will also furnish the means of giving notice of their approach. The diseases incident to different climates, the phenomena of malaria, and the progress and laws of epidemics may be studied in connection with the periodical phenomena from carefully connected stations."

* See Proceedings of the American Association, held at Albany in 1851, pp. 398 to 400.

Deeming it unnecessary to offer any apology for so appropriate though lengthy a quotation as the foregoing, I now proceed to observe, in as concise terms as possible, that I would respectfully propose the adoption *in Canada* of the very same system of observations, with one additional column for the daily registry of the fluctuations in the level of the waters of our great Lakes (or, where a station happens to be on the bank of a river, the rise or fall in its stream),† as exhibited in the annexed blank Table No. 1, as well as in that marked No. 2; showing, by way of climatic example, the very different results of the observations actually recorded near Montreal, and at Toronto, on the 1st days of January, April, July, and October of the same year; and I would further venture to suggest that the following places, at least, should be selected as suitable meteorological stations, though many more might be judiciously added, viz.:—1. Gaspé Basin; 2. Kacoona; 3. Quebec; 4. Montreal (or St. Martins); 5. Cornwall; 6. Bytown; 7. Kingston*; 8. Belleville*; 9. Colborne Harbour (or Presqueisle)*; 10. Peterborough; 11. Cobourg; 12. Toronto; 13. Barrie, on Lake Simcoe; 14. Penetanguisheen, on Lake Huron*; 15. Hamilton*; 16. Port Dalhousie*; 17. Port Colborne*; 18. St. Thomas*; 19. London; 20. Amherstburgh, or Bois-blanc Island*; 21. Port Sarnia*; 22. Goderich*; 23. Great Manitoulin Island*; 24. Bruce Mines*; 25. Sault Ste. Marie, above the Rapids*; and 26. Some station on the western extremity of Lake Superior, say at the mouth of the Pic River:—all the places marked thus * being also intended as stations for observing the rise and fall of the waters of the Lakes, regarding which it is now necessary to add a few explanatory words.

The existence of various periodical fluctuations in the level of our vast Lakes has long been beyond a doubt; but not so, as far as I am yet aware, the various *causes* by which they are produced, or the laws by which they are governed, Independent of the great septennial flux and reflux assigned to them by tradition, and on which a course of observations such as that proposed would in time throw much light—it has long been a question of lively philosophical interest, how far, in the absence of any great feeders in the form of rivers, their *annual* variations are regulated by the amount of rain and snow which falls in their proximity, united with supposed supplies from internal springs, combined with the greater or less evaporation during each summer season; as is also how far the *daily* and even more frequent temporary fluctuations in their levels, are owing to the direction and force of the winds which happen to sweep along their surface during the time.‡ Add to which it will be very desirable to ascertain, by a course of long-continued observations, having reference to the phases of the moon, and other natural phenomena, how far those sudden and uncertain alleged tides, termed "Seiches," described by several writers as observable in some of the inland European lakes, and attributed to unequal atmospheric pressure, are also recognizable in those of America.§

Not doubting that the results would prove highly satisfactory and instructive, I deem it sufficient to add that, of course, the

† It will be admitted that watching the rise and fall of rivers with a philosophic eye is not altogether new to me, when I add that it is now near forty years since, in India, I kept a minute record of those of the great Ganges for a whole season, through a range of between thirty and forty feet; little dreaming that I should ever be in so near a position as at present to learn that those of the equally great and far-famed Mississippi are nearly the same.

‡ See Letter introductory to this Paper.

§ See Young's Natural Philosophy, Vol. I., p. 578; and 16th Vol. of American Journal of Science, pp. 78 to 83; and also 2d Vol. of the Canadian Journal, p. 25.

tide gunge, or lagometer—if the measuring instrument used may be so termed—would require to be self-registering, a mechanical contrivance involving no great ingenuity, and that it would also be necessary to establish beforehand a *Zero* point having reference to the supposed level of the whole of the lakes at the time of commencing the various simultaneous registers, compared with their known or assumed state at some remarkable bygone periods. In my own mind that might be a matter of some little difficulty, as I am inclined to regard each lake as liable to be acted upon by circumstances peculiar to itself; but as a general rule, intended to establish some definite starting point for the whole chain of observations, I would be disposed to take either the level of the sea as the acknowledged zeros, or, in the absence of more positive data, be content to make the lowest ascertained level of Lake Ontario during the past season answer the purpose, and have the guage so adjusted that the surface of the water at the time of recording the first observation, should indicate its relative height above the assumed Zero point. It would also, of course, be advisable to insert beforehand, in the column of remarks, the dates of the full and change and other quadratures of the moon, as well as of the apogee and perigee, from some correct almanac, with the view of duly noticing whether or how far these have any tidal influence on inland lakes.

Much more might be added to the foregoing very desultory and imperfect sketch; but feeling myself incompetent to enter into scientific minutiæ on such a subject, I prefer acting as the humble *pioneer*, and leaving the matter to be elaborated by more competent members of the Institute in such a manner as its philosophical importance deserves; and, therefore, with this view I beg to conclude, with respectfully proposing that a *special committee* be appointed to investigate and report on my project, and that, should their report prove favorable, an immediate energetic appeal should be made to the Government and Legislature in behalf of the accomplishment of the object, in the same manner as adopted by the American Association, and that similar appeals should be addressed to the Governments of New Brunswick, Nova Scotia, and Prince Edward's Island, invoking their cordial co-operation in the patriotic undertaking

All that now remains is to tender my apologies for the unavoidable great length of the above desultory communication, and to express a hope that, however imperfect it must prove as emanating from one who does not pretend to any acquirements as an astronomical or otherwise scientific observer, it will not be altogether unacceptable; and that, at all events, it will not be regarded as an act of idle supererogation in a member of the Institute, who, whatever may be his deficiencies, is disposed to yield to none in long-continued, ardent good wishes for the general advancement of scientific research.

R. LACHLAN, *M. C. S.*

Montreal, 2d March, 1854.

Meteorological Table—No. 1.

Form of Daily Meteorological and Lake (or River) Register. Kept at _____ *during* _____ 185__.

Date.	Barometer.			Thermometer.			Hygrometer.			Anemometer. Wind's direction.			Anemometer. Wind's force.			State of atmosphere			Rain Gauge		Level of Lake (or River)			Remarks on phases of moon, borealis, zodiacal lights, comets, storms, & other phenomena.
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	A.M.	P.M.	6 A.M.	2 P.M.	10 P.M.	
1	29·515	29·444	29·82	9	7	0	1·00	0·92	1·00	N.E.	N.	N.N.W.	2·30	7·12	Calm.	Str.	Clear.	Clear	0	0·50				Moon, last quarter, [4.37 P.M.
2																								
3																								
4																								Perigee, 0·1.
5																								
6																								
7																								M. new, 10.36 A.M.
8																								
9																								
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14																								
15																								
16																								
17																								M. 1st qr. 0.12 A.M.
18																								[Apogee 5 A.M.
19																								
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21																								
22																								
23																								
24																								
25																								
26																								M. Full, 0.26 A.M.
27																								
28																								
29																								
30																								

* The figures inserted in the first day of the month, by way of example, correspond with those noted at St. Martin's, near Montreal, on 1st January, 1853.

Meteorological Table.—No. 2.

Specimen Tabular View of four days' Meteorological Registers, as kept *simultaneously** at St. Martin's, near Montreal, and at Toronto; showing the great difference in Local Temperature, Winds, and Weather, at the two places of observation, on the first day of each quarter, in the year 1850.†

Place & date.	Barometer.			Thermometer.			Hygrometer.			Anemometer. Wind's direction.			Anemometer. Wind's force.			State of atmosphere.			Rain Guage.	Level of lake (or river).	Remarks on phases of moon, borealis, zodiacal lights, comets, storms, & other phenomena.
Montreal, Jan. 1.	29·615	29·744	29·827	9	7	0	1·00	·92	1·00	NE	N	WNW	1·30	7·12	Calm.	Str	Clear	Clear	0	9·56	0	
Toronto, „	·526	·684	·784	23·2	26·9	21·2	·85	·87	·94	N	NW b N	Do.		0			0		0		0	
Montreal, April 1.	·593	·604	·738	35	53	82	·69	·72	·80	NE b N	S b E	N b l	0·00	5·15	·098		Clear		0		0	Zodiacal lights;
Toronto, „	·481	·578	·688	34·8	46·7	34·8	·93	·55	·56	N b E	N	NNW		0			0		0		0	[aurora.
Montreal, July 1.	·573	·594	·518	67·2	75·6	60·0	·81	·58	·66	NW b N	Do.	Do.	6·96	5·33	12·05	Clear	Cum. str.	Clear	0		0	
Toronto, „	·628	·635	·650	64·3	71·2	60·0	·88	·71	·83	N b W	S b W	NNW		Mean 4·38.			0		0		0	
Montreal, Oct. 1.	·393	·339	·372	37·5	60·7	47·6	·83	·71	·86	S	WSW	S b W	5·80	6·27	1·18	Clear	Clear	Overcast	0		0	
Toronto, „	·512	·446	·371	46·5	58·2	53·80	·77	·55	·91	N b E	S	S		Mean 3·04			0		0·085		0	

* It will be readily understood that the term *simultaneous*, as generally used in all such registers, though apparently a correct one, is not actually so, arising from the difference of longitude between each place of observation; and that to approach at all to a state of correctness in a really simultaneous view of the state of the thermometer, winds, weather, &c., it will not only be necessary to keep *hourly*, but even far more numerous observations; instead of three times a day, and to have each particular observation reduced to the true time by corrections for the difference of longitude, as well as for the wind's rate. The term, however, is sufficiently applicable to general purposes; and the observations can be readily reduced to more minute correctness, when systematically arranged in a tabular form for more exact philosophical application.

† These days are taken at random, as comparative specimens of the mere difference of climate at two places, with but three degrees of latitude between them; but there is a far higher philosophical object in view, namely, to arrive at a knowledge of the causes of such great differences as are exemplified in different parts of the Province, to a far greater, and yet, in a great measure, unaccounted for extent. As, for instance, while a friend writes to me from Sandwich on the 14th February, that "yesterday and the day before were perfect May days! no snow, no sleighing! and the river (Detroit) quite open!" The thermometer, as registered on the banks of the ice-bound St. Lawrence, at Montreal, stood as follows:—

	Night. Max.	Night. Min.	Day. Max.	Day. Min.	
12th.	—6	+6	—6	—9	No small difference!
13th.	—3	+10.5	+15	+36·0	

Remarks on the Intrusion of the Germanic Races on the Area of the Older Keltic Races of Europe.

By Daniel Wilson, LL.D., Professor of History, University College, Toronto. Read before the Canadian Institute, April 1st, 1854.

Dr. Arnold, in that beautiful but imperfect narrative of Roman History which his lamented death arrested in its progress towards completion, after devoting a chapter to the description of the general condition of Europe at the commencement of the fourth century before the Christian era, thus concludes:—"Such was the state of the civilized world, when the Kelts, or Gauls, broke through the thin skreen which had hitherto concealed them from sight, and began, for the first time, to take their part in the great drama of the nations. For nearly two hundred years they continued to fill Europe and Asia with the terror of their name; but it was a passing tempest, and, if useful at all, it was useful only to destroy. The Gauls could communicate no essential points of human character in which other races might be deficient; they could neither improve the intellectual state of mankind nor its social and political relations. When, therefore, they had done their appointed work of havoc, they were doomed to be themselves extirpated, or to be lost amidst nations of greater creative and constructive power; nor is there any race which has left fewer traces of itself in the character and institutions of modern civilization."

We must not, however, too hastily assume the extirpation of any race, or the altogether transitory and evanescent influence of its physical or intellectual peculiarities, merely because it ceases to play an independent part as a distinct nation. To those who recognize in all its fullness the influence of primary ethnological differences on national character and institutions, it cannot be doubted that the intermixture of races has largely affected the character of nations. The ancient Pelasgic and Etruscan races have disappeared, yet probably not by extirpation but absorption; and perhaps contributing, in no slight degree, by their diverse ratios of intermixture with Hellenic and Kelto-Italian blood, to produce the permanent differences between the two great nations of classic antiquity.

That the Keltic ethnological element has exercised no beneficial influence either on the intellectual or physical condition of medieval and modern Europe, is no less problematic. The blood of the Gaul still gives no partial hue to the complexion of Gallic France, nor can we assume that no portion of our peculiar Anglo-Saxon national character—so different, in some respects, from that of our continental Saxon congeners—is derived from the early intermixture of the Saxon and Scandinavian with the native Celtic blood. The invasion of the Anglo-Saxons, as of the Danes and Northmen, was one of warriors, not of colonists with their wives and families, and their first settlement must have involved some extent of alliance and mingling of races, such as we see taking place in our own day with aborigines whose physical and moral characteristics present a far more antagonistic diversity of aspect. But viewing the ancient Gauls as they first appear on the stage of history, unaffected as yet by those Germanic or Anglo-Saxon elements which temper

"The blind hysterics of the Celt,"

the justice of one portion, at least, of Dr. Arnold's remarks may be perceived if we look to the transitory nature of the Keltic philological influence on our own English tongue, and consider that while, for upwards of seven centuries after the date here referred to, no other intrusion of foreign races had taken place in the British islands than the very partial military occupation by the Roman legions, yet the English language retains no grammatical or constructive elements of the ancient native Keltic or British tongues, and has so few etymological elements incorporated into its composite vocabulary, excepting such as are indirectly derived through the Latin, that the whole of such

might be expunged without sensibly marring the richness and copiousness of the language. Historically speaking, the English language of the British islands stands in precisely the same relation to its ancient geographical area as the English of Canada does to this portion of its widely diffused modern area; in neither is it the original language of any part of the countries to which it now pertains, but in both cases it has spread itself within well ascertained, though diverse periods, at the expense of earlier and more aboriginal languages, which it has displaced and superseded.

