AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

SECOND DAY.

From Our Own Reporters.

MONTREAL, Thursday, Aug. 13, 1857.

The Association met in general session at 10 a. m. After the usual opening it was announced that the sessions would sit from 10 a. m. until 2 p. m., and that the general meetings would be held at 4½ p. m.

Dr. HARE repeated that he had some important matters to communicate and diagrams to lay before the Association, showing the impossibility of circular storms. Twenty minutes were allowed him to-morrow afternoon.

President CASWELL asked the gentlemen of the press to submit their reports to some gentleman conversant with the technical terms, in order that they might be spelled right, and the Association polypized into two sections.

MATHEMATICS, PHYSICS AND CHEMISTRY.

Prof. BACHE called the Section to order, and appointed Prof. ALEXANDER of Princeton, N. J., Chairman of the day.

The first paper was by Capt. CHAS. WILKES, giving an account of the observations on the zodiacal light made in the exploring expedition, by the officers, as well as by members of the scientific corps. The paper was illustrated by lithographed plates, circulated among the members. The beauty of this phenomenon in the tropics cannot be imagined by those who have only seen it in our northern twilight. It is narrower, but brighter and longer, than in the temperate regions. Capt. Wilkes thinks it consists of a perpendicular column of the atmosphere, directly over the point at which the sun is, at the moment, vertical.

The second paper, by Prof. SNELL of Amherst, was upon the vibration of waterfalls. Acknowledging the reality of vibration produced by friction on the edge of the dam, he proved that it was sometimes produced by the vibration of the air behind the fall.

Professor BACHE, of the Coast Survey, then gave an interesting paper on the measurement of a base line on Epping Plains, Washington County, Me. The line was about 5⅓ miles in length. The paper was beautifully illustrated to the members by photographic views taken by Whipple & Black, of Boston. The line was graded like a common road, at an expense of $4,500, in a cheap and rapid manner. The operations of measurement required extreme care and the most uninterrupted attention. Their most successful measurements were at the rate of over a mile a day; and were so accurate that a remeasurement detected no error, that is, the two measures absolutely coincided. Professor Bache took especial pains to mention his assistants.

The Rev. THOS. HILL next read three short mathematical papers, one on the solar eclipse of March, 1858, one on a system of arithmetical complements, and the third upon possible systems of coördinates in analytical geometry.

Professor PEIRCE remarked that the last paper was one of real value; that he had attained results in mechanics by similar methods which he could not otherwise have obtained; and that if the mathematician ever rose to a knowledge of the laws of the form of plants and animals, it must be by following lines of investigation like those which Mr. Hill had pointed out.

Prof. PEIRCE next gave a mathematical note on the gyroscope, showing that the end of the gyroscope does not necessarily move in small, inverted arches, but it may move in a looping or kinked curve with small loops.

Dr. J. H. GIBBON of the U. S. Mint, Charlotte, N. C., next read an essay on Troy weight, giving a historical sketch of the weight and coinage of earliest nations, the origin of sterling money and the Troy weight of Great Britain, and of the present use of the latter weight. It was filled with curious and interesting facts, but expressed in such terse language that it is impossible to condense the paper into the limits of our columns, and any attempt to do so would be only giving parts of the history and not an outline of the whole. The design of the paper was that of showing the advisability of moving toward the final adoption of a uniform system of weights, measures and coins. We have in our U. S. Mints introduced several changes in the English systems; but while some of these changes have simplified the matter, others have not, and our own coinage, measures and weights are in a state of confusion. It is highly desirable that a uniform system should be devised and made common at least to the coinage of Great Britain, her dependencies, and of the United States.

After a few words of comment from various members, the Section adjourned.

SECTION OF GEOLOGY.

Prof. J. D. DANA in the chair.

Prof. J. W. DAWSON read a paper on the Varieties and Mode of Preservation of the Fossils known as "Sternbergiæ." In 1846, Prof. Dawson suggested that of the curious fossils known as Sternbergiæ, those which occur only with smooth coatings of coal might have been analogous to rushes in their structure, while those which had fragments of fossil wood attached presented structures resembling conifers. Since that time the discovery of other specimens has enabled him to comprehend more fully the homologies of that curious structure. His most perfect specimen, cylindrical but somewhat flattened, is a little less than an inch in one direction and a little more than an inch in the other. The transverse portions appear to have been continuous, but are now somewhat broken, and less than a tenth of an inch apart. The outer surface of the pith, where not covered with the remains of the wood, is marked by strong wrinkles, corresponding to the diaphragms. These partitions are found by the microscope to consist of condensed pith, which must have been of a firm, bark-like texture in the recent wood. The slight remains of wood attached to the specimen are coniferous. The wood and diaphragms are perfectly silicified, and of a dark brown color; the partitions are coated with quartz crystals and a little pyrites, and the remaining shares with sulphate of barytes.

The specimen does not show the size of the tree to which it belonged; it does prove, however, that the pith was not merely dried up and cracked transversely by the elongation of the stem, but that it was condensed into a firm epidermous-like coating and partitions less destructible than the wood which invested them.