Looking, however, upon the older ethnological stock of British and European population, to which the Keltic elements of European languages and customs are traceable, it is important to consider whether the well-ascertained date of its first appearance on the stage of history above referred to, in any degree coincides with that of its earliest intrusion into Europe, or with the appearance of that other hardy barbarian stock, which, issuing at a later period from its fastnesses in the old unexplored north, swept before it, in its young strength, the decrepid vestiges of Rome's Imperial decline? In other words, I would inquire if the Keltic and Germanic races are coeval in their origin, or in their occupation of the European areas which they are found in possession of at the dawn of history?

"We can trace," says Dr. Arnold, "with great distinctness the period at which the Kelts became familiarly known to the Greeks. Herodotus only knew of them from the Phœnician navigators; Thucydides does not name them at all; Xenophon only notices them as forming part of the auxiliary force sent by Dionysius to the aid of Lacedemon; Isocrates makes no mention of them: but immediately afterwards, their incursions into Central and Southern Italy on the one hand, and into the countries beyond the Danube and Macedonia on the other, had made them objects of general interest and curiosity; and Aristotle notices several points in their habits and character in different parts of his philosophical works." Like the first glimpses of the Kassiterides or Tin Countries of Southern Britain, we discern only vaguely and by chance incidental notices, the western Kelts, described by Herodotus as a people who "dwell without the pillars of Hercules, and bordering on the Kynesians who live the farthest to the west of all the nations of Europe."* Few passages of ancient history convey to us a more vivid impression of the complete isolation of the diverse tribes then scattered over the European continent. The Pyrenees and the great Alpine chain, spreading eastward to the head waters of the Danube, formed in the age of the Father of history, a barrier of exclusion for all the Transalpine races, scarcely less effectual than that which, for upwards of eighteen centuries thereafter, concealed this great antiquity, America, from the eyes of Europe. Kelts, Kymric or Gaelic, had doubtless crossed the Alps long prior to the first notice of them by Herodotus, and had established themselves in the fertile valley of the Po, as well as extended their influence far southward into the Italian peninsula. Whether, at that period, they had ever been present on any portion of the Hellenic area of Greece, may well be questioned, nothwithstanding the undoubted Keltic elements recognized in the Greek language. They had, however, already passed to the south of the Pyrenees, and intermingling with the older Iberians of Spain, constituted the ancient Keltiberian population of Arragon and Valencia: unless, indeed, we are prepared to recognize in the Keltæ and Galatæ of Aristotle and Diodorus something more than varied forms of the same name; though even then, the distinction will not necessarily imply a greater one than the philologist recognizes between the Keltic elements of the ancient Greek and Latin, or the ethnologist perceives to separate the modern Gael and Kymri of Great Britain.

To the Greeks of the age of Herodotus the Kelts were only known, by the chance report of some Phœnician seaman, as one among the rude tribes of the barbarian West, where the coasts of Europe intruded furthest into the mysterious Atlantic main, which was to them the aqueous boundary of the world. The Greeks of that age little suspected that these same western Kelts reached from the shores of the Atlantic Ocean as far as the Alps, and overflowing and sweeping round them, already occupied the valley of the Po, and extended nearly to the head of the Adriatic. "The narrow band of coast occupied by the Ligurian and Venetian tribes," says Dr. Arnold, when referring to the approaching Gaulish invasion of Rome, "was as yet sufficient to conceal the movements of the Kelts from the notice of the civilized world. Thus, immediately before that famous eruption which destroyed Herculaneum and Pompeii, the level ridge which was then Vesuvius excited no suspicion; and none could imagine that there were lurking close below that peaceful surface the materials of a fiery deluge, which were so soon to burst forth, and to continue for centuries to work havoc and desolation."

But though that celebrated eruption which took place in the first century of the Christian era is the earliest on record, it is well known to the geologist that the pent-up fires of Vesuvius and Solfatara had long before overflowed the Phlegræan fields; and, in like manner, the philologist recognizes, on no less indisputable evidence, the traces of earlier Keltic intrusions than that which, in the fourth century of Rome, swept like a wasting torrent over Cental Italy. The attention of the members of the Canadian Institute has recently been directed to the well known Keltic element now universally recognized as forming so important a constituent part of the Latin tongue. This Professor Newman assumes to be an essentially intrusive element; but in doing so he recognizes it as derived from Italian races, which, if not aboriginal, are known to us as the primitive inhabitants of well-defined areas of the Italian peninsula at the very dawn of history. Among these Keltic Italians the Umbrians and the Sabines are specially remarkable, and the essential* Celtic character of the Sabine clanship, out of which the later Roman clients, and the whole system of Roman patron and client, patres and plebs, were naturally developed, points to a social condition prevailing among the ancient tribes of Central Italy, and especially among the Sabines, more easily explicable by the analogies of modern Celtic clanship as it existed in Scotland down to the middle of the eighteenth century, than by any other source which history discloses to us.

Assuming, with Prichard, Newman, and other able philological critics, the Kelticity of the Umbrians, and the Kelto-Italian character of both the Umbrians and Sabines, we are left

* This description Dr. Latham would refer to the Kelts as Iberian, and not to the *Kelts* in the general sense in which the designation is accepted, and as it was understood by the Romans in the time of Cæsar. But it is not at all improbable that the population of Gallicia and the Biscayan provinces of Spain might have been purely Gallic B.C. 400, and yet that the displaced Ibéri of the south might have even crossed the Garonne in Cæsar's time. Immense displacement had taken place during the interval in the Spanish peninsula. But the name *Garonne*, like the Scottish *Garry*, is essential Celtic and descriptive: *the rough river.*

* For the purpose of discriminating between the undoubted modern Kelticism of the Gael, Kymri, &c., of the British Isles and Bretagne, and the assumed but disputable Kelticism, in this sense, of some ancient ethnological elements—*e. g.*, the Celtiberians of Spain—the term *Keltic* is employed here in reference to all ancient and purely continental elements, that of *Celtic* to all modern and British elements.

in no doubt as to the antiquity of the Keltic ethnological element in Southern Europe. Among the primitive native Italian populations, the Umbrians were, at the earliest times, the cultivators of the soil and the builders of cities; and their ancient capital, Ameria, was one of the oldest cities of Italy. Pliny assigns the date of its foundation 381 years before that of Rome. Specimens of the language of this people have been preserved to us in the celebrated Eugubine Inscriptions, discovered at Gobbio, the ancient Iguvium, and the relation of this language to the Latin has been satisfactorily assigned by Grotefend and others. But without attempting to determine how far the famous Sabines and Latins, or the less important tribes of Piceni, Vestini, Frentani, and Marsi, which clustered around their ancient areas on the east, approximated to the Umbrian type, it is sufficient for our present purpose to know that "the primitive Latin must have Keltized itself by imbibing Umbrian," (*Newman's "Regal Rome,"*) and that the Keltic element of the Latin is derived, being isolated and fragmentary, and only traceable to its etymological family-groups by a reference to the surviving Celtic dialects: we are hence left in no doubt that that appearance of the Kelts or Gauls in Central Italy, B.C. 389, which Dr. Arnold has characterized as their "beginning for the first time to take their part in the great drama of the nations," was by no means their earliest intrusion into Southern Europe. Dr. Latham, who is little disposed to extend the Keltic area further than the strictest evidence will sanction, and even denies the Kelticity of the element mingling with the Iberian stock to constitute the Celtibéri of Spain (*Ethnology of Europe*, p. 37), in restricting the original area of this ancient race, remarks:—"I am inclined to limit the Keltic area, at its maximum extension, to Venice westwards, and to the neighbourhood of Rome southwards. But this is not enough," he adds, "they may have been aboriginal in parts which they may seem to have invaded as immigrants."—(*Man and his Migrations*, p. 169.)

It may thus be assumed as obvious and undoubted, that the invasion of Rome and Central Italy by the Gauls was no intrusion of a new race, like the first appearance in Europe of the Huns in the fourth century, or of the Moors in the eighth century of our era. May it not, however, indicate to us other intrusions of which it was a secondary cause? My belief is, that it does. It is abundantly obvious that some great cause of dismemberment and revolution was then affecting the great Keltic race. Whatever their older area may have been, we find the Kelts soon after intruding into Thrace and Illyricum, and appearing on the borders of Macedonia in the reigns of the great Philip and Alexander. They even overflow into Asia; and, for nearly two centuries, glance, meteor-like, on the pages of ancient history, the dismembered relics of an old barbarian nationality, terrible though transient in the destructive influences of its scattered fragments. This was the waning struggle of the great Keltic stock. Upwards of two thousand years have elapsed, and still the fragments of that once predominant European branch of the human family linger on the western confines of Europe, preserving to us their ancient tongue, so invaluable for all the investigations of the ethnologist; but assuredly their days are numbered, the hold of twenty centuries is at length giving way, and it seems probable that, ere many more generations have passed, the living languages of the Kymri and the Gael will exist only, like the Cornish, in grammars and vocabularies of the philologist, and in the surviving fragments of their ancient literature.

The stock by which the ancient Keltæ of Europe have been displaced, and the classic nations superseded, is the Germanic or so-called Teutonic group, of which our own Anglo-Saxon race is the most powerful and widely diffused of all its members. The intrusion of the Germanic stock into Europe lies beyond the assigned dates of ancient history; but many indications serve to show, that while the Keltic races only obtrude upon the historic arena in their decline, like some long-voyaging ship seen for the first time as it dashes amid the breakers of a strange and rock-bound coast, the Germanic races dawn upon us in their young barbarian strength, with all their national being still awaiting its developement, and with the geographical arena of their historical existence occupied by the precursors whom they came to displace. Assuming, as a general rule, the uniform north-western progression of European population from the Asiatic cradle-land of the human race, to which science, no less than revelation, points, we are thence led to assign a certain relative age to races from their geographical position. In the extreme north are still found the Ugrian Fins and Laps, pertaining to a stock whose congeners abound in Asia and find their modern European representatives in the intrusive Majiars of Hungary, but who, as an ancient European stock, appear as the probable representatives of those Allophyliæ, whose existence in the north of Europe and in Britain, in periods prior to all written history, is now generally accepted as an established truth. In like manner, the mountainous Basque region of the Pyrenees shelters the last remnant of the ancient Iberian stock, an unclassed, if not aboriginal Allophylian race; while, among the mountains of Albania —like waifs caught in the eddy of the great western stream of population—are still found the Skipetar, another unclassed race, who, for ought that can be said to the contrary, may as truly represent to us the aboriginal Pelasgi of Greece, as the Basques undoubtedly do the Ibéri of Spain. Leaving those, and coming down in point of time to the Indo-European historic races, we find the Gaelic Kelts in the extreme north-west, as in North Britain and Ireland, and in Gaul, with the Kymric and other Kelts, as the Welsh of England, and the Cimbri and even the Teutones* of the northern shores of the European mainland,

* The science of Ethnology is still so much in its infancy, that it will least surprise the most zealous of its students to find its longest accepted terms called in question. Dr. Latham has advanced reasons in his "Ethnology of Europe," for believing that, "instead of the ancient Kelts of Iberia having been Kelts in the modern sense of the word, the Kelts of Gallia were Iberians," *i. e.*, were a different race from the Gauls north of the Garonne. Next to the term *Celtic*, no word is better established among English, though not among continental ethnologists, than *Teutonic*, as equivalent to Germanic, and thereby contra-distinguished from Keltic. The term, however, is at best arbitrary, at worst altogether false; for it is by no means improbable that the Teutones were Keltic, as it is certain that the evidence of Appian tends to show that both they and the Kymbri were of Gallic origin. (Vide Latham's "Germania of Tacitus," pp. cx., clx., clxiv.) The names *Teutones* and *Teutoni* have been mistakenly assumed as derived from the German *deutsch*, *teut-sch=teut-oni*. But the word signifying people, from which *deutsch* is derived, is either written *thiud*, Anglo-Saxon *theod*, or *diut*; never *thiut*, or *theut*, still less *teut*. *Teut*, on the contrary, appears to be a Gallic syllable. We find, among the Gauls, Teutomatus (Cæs. b. 7), Teutates (Lucan), Teutomalus (Liv. epist.). One of the Teuton chiefs was called Teutobochus or Teutobodus (Florus and Eutropius), while Pliny (v. 32) speaks of a Galatic people: Teutobodiaci. Another of the captive Teuton chiefs is named by Plutarch, Boiorix; while Livy (34, 46) names a Boiorix of a "Regulus" among the Galli Insubres in Upper Italy. There was a weapon peculiar to the Teutons, called *cateja* (vide Virgil, b. 7, Teutonico ritu soliti vibrare cateias), which Isidor calls *Genus Gallici teli*: the termination *eja* being strictly Gallic. Among the Belgs were the Aduatici, whose name is purely Keltic, and even recalls that of the Atacotti in Britain; but these Aduatici were, according to Cæsar, descendants of the Cimbri and Teutoni. Old Festus (de signif. verborum) says that the Ambrones who followed the Teutoni, were *gens Gallica*.

all occupying the geographical positions to which the foremost intruders into the European area must have been driven by the accession of successive migrations from the east. In Greece and Italy were the Hellenic and Kelto-Italian successors of the Pelasgi, with, in the Italian peninsula, the intrusive Semitic race of the Rasena or Etruscans. In Spain were the Ibéri and Celtibéri, with also a small intrusive race: Phœnician or Punic; and those with the Phocian and Punic colonies of Masallia and the larger Mediterranean islands, constitute the population of Southern Europe, when the curtain first rises and reveals to us the great arena of the world's later civilization. To the north of this, our imperfect knowledge suffices to disclose the central area of the continent, lying between the Alps and the German Ocean, occupied, from the Atlantic to the head of the Adriatic, by the different branches of the Keltic stock, and thence eastward to the Euxine Sea, and along the valley of the Danube, by the Scytho-Sarmatian stock, including the whole Lithuanian and the first of the Slavonian populations, by whom so large a portion of their ancient area is still retained. Of these latter the Lettes are the most ancient: the Lithuanic being the likest of all the Indo-European tongues to the Sanskrit, the ancient sacred language of India.