Convinced that the structure of the Sternbergiæ implies something more than the tranverse cracking of pith drying, Prof. D. compared his specimens with living plants, and has found in the Cecropia Peltata, in which the medullary cylinder is lined throughout with a coating of dense whitish pith tissue, forming a sort of internal bark. Within this the stem is hollow, but crossed with arched partitions of a tissue like the coating. Of this character must have been many species of the Sternbergiæ.

Another tree cultivated in Montreal is analogous in this respect to the coal formation conifers.

The state of preservation of wood in Sternbergiæ specimens presents many interesting features in a geological point of view. Often fragments only remain, which show an advanced state of decay, while the bark-like pith remains entire. In other cases, there is a coaly expansion on each side, as if the pith were that of the middle of a large leaf. This, however, Prof. D. concludes to be the remains of the bark compressed, while the wood has entirely decayed. Finally, Mr. Dawson has drawn the conclusion from the coniferous character of these fossils, in connection with their state of preservation, as well as from microscopic and field examination of the coal and carboniferous shales, that the largest beds of coal in Eastern America consist mainly of the flattened bark of coniferous, sigillaroid and lepidodendroid trees, the wood of which has perished, or appears only in the form of fragments and films. He did not insist on this view, although he had specimens which showed the mass of the trees reduced to a very thin sheet, while the pith retains a large, perhaps nearly its original size.

Professor LESLEY exhibited a diagram of flexures of the strata in the Broad Top coal-field, Pennsylvania. They amount almost to faults, but are folds, and he thinks they have an important bearing upon the investigation of the genesis of anticlinals. The folds are evidently the result of slow, steady side pressure; they are recurved.

Dr. WYNNE asked if the two beds below that had been studied?

Professor LESLEY said that unfortunately they had not.

Sir W. E. LOGAN made some remarks on the division of the Azoic rocks in Canada. The Azoic rocks of Canada cover nearly a quarter of a million of square miles. They extend from the northern shore of Lake Superior to Labrador. He finds superposed upon deeply dipping gneiss a slate conglomerate at Lake Temiskaming, and also fifty or sixty miles west along the Maskinonge River. East of this out-crop, Canada has 200,000 square miles, but nowhere has there been found a repetition of it. It seems to be distinctly marked, and is exceedingly important, bearing copper. He has given it the name of Huronian, in distinction from the other Azoic rocks of the Provinces, which he proposes to call Laurentian, from the Laurentide mountains, which stretch through it. In answer to a question, he said that the lowest Silurian was composed of the debris of these Huronian conglomerates. The Silurian rested above them unconformably.

Mr. RAMSAY, Director of the Geological Survey of Great Britain, and delegate from the London Geological Society, took the floor to illustrate the position of Sir William by reference to similar rock relations in South Wales. In North Wales there was a rock of a precisely similar lithological character. It contained the same jasper, trap and gneiss pebbles, and was doubtless formed from the ruin of old continents.

Mr. T. STERRY-HUNT spoke briefly on some mineral waters and the origin of magnesian rocks deposited by them. He instanced the springs at Carlsbad, in Bohemia, which deposit ten thousand tuns annually, and stated the conditions under which the magnesian and limestone rocks were deposited. He supposed lagoons of sea-water, such as those now along the margin of the Black Sea, and natron springs, such as those in Hungary, pouring carbonate of magnesia into them. They would deposit first limestone and then magnesian rocks, and this he thought would explain the limited area of rocks of this character, among others the plumbiferous dolomites of Missouri, Illinois and Wisconsin.

Prof. DANA called attention to the change of the coral limestones of the Pacific into dolomite.

Prof. B. SILLIMAN, jr., thought that there was no necessity for this action in their case. He supposed the change to arise from the gradual decomposition of the carbonate of lime and chloride of magnesium.

Mr. STERRY-HUNT characterized this effect of chloride of magnesium water on carbonate of lime as imaginary. Pebbles of pure limestone were found imbedded in other limestone which had been dolomitized. What could protect them from this assumed influence of chloride of magnesium water?

Prof. SILLIMAN said that this influence was exercised only on finely comminuted limestone.

Prof. GEO. H. COOK of Rutgers College read a paper on the Subsidence of the New-Jersey Coast. He said that trees and stumps found buried along the shore are evidently, to the careful observer, in the places where they grew. In some places these stumps amount to thousands in number, and are found deep down in the marshes, along the shores of the Delaware and at various places along that of the Atlantic; at points upon Raritan Bay these remains of trees are found only exposed at very low tides. Yellow pine and white cedar forests are found buried in the marshes along the Passaic and other rivers of New-Jersey, and upon Staten Island. Specimens of these trees retain their smell, and other characteristics, as freshly as in newly-cut trees; and a large trade is carried on in exhuming them for shingles and timber. At Dennisville a marsh has been *mined* for timber for fifty years, and the business there is still profitable. One of the logs thus found had five hundred rings, and the speaker had seen proofs that this accumulation was the work of thousands of years. In another place below this accumulation of cedar were found specimens of gum and magnolia.