As a broad ethnological sketch of the superficies of Europe at the dawn of authentic history, this is no baseless theory, but an outline of facts as well established as the nature of the imperfect evidence admits. But it will be seen that only a very slight extension of the old Ugrian area, such as is presupposed by the assumption of the Fins and Laps of Northern Europe constituting the remnant of a more widely diffused Allophylian stock, is requisite to occupy the whole of Europe, without the presence of a single branch of the Germanic stock in any of their later geographical areas. While, however, those various older races were gradually moving westward, ever pressed from behind by fresh swarms from the Asiatic hive, till the Gael overflowed from Gaul into Britain, northward into the Kimbric Chersonesus, and southward into Italy, the younger Germanic stock entering Europe by the only unguarded portal, between the southern spur of the Ural Mountains and the Caspian Sea, circa 500 v. 400 B.C. (?), found their way along the banks of the tributaries of the Vistula to the Baltic.

Besides the approach to Southern Europe by the Mediterranean, by means of which the isolated Semitic populations of Etruria, Gadir, and Tartessus, and the Phocian and other colonial off-shoots of south-eastern civilization, reached its north-western shores, there are only two passages, or at most three, open to the migratory wanderers from Asia to Europe. The most southern of these, which required the navigation of the Hellespont or the Thracian Bosphorus, may be supposed to have been the course pursued by the ancient Pelasgi, or some still older southern Allophyliæ, in times lying beyond all history. This road, however, we know was early closed by the occupation of the whole of Asia Minor by Phrygians, Lydians, Lycians, Phœnicians, and other civilized and warlike people, whose presence entirely precluded the approach of any migratory horde to the shores of the Propontis. Beyond this, therefore, later migratory tribes, including, perhaps, the earliest pioneers of Keltic colonization, would find open for them the narrow passage formed by the lower valleys between the Caucasus and the Caspian Sea, and then reaching the northern shores of the Kimmerian Bosphorus, they would enter by the passage between the Carpathian Mountains and the Euxine into the fertile valley of the Danube. This road, also, in itself narrow and straightened, was closed against such nomade intruders long prior to the dawn of history, by the occupation of the whole country around the lower Danube by Scythic tribes belonging to the Thracian division. These warlike tribes were in undisputed possession of this important European area when we obtain our first glimpse of them in the pages of Homer, and no doubt can be entertained of their ability to withstand the encroachments of all later intruders.

Thus, then, at the assumed period of the immigration of the Germanic nomades, after the entire occupation of southern and central Europe by older races, there remained only one road open for tribes immigrating westward from Asia into Europe, through the Ural passage to the north of the Caspian Sea; and thence—the southern road through the valley of the Danube being now closed—they must have crossed the vast prairies of Russia, along the northern edge of the impenetrable forests of Volhynia and Poland, and the watershed of the Dnieper and the Vistula—the route pursued by the Huns, under Attila, in the fifth century—and thence along the tributaries of the Vistula to the Baltic. Here the ethnologist may be said to strike the trail of the first Germanic nomades. The later Cimbri or Kymri, and the younger Scytho-Sarmatians in their wake, having been obliged to pursue a north-western course till they reached the southern shores of the Baltic, the Kymri, and no doubt also the Belgæ, penetrated still further to the westward, while their Scytho-Sarmatian followers remained at the Vistula. The Germanic nomades, beginning their intrusive migration long after their precursors had consolidated their power, and occupied their borders with the increased numbers of a settled population, were compelled to pursue the still more northern, but less encumbered course, while being, in the common movement towards the west, driven to the shores of the Baltic near Livonia and Esthonia, they crossed to the Islands, to Gottland, Oland, and to Scania, and there settling themselves in the great northern Scandinavian peninsula, where archaeological research proves them to have displaced an older Allophylian population, they nursed their young strength, preparatory to their intrusion on the historic area of ancient Europe.

Archaeological investigations contribute many valuable accessories to such ethnological inquiries, and specially tend to confirm the conclusions here advanced relative to the late arrival of the Germanic nomades in Western Europe. This is strikingly shown by the abrupt transition from the aboriginal stone relics to the evidences of the metallurgic arts of the last Pagan period, disclosed in the sepulchral depositories of Northern Scandinavia.*

The Kymbri themselves were anciently known as *Galli*. The oldest author mentioning them is Sallust (Bell. Jugurth., c. 114, adversorum Gallos ab ducibus nostris Q. Cæpioni et M. Manlio male pugnatum est); also the Kimbric slave sent to kill Marius at Mintuone is called *natione Gallus* by Livy (Epist. 77). The latter notices tend to show that the assertion of Strabo, or rather Posidonius (Strabo 7), afterwards repeated by Plutarch (Marius c. 11), that the Cimbri and Cimmerii are the same, is not one to be hastily rejected, though so able and cautious an authority as Dr. Latham has expressed himself as "utterly disbelieving the Cimmerii of the Cimmerian Bosphorus to have been Keltic." (Man and his Migrations, p. 169.) The above argument is chiefly designed, however, to justify the substitution of the term *Germanic* for that of *Teutonic*, employed by me elsewhere, and generally used in England to designate the Scandinavo-German race. Even if the Teutons can be shown to be Germanic, they were always a comparatively small and unimportant tribe, nor is the suitableness of the denomination *Germanic* disputed by any one; the supposed risk of confusion with it, in its modern political sense, has alone interfered with its adoption.

* Vide Prehistoric Annals of Scotland, p. 358.

Having established the Germanic nomades as a settled people in the northern peninsula still occupied by one great branch of the Germanic stock, the course pursued by them when they in turn became the aggressors is abundantly manifest, even now, on the map of Europe. Passing over into Denmark, and to a great extent displacing and dispossessing the Kymri, they entered Central Europe from that *point d'appui*, penetrating like a wedge between the Gauls and the Sarmatians, and gradually occupying the whole modern Germanic area between the Elbe and the Rhine. This is the movement which I conceive manifested itself by that overflowing of the Gauls into Central Italy, by means of which they, and thus also, indirectly, the Germanic aggressors on their rear, began, for the first time, to take their part in the great drama of the nations. Then it was that the Gallic population, pressed on from the north-east and confined on the west by the Atlantic, passed over into Britain: not, indeed, occupying it for the first time with a Keltic population, but intruding upon the older Keltic occupants, the Gallic Cantii, Belgæ, and others of those newer southern tribes, whose sympathy with their continental brethren first exposed their country to the aggressive arms of Rome. Few questions in ancient ethnology have been more keenly disputed than the Germanic or Keltic character of the Belgæ of Picardy; but nearly all ethnologists now agree in assuming that the Belgæ of Britain came from Belgic Gaul, and in the opinion that the continental Belgæ were Kelts. These points being assumed, all that we learn of the Belgæ from Cæsar—their warlike hardihood in maintaining the passes of the Rhine, the diversity of their dialect from the older Gauls, and the union and consanguinity recognized among themselves (Cæs. Bell. Gall., XI., 4)—confirm the idea of their recent migration from the eastern shores of the Rhine, and the consequent recentness of the Germanic intrusion of which this was a product.

The same great Germanic migration from the north into the centre of Europe, pressing southward, drove a part of the intercepted Keltæ to seek an outlet down the valley of the Danube, encountering in that fertile region Illyrian and Thracian occupants, and mingling with or displacing them in that rich country, the fertility and many natural advantages of which have so often contributed to make it the theatre of contending claimants. This may account for the two names, Danube and Iser: the former the Keltic name, afterwards adopted by the Romans, while the latter was accepted by the Greeks. When Alexander the Great, in 335 B.C., moved against the Thracians, he found the Kelts already settled to the east of the Adriatic, and received offers of alliance from them, not as a recent band of strange intruders, but as the proud and ambitious aggressors, who, at a later period, under Brennus, invaded Macedonia and Ætolia, and even attacked the holy Delphic shrine. The Keltic tribes, thus cut off from the great stock, and compelled to retrace their course, not only penetrated eastward, as we have seen, into Thrace, but passed over into Asia Minor, where they peopled Galatia; while, if we hold to the true Kelticity of the Keltic element of the Celtibéri of Spain, we may account for a similar overflow of the Gallic Kelts into the Iberian peninsula.

Thus we have the non-Indo-Germanic Phœnician, Punic, Etruscan, and other Semitic elements, passing by the southernmost route, from the shores of the Levant, into Southern Europe, and consequently not diffused as from a common centre, but occupying isolated and widely scattered positions. The oldest branch of the great Indo-European family of nations, the Gallic Kelts, follows by the southern land passage, preceding the classic races, and contributing to them a large portion of the philological elements by which they are known to us. How far they may also have contributed to their ethnological elements is uncertain. Whence, indeed, the Hellenic stock is derived is still a problem scarcely yet attempted to be solved. Was it derived from Italy to Greece, as Dr. Latham inclines, not without reason, to believe (Ethnol. of Europe, p. 97), or from Greece to Italy? Was it the product of an intermixture of Keltic and Pelasgic blood, or of Pelasgo-Keltic and Semitic blood? Intermixture of blood, not purity of race, seems the law of highest development in the historic races; and hence, perhaps, it is that the old Keltic migration moved on westward and diffused itself over the great central area of transalpine Europe through long unrecorded centuries, only making itself known by the shock with which it was rent in pieces when it came into collision with the younger historic races. Behind these Kelts came the Scytho-Sarmatian stock, still occupying to a great extent its original European area, though taking up so small and insignificant a section of the historic page; while the younger Germanic stock, Esau-like, seizing the birthright and the portion of the elder, has overstepped it in the race, preoccupied the area of the displaced Kelts, shared in the spoils, and borne a prominent part in the reinvigoration of Southern Europe; and now entering on the possession of this vast continent of America, and of that other new world which lies sheltered in the temperate zone of the southern hemisphere, the Germanic—or as we too limitedly designate it, the Anglo-Saxon—race is entering on fresh aggressions and claiming a wider theatre for the arena of its triumphs. Whether the stirring among the Lithuanic and Slavonic races of Eastern Europe, which now thrills us with the rumours of war, and shakes all Europe with the coming struggle, be any symptom of the long dormant energies of her Scytho-Sarmatian stock awaking at length to assert the claims of a long-proscribed priority of birthright, is a question which had attracted the notice of Panslavic students of ethnology before it forced itself on the attention of European diplomatists.

On some New Genera and Species of Cystidea from the Trenton Limestone.

Read before the Canadian Institute, February 11th, by E. Billings, *Barrister-at-Law, Bytown, Canada West.*

(*Concluded from page* 218.)

We pass now to the examination of one of the most extraordinary organisms yet discovered in the palæozoic rocks. It is no doubt a true Cystidean, but differing in one remarkable particular widely from any hitherto described. It has an oval or heart-shaped body, the broad base of which rests upon the usual short tapering stem of the group, while from its pointed upper extremity arise two long, slender, flexible arms or tentacula. One side is regularly formed of large plates, like those of the genus *Hemicosmites*, but the other is almost entirely occupied by an immense opening that extends from near the top quite to the base, and which appears to have been covered only by an integument, strengthened by small angular plates in a manner similar to the protection drawn over the cup in certain species of the Crinoidea.* It is constructed as if one side of a Cystidean had been cut away and removed, and the upper part of an encrinite placed in the space thus made vacant. In several specimens, although the integument has long since disappeared, yet the small plates still remain, occupying the cavity. In one species they are exceed-

* See Miller's description of the plated integument of *Pentacrinus caput Medusæ*, in the Natural History of the Crinoidea, p. 53.

ingly small, and more than a thousand in number, while in another they are much larger, and only about forty of them. In the Cystidea, as also in the Crinoidea, the part resting upon the column is considered to be the dorsal pole, and the upper part of the cup the ventral; but in this singular fossil the ventral region appears to have been displaced from its normal position, and drawn down, as it were, to one side, until it reaches the top of the column. This is not a deformity of a single individual, but as it is seen in all the specimens (clearly constituting several species), it must be regarded as a permanent character of the genus.