Other geologists have noticed similar collections of trees in other parts of the country, where all appearances prove that they grew on the spots where they were found. In the solid upland are found stumps buried several feet below the present surface, and beds of oyster and clam shells now ten to twelve feet above the level of high tide. Some of the stumps now below the level of high tide have been growing trees within the memory of man. Near Salem, N. J., a tide-meadow was within the memory of the people living near a heavily timbered upland. Other like instances were given. A surveyor of Cumberland County told the Professor of several such submerged uplands. One gentleman has lost at least a thousand acres of timber lands by the advance of the tides. On the east shore of Cape May the advance is not so rapid, owing to the abruptness of the shore, but the Professor has seen evidence of a similar conversion of upland into salt marsh. Near Cape Barnegat, stumps of trees cut quite recently are already submerged. Similar facts have been observed along the Raritan, on Staten Island, and at Hempstead, L. I. The people of the very flat country of Cape May have generally noticed these facts.

The objection that these phenomena arise from a difference in the hight of the tides, owing to obstructions at the mouths of the bays, is obviated by the fact that the changes noticed are greater than the limits of the tide, which rises but about five feet. The pilots of New-York have noticed no increase of the depth of water in the channel, but two pilots of the Raritan River assure Prof. Cook that the channel of that river is deeper than formerly.

The rate of this subsidence is shown by meadows, which, formerly cut off from the tide by dykes with sluices, now are undefended, the sluices being three or four feet below the tides. Many facts of like character were detailed, and also the observations of gentlemen who have observed the changes for many years by means of permanent marks. A miller upon one of the creeks of New-Jersey has lost eight inches of his water-fall by the increased hight of the tides; at another mill the loss is twelve to fifteen inches, and a third, built a hundred years ago, has lost two feet.

In the neighborhood of New-York there are not the same advantages for careful observation that exist at the lower end of the State, but Prof. Cook is of opinion that the rate of subsidence is the same.

Prof. GUYOT thinks that the proofs of subsidence are clear, but what gives Prof. Cook's paper particular interest is the fact that the subsidence is so great. In Sweden, though the subsidence was but a few inches to the century, it was thought so interesting that distinguished geologists went from Great Britain to examine them. Prof. Guyot suggested that permanent marks should be made, and the subject carefully studied.

Dr. LYNCH of S. C. doubted the general subsidence of the coast, and thought that these changes must be local, and showed from his own observations how a oak dying may still be supported by its top root, until this decaying, the remains of the tree sinks with its wide-spread roots into the quicksands below. In case of a forest of these oaks killed by any means, the result would be an apparent subsidence of coast, when in fact it is but a local depression. So the coasts about Charleston, S. C., have the quicksands below them gradually washed out, and subside in large masses of many acres in extent.

Col. FORSHEY of Texas is acquainted with the delta of the Mississippi, and is satisfied that since 1828 there has been no subsidence of the banks of that river. During the hundred years since the construction of levees no change certainly has occurred. At Port Gibson there are proofs that there has been change since the diluvial period. Again, alluvium is filled with water; now, as the weight of the soil increases the water is crushed out, and the whole surface of course sinks. Such phenomena are very frequent throughout the entire delta.

Again, he suggested that cypress trees, sending their conical top roots deep into the soft soil, and standing for a thousand years moved by the winds, would act as wedges, force their way downward, new roots shoot out, and thus finally give us deeply submerged stumps. Still, though he is convinced that there is no subsidence of the banks of the Mississippi, he will not attempt to cast any doubt upon Prof. Cook's conclusions as to the New-Jersey coast.

Mr. RAMSAY of England agreed with Prof. Cook, and thought that his observations threw much light upon the slow and gradual formation of coal fields.

Prof. COOK thanked Mr. Ramsay for his remarks, and mentioned the preservation of logs in the cedar swamps of New-Jersey by the sudden accumulation of leaves and other substances upon them in the dense *forests*. He also showed that the phenomena mentioned by Dr. Lynch and Col. Forshey, were different in their character from those observed in New-Jersey, and therefore not opposed to his theory.

Col. FORSHEY, in relation to the formation of coal, mentioned the fact that he has found true lignite in the alluvial soil of Mississippi. Near Natchez cotton-wood tree denuded by the action of water, presented such an appearance of coal that he tested it by setting it on fire, and it burnt for several days with all the appearance of coal.

Mr. OSBORNE of Albany suggested that during a period of many thousand years the rise of the ocean may be accounted for by the deposits conveyed into it by the action of rivers and streams. Adjourned.

Mr. E. W. HILGARD read a paper yesterday afternoon on The Quantitative Assay of Chromium by the Blowpipe. The object of quantitative blowpipe assays is mainly a practical one; they are to enable the explorer in the field to determine not only the kind but the absolute value of ores on the spot, so as to guide him in farther investigations. To serve this purpose the process of determination must be both short and capable of execution by means of such compendious apparatus as that composing the admirable micro-laboratory, Plattner's blowpipe chest. The processes themselves, as devised Plattner, are mostly conducted in the dry way by the aid of the blowpipe. The metals are obtained in the shape of beads, easily cleansed and weighed, thus avoiding the tedious processes of precipitation and filtration, so often recurring in the usual wet way of analysis. Processes of this kind have been described by Plattner for gold, silver, lead, copper, tin, bismuth, cobalt and nickel. With metals difficultly fusible and reducible, which cannot be obtained in beads, we are obliged to resort to mixed methods, partially employing the wet way processes. Chromium is one of these metals; it has now become of considerable practical importance, yet its quantitative determination has been thus far confined to the laboratory. The first step is the fusion of the ore or substance with alcalies, preferably nitre, by which chromium is so readily separated from most bases. This is done in a small platinum crucible over the spirit-lamp. When lead or analogous metals are present, silica must be added to the flux, to prevent an inversion of the process when, subsequently, the mass is dissolved in water. This solution, when filtered, will contain most of the acid elements present in the ore, silica and manganic acid having been eliminated by nitrate of ammonia and alcohol respectively, previous to filtration. Were the chromic acid to be precipitated by one of the metallic salts usually employed, the precipitate would be contaminated with the other elements referred to; besides, such a precipitation is never complete until after several hours. I have found a ready process of separation from almost all the acid substances, in the evaporation to dryness of the filtrate with an excess of sulphuric acid and bisulphate of potash, and subsequent heating until all the chromium has passed into the insoluble modification of chrome alum. After this, most of the acid elements will still remain soluble in an acid solution, while the double sulphate of chromium and potash may be collected on a filter; being subsequently ignited, a residue remains, consisting of the sulphate of potash and chromic oxyd, in the same proportions as in the original salt; being weighed, therefore, the amount of oxyd is found by a simple calculation.

The evaporation is carried on simultaneously with the first filtration in a little evaporator of platinum covered with a glass, framed, so as to allow of keeping the fluid violently boiling without loss. The powdery precipitate of the chromo-potassic salt, which clogs the filter, is involved in a precipitate of chlorosulphide of mercury formed in the acid solution, and is washed by a solution of corrosive sublimate. The ignition is performed in a Plattner's charcoal furnace, before the blow-pipe, in a platinum crucible. When all precautions are observed, results rarely varying one tenth per cent may be arrived at in the space of one and a half to two hours.

THIRD DAY.

MONTREAL, Friday, Aug. 14, 1857.

The address of the retiring President, Prof. HALL, and the entertainment of the Natural History Society, in the Concert Hall last night, brought together the largest assemblage which has ever been seen at an entertainment given to the Association. Concert Hall is immense. The main body is capable of seating 4,000 people, and there are retiring and refreshment rooms innumerable. Toward 8 o'clock the human flood set in, and soon after that hour 2,000 or 3,000 people were promenading in grand conversazione. The band of the 39th Regiment contributed to the festivity in the main hall, and Dr. Hare in a small committee room exhibited a little red-haired medium in pantaloons—that and nothing more.

To recount the beauties, the worthies and the dignitaries would be an endless, if not an imprudent task. Of the 350 members of the Association who have already arrived, 100 are accompanied by wife or daughter, and the elite of Canada perfected the assemblage.

The numbers of the audience and the size of the auditory were so great, that Prof. Hall's address was but imperfectly heard. In fact, before he had concluded, and he shortened it very much in the delivery, a considerable portion of the company had found its way to the refreshment-rooms. The collation was abundant from its nature.

MATHEMATICS AND PHYSICS.

The section being called to order by Prof. BACHE, Dr. A. W. SMITH of Middletown, Conn., was appointed Chairman for the day.

The first paper was by the Rev. GEO. JONES, U. S. N., on the zodiacal light, as observed in Quito, Ecuador, during a leave of absence from the Navy. He reached Quito, owing to unavoidable hindrances, late in August, when the best season for observation was past. The atmosphere was so exceedingly clear that the zodiacal light was visible entirely across the sky from west to east. His observations completely established the fact that this light is a circle surrounding the earth, forming an angle of 32° 20′ with the ecliptic, the ascending node being at longitude 62°. Mr. Jones gave a vivid description of the brilliancy of the sky, as seen in equatorial regions from so high an altitude, showing the stars and planets with as much unusual clearness as it shows this nebulous ring between us and the moon. The width of the ring is about 28°, as seen from Quito, and its distance from the earth something like 100,000 miles.

Prof. PEIRCE spoke at some length of the novelty, value and interest of this view of this zodiacal light. We might be proud of its origin in our country, but we should also be careful that all necessary criticism should come from our countrymen. He then showed that by his investigations on Saturn's ring, the sun could not sustain a ring except between Mars and Jupiter; and even there, the great tides produced by those planets would break up the ring in small portions, forming, perhaps, the asteroids. To hold a permanent ring requires satellites or planets of a certain number and weight, such as Saturn has around him. In regard to our zodiacal light, it cannot be composed of small pieces, because it can readily be shown that they would pass in conflicting currents. But if gaseous, why does it not show the great tides which our large and heavy moon would produce? That it is really a ring is manifest, but here is a difficulty in reconciling the existence of a ring with the non-appearance of tides in it. The Professor suggested one or two points of further criticism. After a little conversation, the subject was dropped.