It must have been nearly flat, one of the broadsides being regularly formed of large plates, and the other covered by the integument. The former may be called the back, and the latter the ventral side. The following is the arrangement of the plates. See Figs. 9 and 10.

On the upper joint of the column rest four pelvic plates. Two of these are pentagonal, or hexagonal, and spread away from each other in the form of the capital letter Y, and in the angle thus formed is placed the large central hexagonal plate of the second series. The two other pelvic plates are situated one on each side, and partly under the former. They do not unite on the other side and form the cup-shaped pelvis of the ordinary Cystidea, but spread out, wing-like, from the sides of the column. Each sends out a slender projection at the bottom, which clasps round or rests upon the upper joint. Outside of these, again, are two other small plates, one upon each wing, making in all six in the basal series.

In the second range there are three large plates, one in the centre hexagonal, with a heptagonal plate on each side.

The third series contains four large plates, elongated vertically. One of these on the right hand of the centre is pentagonal, the other on the left hexagonal. They are narrowed above to correspond with the decreasing dimensions of the body, which here begins to contract. The other two plates of this row are either heptagonal or sligtly octagonal, and in their upper extremities they fold round the body, and unite on the other side by narrow projections, which arch over the great oval opening, as may be seen in Fig. 10. All those plates at the edge are folded under, so as to form a border round the ventral region on the other side. Above these are ten smaller plates, which close the summit, and form a solid support for the arms.

These arms are each formed of a series of double joints. When viewed from the rear, as in Fig. 9, or from the front, as in Fig. 10, these joints appear each to be formed of a single piece; but when seen from the outside, as in Fig. 11, they are double. On the inside, a double row of minute projecting tooth-like ossicula follows the suture down each arm, and crosses the summit between them. There is a figure on plate 2, opposite p. 51, in Miller's Natural History of the Crinoidea, which shows six fingers of *Pentacrinus caput Medusæ* attached to the hand, four on one side, and two on the other, which exactly resemble the arms of this species. There, too, it will be observed, a double row of ossicula run up the inside; and these appendages upon this Cystidean appear rather to be of the nature of tentacula than true Crinoidal arms.

The only apertures visible in the specimens yet procured are a small one immediately below the summit on the ventral side on the suture between two small plates, and another at the base, on the right side of the pedicle (Fig. 10), where the border round the great oval opening is excavated into a channel for the passage of what appears to have been a proboscis of small plates. Between the arms, the rows of ossicles which fringe the inside cross from base to base, and it may be that at this point they form a valvular apparatus above the mouth, as in the last species. If this be so, then the orifice immediately below is without doubt an excretory aperture, and the other at the bottom may be regarded as ovarian.

There are three pectinated rhombs, one at the base, half of which is situated on the right pelvic plate, and the other half on the central hexagonal plate of the second series. The other two are situated, one on the left pair of plates in the third series, the other on the right. They are entirely open—that is, the elongated pores cross from one side of the rhomb to the other at right angles to the suture, without being concealed by an unperforated space in the centre, as in *Glyptocystites*. When the rhombs of the latter are ground down, as before mentioned, they are then open, as in the present genus.

As this strange inhabitant of the old Silurian ocean consisted, properly speaking, of but one side, constructed on the normal pattern of the Cystidea, I propose, as a name for the genus, *Pleurocystites*, from the Greek Κυστις and πλευρον. There are clearly several species, but I shall only recognise three at present.

Pleurocystites squamosus.

Fig. 9. Fig. 10. Fig. 11. Fig. 12.

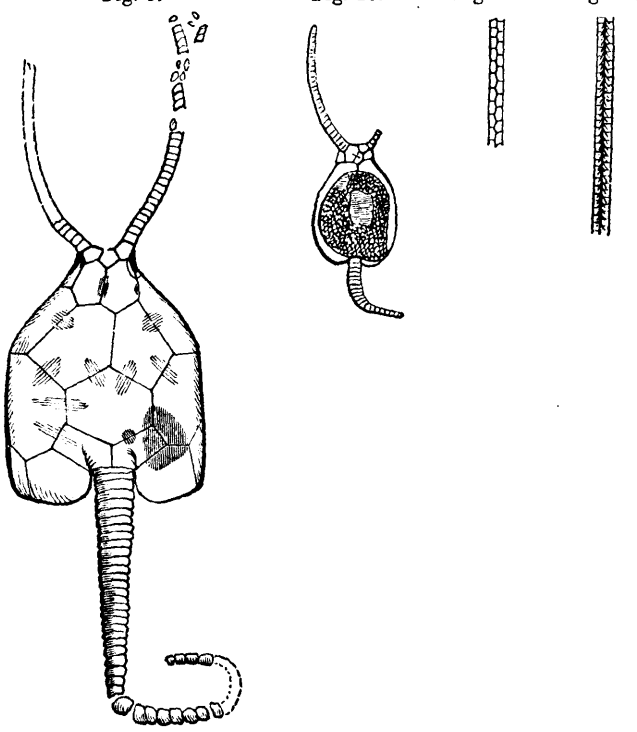


Fig. 9. *Dorsal view of a large specimen.*
" 10. *Ventral view of a small do.*
" 11. *Outside of arm, showing the double joints.*
" 12. *Inside of do., showing the rows of ossicula.*

In this species the rhombs are small in proportion to the size of the body, and of an oval shape, the greater axis of the ellipse crossing the sutures between the pairs of plates upon which they are situated at right angles. The integument is composed of a vast number, more than a thousand, minute, scale-like plates, mostly hexagonal, and less than the fiftieth part of an inch in

diameter. The surfaces of the large plates appear to have been nearly smooth, or only obscurely striated; but as the specimens are much worn, this appearance may be deceptive. These are the only specific characters that can be given at present.

Pleurocystites filitextus.

Fig. 13. Fig. 14.

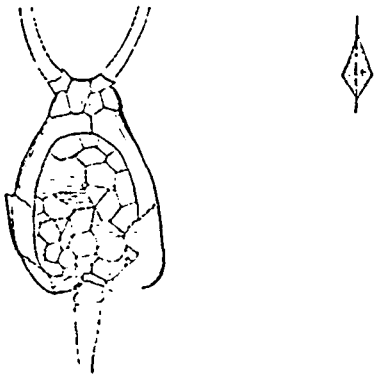
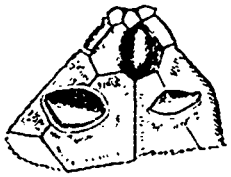


Fig. 13. *Ventral aspect of an imperfect specimen.*
" 14. *The left rhomb alone.*

The rhombs of this beautiful species are lozenge-shaped, with straight sides and sharp angles. They are much larger than those of *Pleurocystites squamosus*, and situated perpendicularly —that is, the longest diagonal of the rhomb extends up and down, and the shortest lies across the fossil. The reverse of this is the order in which they are disposed in the other two species. In all the species, it should be here observed, the left rhomb above is the largest. Fig. 14 is the left rhomb of a specimen of the size figured in 13. All the large plates on the dorsal side have strong rounded ridges radiating from the centres to the corners, and smaller ones between them, which cross the lines of division between the plates at right angles from centre to centre. These are again crossed by lines of growth parallel with the edges, producing a beautiful woven effect. Hence the specific name. The integument consists of about forty angular plates of various sizes. These characters separate this species from the other in a very marked manner. In one locality there are great numbers of the plates and disjointed columns of this species, and it was there that the specimen Fig. 13 was found. It is separated from the matrix, but although the back exhibits one rhomb and the character of the striation, yet it is otherwise so much distorted that a figure of it would convey but little instruction. I have not been able to ascertain clearly the size o the other two rhombs.

Pleurocystites robustus.

Fig. 15.



Of this species I have only the fragment here figured, but it is so widely different from the others, that there can be little doubt of its being distinct. The rhombs are nearly in the shape of a spherical triangle, one side crossing the suture above and one of the angles being upon it below. Here, too, the left one is the largest. They are excavated into a deep hollow with a rounded bottom, the longer axis lying across the fossil. They are also surrounded with an elevated border. The plates near the edges are marked with fine striæ at right angles to the sides, but the ridges proceeding to the corners are barely perceptible. There are also several faintly-perceived crenulations parallel to the edges. An elongated tumour lies between the right rhomb and the vertical suture in the centre. Altogether, this is a more vigorous species than either of the two former.

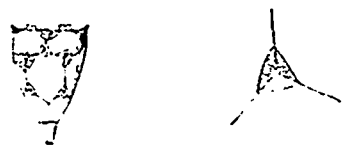
Besides these, there are several specimens exhibiting only the back, but very perfect, which will constitute either one or two other species. Until the other side can be seen, they can hardly be classified as one, and yet they are clearly distinct from the above. It is only within the last four months that specimens were discovered showing the structure of the ventral side of this genus, and since then there has not been time to study them minutely. It may be that an aperture will yet be found situated somewhere in the integument near the centre, but at present appearances are against it.

These are all the Cystidæ in my possession with poriferous areas clearly developed, and which have been found in a sufficient state of perfection to admit of their being described; but there are detached plates frequently found here in the upper layers of the Trenton limestone, which exhibit the remains of these organs of a form different from any of the above. They prove nothing, however, more than the fact that other species of Cystidea are imbedded in the formation. There are seven other species, of which I have some very good specimens, which differ widely from *Glyptocystites* and *Pleurocystites*, and of these I shall probably prepare another paper before the end of the session. They are without poriferous areas, and some of them approach the Spheronites in form, but are furnished with fimbriated arms.

It may be proper here also to notice a remarkable Crinoid, which conspicuously displays upon its surface upwards of twenty small sub-triangular spaces perforated with elongated pores, resembling those of the rhombs of the Cystidæ. The cup is small and conical, composed of three rows of plates. The first series, or pelvis, consists of five pentagonal pieces, the second series of five, four of them hexagonal and one heptagonal, alternating with those below. The scapulæ are also five, and of a heptagonal shape. They alternate with the second series. On one side, between two of the scapulæ, there are either one, two, or three small plates; but owing to the circumstance that all the specimens (four in number) happen to be badly preserved or mutilated at this point, they cannot be ascertained.

These poriferous areas are each formed of the three angles of three contiguous plates. From the point of each plate a pore extends towards the centre, and all the others on that plate are parallel to this central pore. In each area, therefore, they run in three directions, and are not at right angles to the sutures between the plates, as in the Cystidea. Figs. 16 and 17 will explain this arrangement with greater clearness than a written description.

Fig. 16. Fig. 17.



They are thus situated:

On the apices of the pelvic plates	5
At the upper extremities of the upright sutures between the plates of the second series	5
On the upper angles of the second series	5
Between the arms	5
	20

There are thus twenty placed at the angles of the principal plates; but besides these, there are also several small ones among the supplementary plates on one side above mentioned.

Eclipse of the Sun, May 26th, 1854.

Extract from the Minutes of the Council of the Canadian Institute.

"*Resolved*, That Professors Cherriman and Irving be appointed a Committee to draw up instructions for general distribution relative to the approaching solar eclipse."

Report of the Committee appointed by the Council of the Canadian Institute to draw up suggestions for observers of the Eclipse of the Sun on May 26th.

The following recommendations are submitted by the committee appointed by the Council of the Canadian Institute to draw up suggestions for observers of the approaching eclipse of the sun on May 26th. These suggestions are not intended to be addressed to professed astronomers, but to those who, feeling an interest in such subjects, would gladly have those circumstances pointed out on which they should fix their attention, as giving them the means of increasing the recorded data, or as likely to be of special interest to themselves.

The eclipse being, under the most favorable circumstances, only annular, the peculiar phenomena of a total eclipse will not be seen, viz., the corona, and the rose-colored flames or prominences. The corona is never seen till an instant or two after the total obscuration has begun. It is a ring of light, or halo, surrounding the sun, within which have generally been seen certain red flames, as it were bursting out from the side of the moon, very variable both in shape and size. Of these latter we cannot expect to see anything during the approaching eclipse, nor of the corona directly. Indirectly, however, we may probably meet with proof of its existence, and that in a way which will tend to confirm the theory of its appearance; which is this—The sun is supposed to be surrounded by an atmosphere like our own, non-luminous but capable of reflecting light, which would produce to us the same appearance as if the sun's disc were surrounded by a faintly luminous ring. In consequence, however, of the general brightness of the sky produced by the dispersion of the sun's direct light by our own atmosphere, this ring is not generally visible. In a total eclipse, the brightness of the sky is so far reduced in the immediate neighbourhood of the sun that the ring becomes visible, and constitutes the corona. In a partial eclipse the sky is still too bright to admit of our seeing this ring as a corona, but its illumination is strong enough to render visible the part of the moon exterior to the sun's disc as a dark body on a bright ground, the part nearer the sun's edge being more distinctly seen than that more remote. This is in accordance with observations which have been already made; and it will, therefore, be an object of interest to look for the portion of the moon's disc exterior to that of the sun. It will probably be visible when about half the sun's diameter is obscured, and may be seen through an ordinary telescope, provided the lenses are well polished and perfectly clean.

The following are the observations which it will be advisable to make during the progress of the approaching eclipse.

These observations may be conveniently divided into

I. Observations requiring instruments.

II. Observations which may be made without instruments.

I. The observations requiring instruments may be again subdivided into two classes, which we may call Astronomical and Physical.

The observations under the first class will be as follows:—

Note the duration of the eclipse by ascertaining the exact moment of the beginning and end, as denoted by a watch. These epochs will be of no use in themselves, unless the watch's error and rate have been accurately determined; but if the watch be a pretty good one, the difference between the epochs will give, with tolerable accuracy, the duration of the eclipse. At places where the eclipse is annular, there will be four epochs to be noted—the times of the two external contacts, as in the case of the partial eclipse, and also the times of the two internal contacts, corresponding to the beginning and end of the annularity. To ascertain these times with any accuracy, there must be two observers—one holding the watch and keeping his eyes fixed upon the seconds-hand; the other looking at the point of the sun where the contact is expected. The signal should be given sharply, by a single syllable. This observation may be made without a telescope, but better with one. With a sextant, where the eclipse is partial, the distance between the cusps may be repeatedly measured about the time of the greatest obscuration; and where the eclipse is annular, several measures of the breadth of the annulus may be made in its narrowest part: in both cases noting the time of each observation. It will also be interesting to obtain a measure of the moon's apparent diameter, where the eclipse is annular. In consequence of the irradiation of the sun's light, the measure thus obtained may be expected to be less than the calculated apparent diameter.

The following are the points to which an observer who has the opportunity of using a telescope should especially direct his attention. An ordinary telescope will be sufficient for these purposes, provided that it is fitted with coloured glasses of various shades to enable the eye to bear the sun's light.

1. The serrated or jagged edge of the moon's disc may be seen with a low magnifying power, as she moves over the sun's face.

2. When about half the sun's diameter is eclipsed, the observer should carefully endeavour to detect the portion of the moon's disc exterior to the sun; and he should especially notice whether that portion of the external surface of the moon which is close to the sun is seen with sensibly greater distinctness than parts at a greater distance. It may be well here to repeat the warning, that there will be no chance of this observation being successfully made, unless the lenses of the telescope are well cleaned.

3. The cusps should be attentively watched, in order to ascertain whether they remain sharp and well defined, or whether at any time they become blunted or irregular.

4. Where the eclipse is annular, the phenomena known as "Bailey's beads" may be looked for. When the western limb of the moon is leaving the western limb of the sun, it appears

serrated or jagged, the light of the sun shining between the teeth. These teeth or projections appear to increase in size, and to diminish in number, until on some occasions the two discs have been seen united only by broad, well-defined dark threads, which at last disappear instantaneously. The same phenomena recur in an inverse order as the eastern limb of the moon approaches the eastern limb of the sun. It should, however, be noticed that the threads above mentioned are considered by Arago to have been optical delusions, arising from the axis of the telescope not having been properly pointed.

In the second class of observations are included the changes occurring in the intensity and quality of the sun's light and heat, and the atmospheric or terrestrial phenomena produced thereby.

Observations should be made continuously throughout the eclipse with the ordinary psychrometer, or wet and dry bulb thermometers, in the shade; and, in the absence of an actinometer to measure the intensity of heat produced by the sun's rays, valuable information will be given by a common thermometer with a blackened bulb (a coating of lamp-black will serve) fully exposed to the sun's rays, and protected as much as possible from reflection of heat from any neighbouring buildings or substances.

It would be desirable to obtain some measure of the variation in the intensity of the sun's light; but no plan has yet been devised for doing this; the methods rudely practicable in a total eclipse will be here of little avail.

Changes in the quality of the light should be noted by observation of the solar spectrum formed by refraction through a prism, examining whether any of the colours seem more changed in intensity than others, and whether the red end of the spectrum appears to increase; also, if the prism be capable of showing the dark lines, whether they undergo any modifications either in number or position. It would also be interesting to take photographic copies of the spectrum at different stages of the eclipse, to detect any variation in the actino-chemical rays. If the observer be provided with a polariscope or a Nichol's prism, he should examine the polarisation of the light at different points of the sun's disc.

II. One observer should also confine his attention to phenomena which do not require instruments for their observation.

Among these, the most important will be to note if any change be perceptible, about the period of the greatest obscuration, in the aspect of terrestrial objects, and especially in the colour of the sky near the horizon in the part opposite to the sun: to observe whether a well-defined shadow of a staff or cross thrown on a wall be subject to any flickering motion, especially about the edges; and whether any moving bands or patches of light are seen to traverse the wall or ground; also, whether the shadow of the moon can be detected "sweeping through the air," as described by Mr. Airy in the last total eclipse.

Another observer should confine his attention at this period to the sun itself; examining how the intensity of the light varies in different directions round the disc; whether there are beams of light, or the rudiments of a ring round the moon; and whether there is any light on the side opposite to the bright lune.

In the event of a light cloud or haze crossing the sun, the observer should watch for any manifestation of corona or coloured rings, noting their colours and approximate diameters. They will be most easily seen by reflection in water, or by the use of a light brown glass.

It is not to be expected that the effects described as produced on the animal and vegetable creation by the entire deprivation of the sun's light in a total eclipse will be at all noticeable in the present case, nor that stars will be visible to the naked eye. It is, however, possible that the planet Mars may be caught sight of, about 90° to the east of the sun.

In conclusion, observers should be warned against attempting too much. The period of the greatest obscuration only extending over three or four minutes, it is impossible for a single observer to note all the phenomena that occur. The best way will be for several persons to agree beforehand on the points to which the attention of each shall be exclusively directed, and from which no temptation should be suffered to distract him.

As a rough guide to the circumstances of the eclipse at different places in Canada, it may be remarked that a line drawn on a map from Ogdensburgh to Isle Royale, on Lake Superior, will pass through those places at which the eclipse will be central. Lines parallel to this drawn through the south-western extremity of the Island of Montreal and through Kingston will be respectively the northern and southern boundaries of the annularity. Parallel lines through Toronto and Quebec will approximately determine those places at which eleven digits will be eclipsed at the greatest obscuration.

The times of the beginning of the eclipse will be, at Toronto, $3^h\ 44^m{\cdot}7$; at Kingston, $3^h\ 57^m$; at Ogdensburgh, $4^h\ 2^m{\cdot}7$; at Montreal, $4^h\ 11^m\ 3$: at Quebec, $4^h\ 19^m$, the angle of contact being about 150° from the north point toward the west. The duration of the eclipse will be nearly two hours and a half.

In order that observations made in accordance with the above suggestions may be presented in a combined form to the Institute, it is requested that any communications on the subject be addressed to the Director of the Magnetic Observatory, Toronto.

INCORPORATED BY ROYAL CHARTER.

Fifteenth Ordinary Meeting, April 1st, 1854.

The following gentlemen were elected members:

J. S. Walker ..... Brantford.
T. Maclear ..... Toronto.
H. Piper ..... "

A paper was read by Professor Wilson on the following subject: "Some remarks on the intrusion of the Germanic races into the area of the older Keltic races of Europe."

Sixteenth Ordinary Meeting, April 8th, 1854.

The names of the following candidates for membership were read:

Thomas Keefer, C.E.....Montreal.
Andrew Hood, P.L.S.....Dunville.

A second paper by Elkanah Billings, Barrister-at-Law, of Bytown, C.W., "On some new Genera and Species of Cystidea from the Trenton Limestone," was read.

The President announced that the concluding meeting of the Institute for the Session 1853–4, would be held on Saturday, 29th April.

Seventeenth Ordinary Meeting, April 29th, 1854.

The following gentlemen were elected members:

Thomas Keefer, C.E.....Montreal.
Andrew Wood, P.L.S.....Dunnville.

The name of the following candidate for membership was read:

James Farley.....St. Thomas.

The Rev. John McCaul, LL.D., President of University College, delivered an eloquent and learned Lecture on "Some doubtful points of Grecian and Roman Antiquities."

A very interesting and elaborate paper "On the Rise and Fall of the great Lakes," by Major R. Lachlan, of Montreal, was read by the Rev. Professor Irving.

The President announced that on Saturday, May 6th, a General Meeting would be held to take into consideration the Report of the Committee appointed by the Council to make final arrangements for the union of the Toronto Athenæum with the Canadian Institute.

Sykes' Steam Hammer.

We publish this month an engraving of a very ingenious arrangement of a steam-hammer, which has been invented and patented by Mr. Sykes, Superintendent of the Toronto Locomotive Works.

This hammer is not proposed to equal in the range of its application the steam-hammer invented by Nasmyth, but it accomplishes in a much cheaper and more simple form many of the objects attained by that patent.

The chief advantages of this arrangement are: first, the direct application of the steam without the intervention of a steam-engine, and its consequent fly-wheels, belts, and gearing; secondly, the arrangement of the steam valves in such a form as to admit of a perfect adjustment of the height of the stroke and the vigour of the blow given. This adjustment is not perhaps quite so perfect as that of Nasmyth's, but it is sufficient for all practical purposes. As compared with Nasmyth's, its disadvantages are that it does not give a square or parallel blow, and the forging of square work must therefore partake of the angularity of the face of the anvil to that of the hammer in proportion to its thickness, unless the hammer head is changed with each change in the dimensions of the work to be done. This, however, is only true in the case of work requiring parallel faces, and does not affect the forging of shafts or other round work. The nature of this arrangement also prevents its application on so large a scale as in Nasmyth's hammer. For ordinary work, however, and for shafts which do not exceed ten or twelve inches in diameter, the small cost of this hammer will, we think, be sufficient to ensure its extensive use.

LITERAL REFERENCES.

A—Anvil block.
B—Hammer head. These may be of such form as is desirable for swaging the work to the required form.
C—A spring of flexible timber against which the hammer head strikes in its upward stroke, and is intended to overcome the momentum of the hammer, which would otherwise throw the piston out of the stuffing-box.
D—A cast-iron socket which carries the hammer arm, the centre *O* on which it oscillates, and the piston.
E—The piston made square and concentric with the centre *O*, and can be completely finished in the lathe.
F—Is the steam-chest in which the piston works, being furnished with a stuffing-box and gland of the ordinary construction.
a—Valve-chest, containing double slide valves, the adjustment of which in relation to each other regulates the stroke of the hammer.
b—Valve-lever, the position of which on the arc *c* regulates the relative position of the valves.
d—The under valve rod.
e—Exhaust-pipe for waste steam.
f—Lever attached to the main centre *O*, by which the oscillations of the shaft communicate the requisite motion to the upper slide-valve by acting on studs placed in the proper position on the valve-spindle *g*.
s—Steam pipe.
G—Main centre frame of metal.
H—Foundation plate.
K—Foundation of timber or stone.
t t—Iron columns by which the spring *C* is secured.

The Northern Railroad—Lake Ontario and Lake Simcoe.

On Saturday, May 6th, the Mayor and Corporation of the City of Toronto, the Sheriffs and Wardens of the Counties of Ontario and Simcoe, the Member for Simcoe, and a large number of private gentlemen, were invited by the President and Directors of the Northern Railroad to assist in celebrating the establishment of a daily communication, going and returning, between the City of Toronto and the shores of Lakes Simcoe and Couchiching.

The Northern road was in excellent condition, and the cars acquired a high degree of speed without the least disagreeable motion, placing the guests of the Directors by the side of a handsome and very commodious steamboat at Bell Ewart, on Lake Simcoe, in a little over two hours after leaving Toronto.

Shortly after the arrival of the party at Bell Ewart, the

steamer was under weigh for Orillia, on the shores of Lake Couchiching, where a stay of about an hour was made. Returning, the boat arrived at her destination some time before the cars appeared. The party reached Toronto a few minutes after 10 o'clock, p.m. It is needless to remark that every attention was paid by the Directors to the enjoyment of their guests. All arrangements were admirable, and cannot fail to secure for the delightful scenery of Lake Simcoe and Lake Couchiching many admirers during the coming summer.

Miscellaneous Intelligence.

DR. BARTH'S ARRIVAL AT TIMBUCTOO.

To the Editor of the Evening Mail.

SIR,—Despatches and private letters have this morning been received from Dr. Barth, announcing his safe arrival at that celebrated city, Timbuctoo.

In order not to encroach too greatly on your valuable space, the reader may be referred to the account of the expedition under Dr. Barth just published by authority of Her Majesty's Foreign Office, in which work all the reasons that prompted Dr. Barth to venture on that undertaking are explained, and the first portion of the journey itself is described. It suffices to observe that when Dr. Barth, in September, 1852, lost his only companion, Dr. Overweg, he saw himself reluctantly compelled to abandon for the time the contemplated journey across the continent towards the Indian Ocean. He resolved, however, with true heroism, to undertake alone the journey to Timbuctoo, which, though greatly less in magnitude than a journey would be to the Indian Ocean, was looked upon as a most difficult and dangerous attempt. "As the sole survivor of the mission [so wrote Dr. Barth before his departure from Kuka], the completion of its objects now devolving entirely on me, I feel my powers doubled, and my mind all the more determined, single-handed, to follow up the results already obtained. My means consist of a tolerable supply of presents, in addition to 200 dollars, four camels, and four horses. My health is in the best condition, and, with five trustworthy, long-tried servants, well armed, and having plenty of powder and shot with us, I shall, with fresh and redoubled courage, and with full confidence of success, start on my journey to Timbuctoo."