Prof. BACHE then read a paper on the winds of the Pacific coasts, its object being practical, namely, to give navigators information concerning the average force and direction of the winds at different seasons. For scientific purposes these observations are also reduced to *quantities*, that is, the quantity of air passing each day and each hour of the day in different directions at San Diego, San Francisco and Astoria. The whole observations are beautifully represented by three charts, upon which the eye instantly perceives at what season of the year and what hour of the day the wind blows in any direction or with any force. The observations at the three places are compared with each other by means of other charts. The first general result is the great prevalence of westerly winds, showing a great flow of air from the ocean over the land, which increases in Summer. The few east winds are on Winter mornings. The west winds are usually afternoon breezes, from April to October. June is the windiest month, and September and March the most calm months.

Prof. HENRY next read a paper by Mrs. Elisha Foote, proving that the rarefaction and condensation of air produce electrical excitation, the kind of electricity varying with the condensation or rarefaction. The effects on oxygen gas are similar, but in carbonic acid Mrs. Foote obtained no results.

Prof. HENRY afterward read a paper of his own, illustrated by large maps, upon the physical conditions determining the climate of the United States. He thinks that we should first consider and eliminate the better known causes, and so pass to the consideration of more variable and intricate phenomena. After the astronomical position of the place, the next great element is the motion of the air, the first cause of which is the difference of temperature in the frigid and torrid zones. Then comes in the perturbing influence of the condensation of moisture first pointed out by Mr. Espy. This action of the latent heat given out in rain clouds must be very great, and produces many fitful changes in wind and weather. Afterward we must consider the effect of the great ocean currents; the cold currents which creep down eastern coasts from the pole, and the warmer currents like the gulf stream in mid ocean and on Western coasts. Next in order come the mountain ranges and general elevations, acting by their altitude, and also by their direction. The Professor then distributed printed charts of the isothermal lines on the North American Continent, reduced to sea level. From these charts it was evident that the Alleghanies produce no sensible effect on our temperature, while the Pacific mountains exert a very marked influence, lying as they do across the path of the winds, heating the winds by condensing and freezing their moisture. These mountains cutting off all moisture from the Pacific, and the rotation of the earth turning the Gulf winds eastward, produce the great sterility of the western parts of the Mississippi valley. The Professor then gave some general views concerning the origin and cause of storms in the eastern part of the United States, giving the speculations of others, he said, rather than his own.

Dr. WAYNE spoke for a few minutes upon "The Influence of the Gulf Stream upon the Summer Climates of the Atlantic Coast." He said: The recent examinations conducted by the officers under the direction of the Superintendent of the Coast Survey have shown that the bottom of the Atlantic Ocean presents a range of mountains, pursuing a similar course to the Apalachian chains some distance back from the coast. These examinations have not yet been completed, but so far as they have been prosecuted, they clearly demonstrate the continuity of this chain of submarine mountains and its general course. The effect of this configuration of the bottom of the ocean over the temperature of the water is clear and unequivocal. The whole extent of this influence has not yet been determined, but thus far it shows that the Gulf Stream is not one uniform mass of warm water, pursuing a north easterly course along the coast at a pretty uniform distance from it, but a series of bands of warm water, interspersed with colder ones. These have been laid down by Prof. Bache with precision in his map delineating the distribution of temperature of the Gulf Stream. An underlying Polar current of cold water even in the more southerly explorations is likewise clearly established. The position of this mountain chain in affecting the temperature of the air along the coast, as well as the water overlaying it, has been as clearly demonstrated.

Lieut. Maury, in his pilot-chart of the North Atlantic, has recorded the direction of the wind for each month in the year with great accuracy. The information contained in his chart is taken from the most authoritative sources, and in some instances extends back as far as 1810. This chart subdivides the ocean into squares of five degrees each of latitude and longitude, and the monthly observations within each subdivision are made to extend over this surface. For the purpose of our present inquiry, subdivisions of a single degree would have afforded greater definiteness, but the facts deduced from the chart as it is are of the highest value. As our inquiry is confined to the summer months, when invalids in search of health, or those who are well, in pursuit of a more temperate air than is to be found in the cities, even in rural districts, visit the seashore, our deductions from the chart will be confined to the months of June, July and August, and to that portion of the Atlantic stretching along the sea-coast.

In the subdivisions between latitude 30° and 35° and longitude 70° and 75°, embracing the sea-coast from St. Augustine in Florida to Cape Hatteras in North Carolina, there were made ninety-nine observations of winds in the month of June; of these forty-one or nearly one half were from the south and south-west. In July eighty-four winds were noticed, of which fifty-two came from the south and south-west; in August, one hundred and thirty-eight, of which sixty came from the south and west.

In the subdivision embracing latitude 35° to 40° and longitude 70° to 75°, extending from Cape Hatteras to Cold Spring, N. J., three hundred and fifty winds were observed in the month of June, of which one hundred and forty-three were from the south and south-west; in July, three hundred and ten, of which one hundred and sixteen came from the south and south-west; in August, three hundred and sixty-six, of which one hundred and twenty-three were from the same directions.

In the subdivision between latitude 40° and 45°, longitude 70° and 75°, embracing Long Island Sound and the southern expanse of the New-England coast, in June two hundred and thirty-one winds were noted, of which one hundred and eight came from the south and south-west; in July, three hundred and eight, of which one hundred and sixty were from those directions; and in August one hundred and eighty-three, of which sixty were from the south and south-west.

These are the facts. The deductions from them are important. It appears from these observations that of the prevailing winds in the summer months, never less than one-third, and in many instances one-half come from the south and south-west. It must be remarked that the winds noted were sailing winds with some degree of force, and not the slight ruffling wind, which, although insufficient for the purpose of rapid sailing, is yet most grateful in its effect upon the health and comfort of those circumstanced as to come within its range. The usual direction of this lighter breeze on the Atlantic in the summer months is from south and south-west directly over the current of warm water composing the Gulf Stream. The winds from this quarter are for the most part gentle, balmy, exhilarating and peculiarly happy in their influence upon the human body; those from the north and east, on the contrary, are violent, raw and depressing; while the former should be courted by the invalid, the latter should be as sedulously avoided.

It by no means follows that the wind on the shore is the same as that upon the ocean. A very slight obstruction, as an intervening range of hills, or indentation of the coast, may leave any particular situation in calm, or subject to the influence of a less grateful wind, while the whole surface of the water is swept by a delightful air from the south or south-west. An example of this may be given in the Highlands of Neversink, situated a short distance from Neversink and immediately behind the light-house on Sandy Hook point. These Highlands, whose sides are covered to the water's edge by a rich growth of vegetation, and are highly picturesque in their effect, are shut off from the south-westerly ocean winds by a small promontory, the effect of which is to render the air upon the sheltered localities calm and oppressive; while on the sandy point directly in front, and scarcely more than a stone's throw distant, it is agitated by a balmy and refreshing breeze.

The traveler over the New-York and New-Haven or New-London Railways, which pursue an easterly course along the Long Island Sound, cannot fail to remark the perceptible difference almost always observed in the temperature after leaving New-Haven for the east. However exalted the temperature may have been, or oppressive the condition of the atmosphere, between New-York and New-Haven, yet he is almost certain to be met by a delightful ocean air from the south-west, a few miles east of New-Haven, and which accompanies him on his passage to New-London. This is due to the configuration of Long Island.

Near New-York, the northern shore of Long Island rises into elevations of greater or less extent, but sufficiently so, at most places, to intercept the sweep of wind from the ocean on its southern border. These elevations gradually diminish in an easterly direction, until a point is reached a few miles east of New-Haven, where the whole island becomes flat and sandy, and but a few miles in width. This low plateau offers but slight interruption to the progress of the southerly ocean winds, and allows them to play over the surface of the water in the Sound itself, and fan the opposite New-England coast.

The islands of the coast of South Carolina, as well as the coast of North Carolina, Virginia and New-Jersey, have a greater or less south and south-western expanse. Within these limits are found Old Point Comfort, Cape May and Long Branch, which have great celebrity as sea-side places, and attract large numbers of visitors. Each of these places is subject, however, to the depressing effects of the north-easterly gales; the more southerly points are less affected from this cause than the more northern.

The whole stretch of Long Island on its southern side—which is at present, with but few exceptions, little better than an inhospitable sand bar drifted up from the waves of the ocean—that portion of the Connecticut coast to which we have alluded east of New-Haven, as well as Rhode Island and a part of Massachusetts, enjoy in the highest degree the advantage of exposure to the south and south-west, and are at the same time best protected from the winds from the north-east. Newport, with many disadvantages, not the least of which is the compactness of its houses and their almost total exclusion from a sea view, enjoys a world-wide reputation as a sea-side residence, for which it is wholly indebted to the salubrity of its air, derived from its sheltered position on the one side and its free expanse upon the other.

Many sheltered positions may doubtless be found upon the coast south of Long Island, uniting many if not all of the advantages already pointed out, which it is earnestly to be hoped will be discovered and improved. The advantage of sea-side resorts in such positions as to render them available for those whose occupation or means do not permit them to take long journeys, cannot be too highly estimated.

GEOLOGY.

Prof. RAMSAY in the chair.