Accordingly, Dr. Barth, a man who never boasts with empty words, set out from Kuka by the end of November, 1852, and proceeded first to Sakata, by way of Zinder and Kashna, the route by Kano being impracticable, on account of the war in that region between the Bournouese and Fellatahs. The last letters received from him were dated Kashea, 6th of March, 1853; those received this day from Timbuctoo, by way of Tuat, bear dates ranging from the 7th of September to the 5th of October last, and none of the various letters despatched during the six months from March to September have as yet reached Europe. The details of his proceedings during that time, therefore, comprising the whole of his journey from Kashna to Timbuctoo, are yet unknown. It appears, however, that the general direction of his route from Sakatu to Timbuctoo was at first west-north-west, and that he crossed the Kowara (commonly called Niger) at Say, an important place, of considerable size, situated in about 14° north latitude and 3° 45′ east longitude, Greenwich, 150 geographical miles west-north-west from Sakatu. Both from this place and Libtako he had despatched letters to Europe by way of Sakatu. Libtako is a large place, situated in about 14° 40′ north latitude and 0° 30′ east longitude, 335 geographical miles from Sakatu, and 240 from Timbuctoo.

From Libtako to Timbuctoo, the general direction of Dr. Barth's course was north-west till he reached Saraiyamo, a large town 60 miles south of Timbuctoo, and situated on a tributary or branch of the Kowara. On the former river he embarked on the 1st of September. At first it presented a fine sheet of water, 300 yards in width, but afterwards a most intricate system of narrow meandering channels, partly overgrown with reeds and grass, at a distance of 40 miles in a straight line from Saraiyamo. After a very tedious zigzag navigation, he entered the main stream, the Kowara, on the 4th of September, near the village of Koromeh, presenting a magnificent aspect, covered, as it was, with a numerous fleet of vessels and boats of various sizes.

Crossing the Kowara, and entering a creek on its northern side, Dr. Barth reached Kábara on the next following day. Kábara is only a small town of 400 houses and huts, but has attained great celebrity as the port of Timbuctoo. It scarcely, however, deserves that distinction, as it is approachable by water only during four months of the year at an average, and at most during five months, when the floods are unusually high. The creek on which it is situated is of so inconsiderable a size and depth that even at the time of Dr. Barth's visit, which was during the rainy season, the boat, bearing only himself and his effects, had to be dragged up to the place with great difficulty; the creek measured about fifteen feet across, and the water scarcely reached up to the boatmen's knees. The docks of Kábara, as an artificial, large, handsome basin close to the town may be called, contained but a few boats at the time of Dr. Barth's arrival. Koromeh, the place already mentioned, and the islands of Day, between it and Kábara, have greater claims to be considered the port of Timbuctoo.

On the 7th of September, 1853, Dr. Barth entered the city of Timbuctoo in grand style, escorted by the brother of the Sheikh-el-Bakay, the ruling chief, and by a splendid suite on horseback, on camel and on foot, welcomed and saluted by the festive multitudes of the inhabitants. The latter had been made to believe that the arriving stranger was a messenger from the Great Sultan of Stamboul! The real character of Dr. Barth was only known to the Sheikh himself, whose protection and goodwill the intrepid traveller had been fortunate enough to obtain, and who considered it advisable that he should assume that character, on account of the very fanatical disposition of the great mass of the people. During Dr. Barth's subsequent stay, up to the 5th of October, the Sheikh-el-Bakay and his brother had remained the faithful friends of the pretended "ambassador from Stamboul;" but even under this character Dr. Barth considered himself not entirely free from danger, owing to the complicated nature of the political powers which exercise a sovereign sway over Timbuctoo, the inhabitants being composed of various nationalities. There are—first, the Sonray, forming the great mass of the people; then Arabs of various tribes—Fellatahs and Tuaricks, together with a small number of Bambara and Mandingo. One faction was not at all favorably disposed towards Dr. Barth, but wished his death; so that it was necessary for him to observe great caution in his movements and intercourse with the people. Fortunate, indeed, was it that the traveller had secured the sincere and unequivocal friendship of the Sheikh, under whose immediate protection he lived at his residence, and who had promised to have him safely escorted on his return to Sakatu.

Thus far the news will be gratifying to the friends of Dr. Barth. His state of health, however, was not in the same degree satisfactory. The accomplishment of the journey from Lake Tsad to Timbuctoo, which, in linear extent, taking into account the windings of the route, amounts to at least 2000 miles, may well prove a trying task for the physical powers of any man, from its extent alone; but when to this is added a preceding three years' travel and toil, the obstructions arising from the rainy season, with its swollen rivers, floods, and inundations, during which, partly at least, the journey to Timbuctoo was accomplished, together with the harassing difficulties and dangers arising from the fanatical character of the inhabitants he had to pass through, it will scarcely excite surprise that Dr, Barth should have reached Timbuctoo in a rather exhausted condition. Such were the exertions of the journey that two out of the six camels died on the road, and the remainder were unfit for further use. And as to Timbuctoo, the sojourn at that place seems to have been anything but refreshing and strengthening in its effects on Dr. Barth, consisting, as it does, of a pent-up mass of closely packed buildings. Attacks of fever, therefore, affected the health of the traveller still more than the weakening effects of the journey, and it is evident from the letters that his strength was greatly impaired when he wrote them. Hopes, however, of soon rallying and regaining his strength never left Dr. Barth, and with a most remarkable perseverance and courage he was planning his next journey, the return to Sakatu, while despatching the letters now received.

The city of Timbuctoo, which to reach has been the life's ambition of so many celebrated travellers, is placed by Dr. Barth in 18° 3′ 30″ to 18° 4′ 5″ north latitude, and 1° 45′ west longitude, Greenwich. Its form is that of a triangle; it is closely built of houses, mostly of clay and stone, many with handsome and tasteful fronts—the interior being similarly arranged to that of the houses in Agadez, visited by

Dr. Barth in 1850. The population is estimated at 20,000 souls. Dr. Barth found the market of Timbuctoo, celebrated as the centre of the North African caravan trade, of less extent than that of Kano, but the merchandize of superior quality and of greater value. He has obtained a complete *imana* from the Sheikh for any English traders who may wish to visit Timbuctoo. The country in which that city is situated borders on the Zahara, and is, indeed, similar to that region, being of a dry and barren description, except towards the Kowara, where it assumes a more fertile appearance. September formed the height of the rainy season, and the rains, though not heavy, occur every second or third day.

Dr. Barth hoped to leave Timbuctoo "within a month" from the 29th of September last, to return to Sakatu, and it is most probable that he will travel down the Kowara as far as the town of Say. He was not yet aware either of the succour under Dr. Vogel, despatched from this country in February, 1853, nor of the steamboat expedition now on the eve of departure for visiting the regions discovered by him in 1851; but it is sincerely hoped this cheering and encouraging news may have reached him soon after the despatch of his letters, and that, moreover, it may be his good fortune to fall in with either the one or the other.

Further communications, both from Dr. Barth and from Dr. Vogel, may now be expected with every mail.

The geographical importance of Dr. Barth's journey to Timbuctoo will not require to be pointed out; its accomplishment adds a fresh leaf to the laurels of that meritorious and distinguished traveller.

I have the honor to be, Sir,

Your most obedient humble servant,

AUGUSTUS PETERMANN.

9, Charing Cross, March 25.

Book Trade in the United States.

Of the octavo edition of the Modern British Essayists, there have been sold in five years not less than 80,000 volumes. Of Macaulay's Miscellanies, 3 vol. 12mo the sale has amounted to 60,000 volumes. Of Miss Aguilar's writings, the sale, in two years, has been 100,000 volumes. Of Murray's Enclopædia of Geography, more than 50,000 volumes have been sold, and of M'Culloch's Commercial Dictionary, 10,000 volumes. Of Alexander Smith's Poems, the sale, in a few months, has reached 10,000 copies. The sale of Mr. Thackeray's works in America is said to have been quadruple that in England,—and that of the works of Mr. Dickens counts almost by millions of volumes. Of Bleak House, in all its various forms—in newspapers, magazines and volumes—the sale has already amounted to several hundred thousands of copies. Of Bulwer's last novel, since it was completed, the sale is said to have exceeded 35,000. Of Thiers's French Revolution and Consulate, there have been sold 32,000, and of Montagu's edition of Lord Bacon's works 4,000 copies. Of American authors, the most popular—not excepting Mrs. Stowe—is Mr. Washington Irving;—and of all native works his has been the most widely circulated. Prior to the publication of the edition recently issued by Mr. Putnam, the sale has amounted to some hundreds of thousands; and yet of that edition, selling at $1 25 cents per volume, it has already amounted to 144,000 volumes. Of Uncle Tom, the sale has amounted to 295,000 copies, partly in one, and partly in two volumes, and the total number of volumes amounts probably to about 450,000. Of the two works of Miss Warner, Queechy, and the Wide, Wide World, the sale in America has been 104,000 volumes. The following may be also noted:—Fern Leaves, by Fanny Fern, in six months, 45,000; Reveries of a Bachelor, and other books, by Ik Marvel, 70,000; Alderbrook, by Fanny Forester, 3 vols. 33,000; Northup's Twelve Years a Slave, 20,000; Novels of Mrs. Hentz, in three years, 93,000; Major Jones's Courtship and Travels, 31,000; Salad for the Solitary, by a new author, in five months, 5,000; Headley's Napoleon and his Marshals, Washington and his Generals, and other works, 200,000; Stephen's Travels in Egypt and Greece, 80,000; Stephen's Travels in Yutacan and Central America, 60,000; Kendall's Expedition to Santa Fè, 40,000; Western Scenes, 14,000; Young's Science of Government, 12,000; Seward's Life of John Quincy Adams, 30,000; Frost's Pictorial History of the World, 3 vols. 60,000; Spark's American Biography, 25 vols. 100,000; Encyclopædia Americana, 14 vols. 280,000; Griswold's Poets and Prose Writers of America, 3 vols. 21,000; Barnes's Notes on the Gospels, Epistles, &c., 11 vols. 300,000; Aiken's Christian Minstrel, in two years, 40,000; Alexander on the Psalms, 3 vols. 10,000; Buist's Flower Garden Directory, 10,000; Cole on Fruit Trees, 18,000; Cole on Diseases of Domestic Animals, 34,000; Leslie's Cookery and Receipt Books, 96,000; Wood and Bache's Medical Dispensary, 60,000; Dunglison's Medical Writings, in all 10 vols. 50,000; Webster's Works, 6 vols. 46,800; Kent's Commentaries, 4 vols. 84,000. Such a list looks rather odd under the light of the misrepresentation that the Anglo-American enjoys no native-born literature, and relies on English writers for his intellectual nourishment.

Production of Oxygen Gas.

M. Boussingault has lately decribed a process by which pure oxygen gas may be obtained from the atmosphere at a trifling cost, so as to enable it to be collected in unlimited quantities, and preserved in gasometers, like coal gas, for application to many practical uses in the arts. This process depends upon a peculiar property possessed by the earth barytes, of absorbing the atmospheric oxygen at one temperature and evolving it at another; or rather, the ready conversion of hydrate of barytes into peroxide of barium, by a current of atmospheric air at a dull red heat, and the decomposition of the peroxide, by steam, at a lower temperature, even at 212 degrees F., with re-formation of the hydrate of barytes—the process being in reality a continuous one.

It is found in practice advisable to mix the barytes with hydrate of lime or magnesia, so as to prevent the fusing of the first; this mixture, when placed in an earthen tube heated to dull redness, is to be oxidized by passing a current of dry atmospheric air over it. So soon as the oxidation is completed, the tube is connected with the gas-holder, and a jet of steam allowed to act upon it; this re-converts the peroxide of barium into hydrate of barytes, the excess of oxygen being given off and collected in the gas-holder. The barytes is then again oxidized by a fresh current of air, and deoxidized by steam, as frequently as required, thus making the process continuous. M. Boussingault considers that about 1,000 cubic feet of pure oxygen gas could be obtained every twenty-four hours, by the use of 10 cwts. of barytes, which will answer this purpose for any length of time.

Sugar of Lead Refuse.

Sir: Having reason to believe, from what passed in conversation with a Chemist and a Fellow of the Royal Society, that the manufacturers of sugar of lead are not aware of the nature of a greyish powder produced by the solution of that metal in vlnegar, and that, thinking it of no value, they allow it to be thrown away, I beg to mention that it consists almost entirely of silver, in a state of very minute division.

Mineralogists have long been aware that most ores of lead contain a greater or less per centage of silver, and hence it was natural to conclude that the lead procured from them should also contain silver. But it was reserved for an eminent manufacturing chemist, who was remarkable for turning chemical refuse to useful purposes, to examine this powder and collect it in such quantities as in the course of years to supply himself with many valuable articles of plate.

Your obedient servant,

December 14, 1853. W. C.

At the close of the meeting of the Royal Astronomical Society, December 9, the President stated that operations had commenced for determining the difference of longitude of Brussels and Greenwich, by means of galvanic signals, with the view of forming an electric communication between Greenwich and the principal Observatories of the Continent. With respect to the velocity of the electric current, the President remarked that, in the present instance, there was reason for suspecting it to be affected by the subterranean and submarine passage of a portion of the wire. It appeared that the time occupied by the electric current in passing from Greenwich to Brussels amounted to 1-10th of a second,—whereas the time occupied by the current in passing from Greenwich to Edinburgh, which was almost double the distance, amounted only to 1-17th of a second. The President acknowledged the obliging conduct of the authorities of the European and Submarine Telegraph Company, who had cordially co-operated in promoting the success of this important undertaking.