T. STERRY HUNT read a paper containing "General 'Considerations on the Metamorphism of the Sedi-"mentary Rocks." He said that the fact which forms the point of departure for the history of the metamorphic rocks is this: That the sedimentary strata, common to different geological formations, may, under certain conditions, be converted into crystalline rocks. One of the most important results of modern geological research has shown that the crystalline salts of various regions are stratigraphically identical with unaltered sediments of Silurian, Devonian, and even of later secondary age, although regarded as primitive rocks by the geologists of the last generation. Mr. Hunt observed that we have, beside those sedimentary rocks of mechanical origin which are composed of the ruins of felspathic rocks and quartzose rocks, others of organic origin, and finally deposits of limestone, dolomite, magnesite, carbonates and oxide of iron, and manganese. These chemical deposits are often mingled with those of mechanical origin. He contended that a dry heat, producing fusion of the sediments, cannot be admitted to explain the changes which they have been found to have undergone, from the fact that such a temperature was incompatible with the existence of alkaline silicates and graphite in the limestone. The influence of hot water alone is equally inadmissible, for the silica being dissolved by water before it could act upon the bases, we should find the quartzites rendered vitreous and crystalline. He regards the changes as having been produced by the action of small amounts of carbonate of soda in aqueous solution, forming, with the quartz, silicate of soda, which is afterward decomposed by the carbonate of lime, the yielding silicates of these bases reproducing the alkaline of soda. A portion of the alkali is, however, always fixed and rendered insoluble in the process, so that with a limited portion of soda the action is at last exhausted. These reactions, resulting in the production of silicates of lime, magnesia, &c., take place even at 212°F., and the intervention of alumina gives rise to garnet, chlorite and epidote. The absence of iron from some felspathic and quartzose sediments and its accumulation as beds of iron ore he regards as effected by the agency of organic matters, which reduce the iron to protoxide and render it soluble in water, which afterward deposits it as oxide or carbonate. The same process produced the fire-clays and ironstones of the coal period, and is now operating in bogs and marshes. In this way we have beds of argillaceous and felspathic materials freed from iron.

Prof. SILLIMAN, jr., endorsed the views of Mr. Hunt, and spoke of the very great degree of heat which must have attended upheavals under the ocean.

Prof. HOSFORD spoke of some examinations of metamorphoses produced by springs in Oregon, but these Mr. Hunt considered as merely of local character.

Prof. CHAPMAN mentioned mica as an instance of igneous formation, which is an exception to Mr. Hunt's theory, warning him against carrying his theories too far.

Mr. HUNT replied that mica scales in some localities are the first proof of metamorphism.

Prof. RAMSAY expressed his pleasure at Mr. Hunt's paper, and glancing at the history of theories of metamorphism from the old granite theory, through Hutton and Darwin, to the present day, gave Mr. Hunt great credit.

Mr. SIEMANA read a paper on the Partheno genesis of animals and plants. The idea of the production of animals and plants without the action of the male principle is very ancient, and in modern times has been almost universally rejected. But recent investigations had seemed to prove its possibility among the crustaces, and nine species of diœceous plants were known to have ripened their seeds without the pollen of the male plant.

Sir WILLIAM LOGAN read the following communication from Sir Roderick Murchison on the place of some crystalline rocks in the Highlands of Scotland, in which fossils have lately been found, proving these rocks to be of the lower Silurian age, and corresponding to the Trenton Limestone, and that the same order obtains in the rocks of Scotland and this country:

LONDON, July 27, 1857.

MY DEAR SIR WILLIAM: Being unable, to my great regret, to attend the Montreal meeting of the American Association for the Advancement of Science, where my distinguished friend, Professor Ramsay, will represent British Geologists and our Survey, I beg to communicate to you and any geological cotemporaries who may be present, the final determination of a question which has been much agitated in this country, and which has just been settled by a comparison with North American typical fossils of Lower Silurian age.

This question is, What is the true place in the geological series of those great masses of crystalline or sub-crystalline rocks in the North Highlands of Scotland, in some of which organic remains were discovered by Mr. Charles Peach in 1855?

That discovery induced me, in the same year, to revisit the localities in the north-west part of Sutherlandshire, on the east of Cape Wrath (Durness), in which the fossils had been detected; my chief object being to ascertain if the views of former explorers of that region, including Sedgwick and myself, in 1827, were correct, viz: That these quartz rocks and limestones, associated with mica schist and a sort of gneiss, are of a more ancient date than the great series of Old Red Sandstone, or Devonian deposits, that occupy so large a portion of the north-east of Scotland, and are particularly developed in Caithness and the Orkney Islands.

The results I arrived at in that excursion, in which I was accompanied by Prof. James Nicoll, were communicated at the meeting of the British Association at Glasgow in September, 1855, and published in the volume of that year. (See Trans. of the Sections, 1855.) I then re-affirmed the opinions I had formed in 1827, in company with Prof. Sedgwick, as to the anteriority of all such quartz rock with intercalated limestones to the Old Red Sandstone or Devonian system; and, judging from the facts that such crystalline and sub-crystalline strata reposed unconformably upon ancient granitoid gneiss, and were flanked and surmounted transgressively by the ichthyolithic deposits of Caithness, I expressed my belief that, although very imperfect and difficult of absolute determination, the fossils the found by Mr. Peach were of Lower Silurian age.

At that time, my eminent and lamented friend, the late Hugh Miller, had suggested theoretically that the quartzites and limestones of the Western Highlands might prove to be the metamorphosed equivalents of the Old Red series of the East Coast; and, subsequently, Prof. Nicol has even endeavored to show that these rocks may be the metamorphosed representatives of the carboniferous series of the South of Scotland. Both these suggestions were of course opposed to my own belief, and as they have been put forth by distinguished cotemporaries, I have now to show how my own views have been sustained.