Monthly meteorological Register, at the Provincial Magnetical Observatory, Toronto, Canada West.—March, 1854.

Latitude, 43 *deg.* 39.4 *min. North. Longitude*, 79 *deg.* 21. *min. West. Elevation above Lake Ontario*, 108 *feet.*

Magnet.	Day.	Barom. at tem. of 32 deg. 6 A.M.	2 P.M.	10 P.M	Mean.	Tem. of the Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Wind. 6 A.M.	2 P.M.	10 P.M.	Mean Vel'y	Rain in Inch.	Snow in Inch.
						°	°	°	°														
a	1	29·934	29·878	29·867	29·886	31·5	37·0	24·8	30·72	0·163	0·175	0·115	0·148	·93	·80	·85	·85	Calm	S W b S	Calm	3·44	...	...
b	2	·788	·658	·382	·581	29·1	36·3	34·8	33·98	·14[illegible]	·19[illegible]	·199	·185	93	90	99	94	E N E	E	E	10·94	0·875	...
c	3	·253	·273	·370	·303	35·3	41·2	38·6	39·07	·20[illegible]	·21[illegible]	·210	·209	100	84	91	89	E b N	S W b W	S W	8·47	...	...
a	4	·389	·284	·461	·389	34·7	42·0	29·1	35·12	·188	·16[illegible]	·143	·160	94	62	89	80	S W	S W	N W b W	9·57	...	...
b	5	·633	·710	—	—	26·6	33·7	—	—	·134	·16[illegible]	—	—	91	84	—	—	W	N W b N	—	7·18	...	...
d	6	·926	·926	·776	·871	26·2	29·4	31·9	29·75	·12[illegible]	·11[illegible]	·160	·141	86	71	90	85	N N W	S b W	S E	3·23	...	...
a	7	·632	·535	·438	·523	33·0	36·5	35·5	34·98	·18[illegible]	·18[illegible]	·194	·184	99	87	94	91	Calm	Calm	E	2·88	0·240	...
a	8	·137	28·884	·367	·135	34·2	36·6	34·2	35·02	·18[illegible]	·19[illegible]	·183	·187	94	90	94	93	E b S	Calm	N N W	5·50	0·240	...
a	9	·440	29·436	·422	·436	32·3	35·5	30·5	32·67	·17[illegible]	·19[illegible]	·167	·177	95	95	98	96	E N E	E	E N E	5·03	0 685	...
a	10	·366	·303	·472	·387	34·1	36·3	33·2	34·68	·192	·19[illegible]	·169	·187	98	89	87	93	N N E	N	N W b N	6·37	0·040	...
a	11	·681	·808	·835	·781	28·0	39·2	32·7	33·70	·13[illegible]	·18[illegible]	·166	·165	89	79	90	85	N W b N	N W b W	S W	7·69	...	...
b	12	·798	·680	—	—	30·2	44·0	—	—	·15[illegible]	·22[illegible]	—	—	89	79	—	—	S W b W	S W b S	—	5·08	...	...
c	13	·607	·584	·595	·595	40·2	51·0	41·2	44 00	·192	·29[illegible]	·233	·242	77	80	91	84	S W	S W	E b N	4·21	0·040	...
b	14	·400	·442	·600	·487	36·3	47·2	40·3	41·50	·20[illegible]	·28[illegible]	·233	·245	96	90	93	93	E	S b W	W b N	5·26	0·045	...
c	15	·551	·185	28·970	·219	37·3	48·5	40·2	41·67	·19[illegible]	·28[illegible]	·229	·237	90	86	93	90	Calm	S	Calm	2·72	...	...
...	16	28·983	28·968	29·181	·052	40·6	52·9	34·7	43·38	·23[illegible]	·31[illegible]	·177	·241	95	89	89	85	W N W	W N W	W N W	10·62	...	...
b	17	29·261	28·914	·122	·099	29·2	31·6	18·7	27·17	·14[illegible]	·16[illegible]	·086	·138	91	95	81	89	W N W	S E b E	N W b W	12·28	...	2·2
a	18	·364	29·643	·821	·623	14·7	19·0	19·2	18·03	·08[illegible]	·07[illegible]	·093	·081	89	70	86	79	N W b W	N W b W	W	15·10	...	...
a	19	·896	·749	—	—	19·0	29·8	—	—	·095	·087	—	—	89	52	—	—	N W	W	—	11·33	...	0·2
a	20	·844	·980	·992	·949	14·0	20·5	19·0	18·58	·073	·069	·090	·080	82	60	82	75	N N W	N N W	N	6·85	...	...
a	21	30·030	·926	·806	·901	18·3	30·6	26·8	26·43	·088	·126	·126	·120	85	74	86	82	Calm	S	E b S	4·61	...	...
a	22	29·562	·249	·054	·266	29·4	33·0	34·3	32·80	·136	·173	·188	·168	83	93	99	90	E b S	E b S	E S E	7·80	0·100	0·4
a	23	·039	·079	·268	·138	35·5	42·5	24·8	33·37	·199	·153	·115	·153	96	57	84	80	S W b W	W N W	N W	12·73	...	...
b	24	·283	·281	·375	·316	16·9	22·4	14·3	17·47	·084	·095	·076	·085	84	77	86	84	N W b N	N W b W	N W b N	11·40	...	Inap.
c	25	·335	·319	·459	·376	14·0	25·6	21·2	20·03	·068	·112	·102	·090	78	79	86	78	N N W	N W	N W	14·76	...	Inap.
c	26	·501	·502	—	—	17·2	28·8	—	—	·085	·112	—	—	85	70	—	—	N W b N	N W b W	—	14 26	...	...
f	27	·707	·682	·799	·737	14·4	24·9	14·7	17·53	·073	·113	·072	·085	82	82	80	82	N W	W N W	N W	10·67	...	...
e	28	·855	·915	30·051	·949	10·4	23·6	16·5	17·17	·060	·069	·068	·063	80	53	69	64	N W b N	N W	N b W	8·47	...	...
c	29	30·074	30 017	29·946	30·013	12·4	28·5	24·4	21·83	·067	·088	·106	·085	80	55	79	70	N N W	S	S b E	5·07	...	...
d	30	29·848	29·714	·709	29·757	20·5	32·1	31·7	29·42	·098	·148	·155	·139	86	81	87	84	S b E	E S E	E b N	9·02	Inap.	...
b	31	·627	·461	·176	·394	34·1	39·9	39·5	38·22	·177	·203	·226	·205	91	83	94	89	E b S	E N E	E b S	6·00	0·160	...
																		Miles.	Miles.	Miles.	Miles		
	M	20·552	29·494	29·530	29·525	27·28	34·96	29·14	30·68	0·144	0·170	0·151	0·156	89	79	88	85	6·54	9·34	6·78	8·02	2.425	2·8

Highest Barometer.. 30·098, at 8 a.m. on 29th } Monthly range:
Lowest Barometer... 28·788, at 4 30 p.m. on 17th } 1·310 inches.

Highest temperature.. 55°·1, at p.m. on 16th } Monthly range:
Lowest temperature... 7°·4, at a.m. on 28th } 47°·7.

Mean Maximum Thermometer..... 36°·32 } Mean daily range:
Mean Minimum Thermometer..... 22°·94 } 13°·38.

Greatest daily range..... 27°·1, from p.m. 16th to a.m. of 17th.

Warmest day..... 13th. Mean temperature..... 44°·00 } Difference,
Coldest day..... 28th. Mean temperature..... 17°·17 } 26°·83.

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
2368·10	3239·78	825·98	1379.74

Mean direction of Wind W 40° N.

Mean velocity of the Wind... 8·02 miles per hour.

Maximum velocity ..... 25·8 miles per hour, from 9 to 10 a.m. on 18th.

Most windy day..... 18th; Mean velocity... 15·10 miles per hour.
Least windy day.....: 15th; Mean velocity... 2·72 ditto.
Raining on 9 days. Raining 62·9 hours. Depth, 2·425 inches.
Snowing on 3 days. Snowing 10·2 hours. Depth, 2·8 inches.

This has been the most windy *March* during the last ten years.

The mean temperature of the first 16 days of this month has been 8°·6 warmer, whilst that of the last 15 days 8°·9 colder, than the mean average temperature of those periods respectively.

Aurora observed on 12 nights.

Possible to see Aurora on 19 nights.

Impossible to see Aurora on 12 nights.

Thunderstorm from 6 to 10 30 p.m. on the 15th.

The Aurora of the 27th was splendid, and the magnetic disturbance very great.

Comparative Table for March.

Year.	Temperature. Mean.	Max. obs'vd.	Min. obs'vd.	Range.	Rain. D's.	Inch.	Snow. D'ys	Inch.	Wind. Mean Vel'y.	
	°	°	°	°						
1840	33·3	56·9	8·7	48·2	8	1·610	8	Not Regis'd.	Not Regis'd.	
1841	27·7	53·5	−6·9	60·4	5	1·170	7			
1842	35·8	68·7	14·9	53·8	4	3·150	8			
1843	21·3	38·6	−2·8	41·4	2	0·625	18	25·7	1·18	lb.
1844	31·3	50·3	9·6	40·7	8	2·470	8	14·0	0·57	lb.
1845	35·4	61·7	9·9	51·8	5	Imp.	8	2·8	0·66	lb.
1846	33·1	49·3	7·6	41·7	9	1·965	5	2·3	0·30	lb.
1847	26·2	44·3	4·8	39·5	5	0·850	6	4·2	0·71	lb.
1848	28·6	58 9	0·9	58·0	5	1·220	6	9·7	5·80	Miles.
1849	33·5	53·4	15·4	38·0	7	1·525	2	2·3	5·37	Miles.
1850	29·8	46·0	6·0	40·0	2	0·745	7	11·2	7·62	Miles.
1851	32·4	58·7	13·1	45·6	3	0·770	9	8·8	7·65	Miles.
1852	27·7	44·8	−3·2	48·0	8	3·080	12	19·5	5·81	Miles.
1853	30·6	56·3	−0·1	56·4	6	1·080	8	7·1	5·87	Miles.
1854	30·7	52·8	10·4	42·4	9	2·425	3	2·8	8·02	Miles.
									0·68	lb.
M'n.	30.49	52·95	5·89	47·06	5·7	1·622	7·7	9·2	6·59	Miles.

Monthly Meteorological Register, St. Martin, Isle Jesus, Canada East.—March, 1854.

NINE MILES WEST OF MONTREAL.

BY CHARLES SMALLWOOD, M.D.

Latitude—45 *deg.* 32 *min. North. Longitude*—73 *deg.* 36 *min. West. Height above the Level of the Sea*—118 *Feet.*

Day.	Barom. corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in Miles per Hour.			Rain in	Snow in.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10. P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	Inch.	Inch.	6 A.M.	2 P.M.	10 P.M.
1	29·550	29·580	29·591	8·1	42·2	33·2	·058	·243	·178	·80	·85	·85	W b S	W b S	W b S	1·17	2·15	4·31			Clear.	Cum. Str. 8.	Hazy.
2	·676	·605	·631	30·0	29·4	25·5	145	161	141	78	89	90	N b W	N E	N E b E	0·41	3·34	3·75			Do.	Cir. Cum. 4.	Clear.
3	·229	·201	·249	31·0	41·2	34·2	185	253	195	96	92	91	E b S	S	S E b E	5·55	3·17	1·55		1·10	Snow.	Cum. Str. 8.	Cir. Str. 4.
4	·223	·315	·100	30·5	47·0	32·5	168	291	160	90	86	80	N E b E	W b S	S S W	16·25	5·63	1·17			Clear.	Clear.	Clear.
5	·271	·412	·471	26·5	46·2	26·0	141	282	135	88	86	83	W b N	W N W	W N W	12·15	10·17	17·50		Inapp.	Str. 8.	Cir. Str. 4.	Do. [Borealis.
6	·635	·620	·611	15·6	32·0	20·3	092	160	101	83	80	77	W N W	W b N	W S W	2·87	6·25	5·25			Clear.	Clear.	Do. Aurora
7	·474	·371	·403	26·0	40·2	28·2	123	227	144	76	85	83	S	E b N	E b N	1·37	0·11	Calm			Do.	Str. 10.	Str. 10.
8	·242	·012	28·979	22·6	27·0	26·8	127	157	156	88	90	93	N E	N E b E	N E b E	7·25	14·87	14·60		8·70	Str. 10.	Snow com. at	Snow till mid-
9	·401	·361	29·358	30·5	38·4	28·6	168	226	161	90	91	89	S S E	N E b E	N E b E	15·28	1·12	1·15		0·18	Do.	Str. 10. [noon.	Str. 10. [night.
10	·237	·112	·080	29·2	34·1	32·5	170	204	182	94	95	91	N E b E	N E b E	N E b E	12·89	4·81	3·78	0·54	Inapp.	Rain.	Rain.	Snow.
11	·356	·488	·558	29·9	35·2	27·0	160	186	146	86	83	88	N W	W N W	S W b S	4·64	10·63	4·24		1.01	Str. 10.	Clear.	Clear.
12	·565	·395	·392	28·4	49·5	36·0	160	290	192	90	80	83	S W b W	S W b W	S S W	9·19	8·28	6·69			Clear.	Do.	Light Cir. L.
13	·322	·409	·364	35·0	44·0	35·0	186	223	203	83	73	90	S W b S	W N W	N E b E	1·32	1·51	1·80	0.09		Light Cir. 4.	Rain at 3 p.m.	Str. 10. [halo.
14	·342	·254	·311	26·5	27·2	29·0	147	151	170	91	89	94	N E b E	N E b E	N E	14·00	11·98	6·26	0·12		Str. 10.	Sleet.	Do. 10. [ning.
15	·449	·223	28·885	35·0	46·1	38·1	203	272	230	92	83	94	W b S	S W	S S E	Calm	Calm	3·75	0·14		Cum. Str. 4.	Str. 8.	Rain. Ligh -
16	28·735	28·687	28·710	39·0	56·4	36·0	234	323	196	91	70	85	W S W	W S W	W	2·60	6·24	15·53	0·02		Cir. Cum. Str.	Cir. Str. 4. [8.	Cir. Str. 4. A.
17	28·960	28·884	28·616	30·0	42·6	31·0	168	263	178	90	92	92	W N W	S W b W	W N W	11·75	12·50	3·75			Clear. [4.	Cum. Cir. Str.	Snow. [Bo.
18	28·856	29·183	29·390	5·0	12·0	13·0	053	085	083	85	88	82	W N W	W N W	W N W	25·16	26·66	19·65		3·10	Snow.	Cum. Str. 10.	Cir. Str. 2.
19	29·501	·387	·391	9·0	23·7	18·6	069	120	089	82	80	83	W b N	W b N	N W	17·10	16·66	7·25			Clear.	Clear.	Clear. [Bo.
20	·551	·592	·683	9·5	17·0	8·1	060	090	070	80	78	90	N W	W	W	4·30	7·90	6·50			Do.	Do.	Do. Aurora
21	·798	·666	·611	2·5	27·2	14·0	042	128	067	76	76	71	W N W	W S W	W S W	Calm	0·62	1·12			Do.	Do.	Do. do.
22	·589	·378	·211	0·0	30·5	24·1	041	148	116	83	81	88	N E	N E b E	E b N	Calm	1·93	1·01			Do.	Light Cirrs.	Str. 10.
23	·002	28·948	28·951	28·0	35·0	33·0	153	203	197	88	91	95	S S E	S	S	11·50	8·44	1·40		1·20	Snow.	Str. 10.	Do.
24	28·934	28·888	28·989	26·0	24·6	14·0	129	135	080	80	86	78	W	W	W	8·75	14·57	18·50		1·36	Slight Snow.	Snow.	Cir. Str. 4.
25	28·968	28·939	29·002	11·0	16·5	12·2	067	084	075	73	73	78	W	W	W b N	14·13	13·95	15·37		2·55	Snow.	Str. 4.	Snow.
26	29·221	29·145	·260	8·6	16·0	14·0	058	081	080	80	73	78	W b N	W b N	W b N	17·47	12·25	18·83		8·42	Cum. Str. 9.	Str. 10.	Str. 10.
27	·315	·367	·428	10·5	13·5	12·0	076	073	086	85	73	83	W b N	W b N	N W b W	11·66	21·29	6·62		1·00	Str. 10.	Cir. Str. 10.	Cum. Str. 4.
28	·478	·522	·652	7·7	20·3	15·0	063	101	078	90	77	73	W N W	W	W N W	12·08	5·11	10·00			Cir. 4.	Do.	Clear. [Bo.
29	·763	·678	·719	8·0	32·2	15·1	060	167	083	80	83	78	N N W	S W	W S W	3·62	7·97	5·07			Clear.	Clear.	Do. Aurora
30	·750	·666	·710	10·7	31·2	20·2	082	141	094	88	72	72	W S W	N E	N E b E	1·00	1·46	0·17			Do.	Cir. Cum. 6.	Do. do.
31	·586	·501	·356	16·1	38·0	35·0	081	173	203	73	70	91	N E b E	S E b S	S E b S	7·52	7·10	12·22			Str. 10.	Str. 10.	Str. 10.

Barometer ....
- Highest, the 29th day ..... 29·763
- Lowest, the 16th day ..... 28·687
- Monthly Mean ..... 29·024
- " Range ..... 1·076

Thermometer.
- Highest, the 16th day ..... 56°·4
- Lowest, the 21st day ..... –4°·0
- Monthly Mean ..... 25°·84
- " Range ..... 60°·4
- Mean Humidity ..... ·840

Greatest Intensity of the Sun's Rays ..... 130°·1

Rain fell on 5 days, amounting to 0·910 inches.
Snow fell on 12 days, amounting to 28·61 inches.
Most prevalent Wind, N E b E.
Least prevalent Wind, S S E.
Most Windy Day, the 18th day; mean miles per hour, 23·83.
Least Windy Day, the 21st day; mean miles per hour, 0·58.
Aurora Borealis visible on 6 nights. Might have been seen on 7 nights.
Lunar halo on 1 night.
The electrical state of the atmosphere has been marked *generally* by moderate intensity of a positive character, and during the storm of the 26th day indicated a very high tension of positive electricity.

Monthly Meteorological Register, Quebec, Canada East.—March, 1854.

BY LIEUT. A. NOBLE, R.A.

Latitude, 46 *deg.* 49·2 *min. North; Longitude*, 71 *deg.* 16 *min. West. Elevation above the level of the Sea, — Feet.*

Date.	Barometer corrected and reduced to 32 degrees, Fahr.				Temperature of Air.				Elasticity of Air.				Humidity of Air.				Direction of Wind.			Velocity of Miles.			Rain in inch.	Snow in inch.	REMARKS.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M.	2 P.M.	10 P.M.	MEAN	6 A.M.	2 P.M.	10 P.M.	M'N.	6 A.M.	2 P.M.	10 P.M.	M'N.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.			
					°	°	°	°																	
1	29·920	29·871	29·887	29·893	10·0	33·8	32·0	25·2	·058	·164	·156	·126	79	85	87	84	W S W	W S W	W S W	6·2	6·2	8·0	...	...	
2	30·062	30·099	30·156	30·105	24·0	25·5	11·5	20·3	116	109	058	094	87	78	75	80	E b N	E N E	E N E	5·2	7·2	12·4	...	...	
3	29·943	29·704	29·622	29·756	19·5	20·5	21·5	20·5	095	092	098	095	86	81	81	83	E N E	E N E	E N E	21·2	21·2	16·0	...	6·0	
4	·589	·902	·452	·647	24·0	29·6	25·5	26·3	116	143	134	131	87	87	95	90	E N E	E N E	E N E	6·2	8·0	5·2	...	4·0	7th. Snowing slightly.
5	·406	·534	·605	·515	25·0	38·0	23·5	28·8	112	140	112	121	81	62	86	76	W	S W	S W	5·2	8·0	5·2	...	...	8th. Heavy fog during the morning.
6	·804	·898	·982	·895	18·0	31·0	24·6	24·5	082	117	117	105	80	67	87	78	S W	S W	S W	5·2	10·1	8·0	...	...	
7	·897	·765	·702	·788	21·4	39·8	23·2	28·1	100	156	111	122	84	64	86	78	W b S	W b S	Calm	5·2	5·2	...	...	0·5	16th. Thunder and lightning, accompanied with hail and rain.
8	·685	·480	·386	·517	10·4	29·3	25·0	21·6	060	149	122	110	80	93	88	87	Calm	E b N	E b S	...	13·9	31·2	...	5·0	
9	·601	·720	·788	·703	25·4	31·4	28·0	28·3	115	140	139	131	82	80	89	84	E b S	E b S	E b S	21·2	21·2	12·4	...	...	20th. Clear, but no Aurora observed.
10	·659	·592	·415	·529	27·8	32·8	30·0	30·2	135	145	134	138	88	78	80	82	E b S	E b S	E b S	13·9	16·0	16·0	...	7·0	
11	·473	·717	·897	·696	27·4	43·0	38·6	36·3	141	169	204	171	93	62	87	81	N b W	N W	N W	11·3	10·9	10·1	...	...	21st. Aurora observed. A luminous arch with dark segment, but no streamers.
12	·399	·681	·677	·586	26·5	42·5	38·6	35·8	128	176	186	163	87	66	80	78	N W	N W	NWbW	8·0	8·0	7·2	...	...	
13	·722	·774	·915	·803	37·5	35·4	32·0	35·0	178	127	171	159	79	61	95	78	NWbW	E b S	E b S	5·2	6·2	8·0	0·04	1·0	
14	·975	·732	·630	·779	23·0	25·6	26·2	24·9	104	128	142	125	81	90	98	90	E b S	E b S	S E	13·9	22·1	12·4	...	0·5	22nd. Aurora observed. Two mock suns seen, 10 p.m.
15	·653	·658	·442	·591	28·6	46·0	35·5	36·7	145	218	188	184	92	70	91	84	S W	S W	S W	8·8	8·0	8·0	...	...	
16	28·932	28·829	28·910	28·890	38·5	48·8	38·0	41·8	209	213	156	158	91	63	68	74	Calm	W	N W	...	10·1	9·6	0·09	0·3	23rd and 24th. Very heavy fall of snow.
17	29·021	29·131	28·987	29·046	30·0	40·3	26·5	32·9	141	241	134	172	84	97	84	88	N W	W	W b N	11·3	16·0	13·9	...	3·0	
18	28·781	28·948	29·446	·058	7·0	17·6	23·0	15·8	053	084	107	081	81	83	84	86	W N W	W N W	W b N	19·7	32·1	27·8	...	4·0	
19	29·678	29·570	·567	·605	7·5	22·8	8·5	12·9	052	103	050	068	79	81	73	78	NWb N	NWb N	NWb N	19·7	16·0	10·1	...	...	26th. Aurora visible through the clouds.
20	29·730	·818	·980	·843	0·0	17·0	10·5	9·1	036	071	069	059	76	72	94	81	NWb N	NWb N	NWb N	10·1	11·3	10·9	...	...	
21	30·051	·977	30·008	30·012	1·3	24·0	10·0	11·7	041	082	060	061	82	63	81	75	NWb N	NWb N	NWb N	11·3	11·3	3·8	...	...	29th. A comet visible just after sunset. A very remarkable Aurora, consisting of three arches; one in the north, another passing through the zenith, and a third in the south.
22	29·980	·804	29·618	29·801	−0·3	26·0	19·2	14·9	036	128	091	085	78	88	83	83	NWb N	NWb N	NWb N	8·0	6·2	10·1	...	...	
23	·465	·377	319	·387	18·0	32·3	31·0	27·1	093	163	165	140	91	90	95	92	S E	S E	S E	10·1	13·9	20·2	...	9·0	
24	·179	·088	·014	·093	28·6	30·8	28·0	29·1	137	144	128	136	87	83	83	84	S E	S E	S E	21·2	27·8	10·1	...	9·0	
25	·081	·047	·063	·064	16·3	23·0	17·0	18·7	090	123	085	099	93	97	86	92	W	W	W	11·3	19·7	16·0	...	2·0	
26	·121	·201	·330	·217	8·0	23·0	19·8	16·9	059	086	092	079	87	67	82	79	W	W	W S W	19 7	19·7	19·7	...	...	
27	·409	·460	·571	·480	12·8	21·8	13·0	15·8	078	107	057	081	93	89	68	83	W S W	W S W	W S W	16·0	16·0	11·3	...	...	
28	·638	·724	·864	·742	13·0	34·3	21·0	22·7	075	158	102	112	88	79	88	85	W b N	W b N	W b N	11·3	13·9	11·3	...	...	
29	·924	·993	30·080	·999	13·0	27·2	13·5	17·9	052	124	071	082	62	82	82	75	W b N	W b N	W b N	10·1	7·2	5·2	...	...	
30	30·134	30 070	30·148	30·117	8·8	31·3	16·3	18·8	053	104	092	083	76	59	95	77	Calm	S W	Calm	...	5·2	...	...	...	30th. Aurora observed. A great deal of motion.
31	30·163	30·073	29·871	30·036	18·0	26·2	29·0	24·4	097	113	148	119	94	79	94	89	Calm	E S E	E S E	...	8·0	...	...	...	
M	29·615	29·618	29·624	29·619	18·3	30·6	23·9	24·3	096	136	118	116	84	77	85	82				10·2	13·1	10·9	0·13	55·8	

Highest Barometer, at 6 a.m. on the 31st..... 30·163
Lowest Barometer, at 6 a.m. on the 15th..... 28·781
} Monthly Range, 1·382 in.

Maximum Thermometer, on the 18th..... 50°·0
Minimum Thermometer, on the 19th..... −2°·0
} Monthly Range, 52°·0

Mean Maximum Thermometer..... 31°·9
Mean Minimum Thermometer..... 14°·4
} Mean Daily Range, 17°·5

Greatest Daily Range, on the 17th..... 35°·0
Least Daily Range, on the 14th..... 5°·6

Warmest Day, the 16th; mean temperature..... 41°·8
Coldest Day, the 20th; mean temperature..... 9°·1
} Climatic Difference, 32°·7

Possible to see Aurora on 12 nights.
Aurora visible on 10 nights.