Within these few weeks Mr. C. Peach has found, in the same locality (Durness), other and better preserved fossils, which have, I rejoice to say, set the *questio vexata* at rest, as will be seen by the annexed note of Mr. Salter, who unhesitatingly compares these remains with those known to Mr. James Hall, yourself and other North American geologists, as occupying the true Silurian position of the calciferous Sand Rocks and base of the Trenton Limestones.

It is, of course, most gratifying to me to find that the general views of succession of the rocks of my native Highlands indicated so far back as the years 1826-7—opinions thus formed irrespectively of zoological evidences, and simply from the physical relations of the rock masses—should have been thus supported by fossil discoveries.

North American geologists will, of course, have no difficulty in understanding and admitting the conversion of Lower Silurian sediments into quartz rocks, crystalline limestones, mica schists, chloritic slates, &c.; since their own eastern coast ranges exhibit such phenomena, some of which have been described and mapped by yourself.

To the geologists of the old country this determination is of the deepest interest; for it gives them a key to unravel the real age of large masses of the quartzites, limestones, chloritic and clay slates, mica schists and quasi gneissi rocks (sometimes more, sometimes less metamorphosed), which occupy vast wild tracts of the Highlands of Scotland.

The general order of the Scottish Rocks is, therefore, pretty well ascertained. The lowest known rocks are masses of granitoid gneiss, on the upturned edges of which repose certain hard gritty beds, and conglomerates often of a red colour, which, in the early days of our science, were confounded with the Old Red Sandstone. Now, however, that the existence of conglomerates at the different levels in the Lower Silurian rocks of the South of Scotland has been demonstrated, (see Siluria, pp. 156-160), the old errata as dependent on mineral characters only have been swept away. The lowest, indeed, of the conglomerates on that on the north-west coast of the Highlands may pass for the Cambrian Rocks of the Geological Survey. Then follows in an ascending order the series of quartzites, mica and chloritic schists, &c., with included limestones, representing in a metamorphic condition the Lower Silurian sediments.

It is highly probable that the Upper Silurian Rocks which exist partially in the South of Scotland have no real equivalent in the Highlands; since the metamorphic rocks above adverted to are unconformably overlapped by those conglomerates and sandstones which form the very base of the Devonian Rocks or Old Red Sandstone.

That great series is clearly exhibited on the north-east coast of the Highlands, and is made up of three subdivisions, viz: (a) lower conglomerates and sandstone; (b) middle flagstones and schists, with abundance of the well-known ichthyolites, and (c) overlaying sandstones—the latter constituting the northern headlands of Caithness, and the chief hills of the Orkney Islands.

I feel confident that the triple series represents in full, as I have endeavored to show in my work, Siluria, the Devonian rocks of Devonshire, as well as the slaty rocks of the Rhenish Provinces (including the terrain Rhénan of Dumont).

The *experimentum crucis*, as respects Russia, was, in fact, settled by the discoveries of my colleagues, De Verneuil, Keyrling, and myself, when we found the fossil shells of Devonshire and of the gorges of the Rhine in the same beds with the ichthyolites of the Scottish Old Red—many species being identical.

In turning to Ireland, we have there obtained evidences illustrative of the conversion of Lower Silurian rocks, as shown by sections across the Connemara Mountains, where a great succession of crystalline limestone and quartzites, including the green Connemara marble, have been observed to lie directly beneath strata with fossils of the Llandovery Rocks (Middle Silurian). I have had no hesitation in considering these altered masses to be representatives of the Lower Silurians of other tracts (See Siluria, p. 108).*

Again adverting to Ireland, the Survey under our friend Mr. Beete Jukes, has ascertained that, in the Dingle Promontory, true Upper Silurian Rocks, with both Wenlock and Ludlow fossils, are conformably surmounted by many thousand feet of hard chloritic and silicious grits and schists (Glengariff grits), which represent, in my opinion, the great mass of the Devonian Rocks. The peculiarity, however, of the Irish Section is, that between these Glengariff grits and that which has hitherto been exclusively called the Old Red Sandstone of Ireland, there is a great hiatus; for the latter exposes on the edges of the former, and passes conformably under the carboniferous deposits.

This phenomenon, however, simply shows that a great break or local change in the sediments took place in the south-west of Ireland which had no existence in the north-east of Scotland, where the Old Red or Devonian series is continuous.

I cannot on this occasion enter into questions of detail concerning the localities where the Upper Silurian strata pass upward with perfect conformity into the Old Red or Devonian rocks, or indicate other tracts in Europe (notably in France and Spain) where, on the contrary, the Upper Silurian is almost entirely omitted. In regard to local dislocations, I particularly refer you to my comparison of the Old Rocks of the Thuringerwald and the Harz.† I will simply conclude this letter by calling your attention to that which is now seen to be the true method of comparing the Older Palæozoic or Silurian rocks of distant regions.

When that skillful and profound geologist, Mr. Barrande, published in the course of last year his most instructive essay, entitled "Parallèle entre les "Dépôts Siluriens de Bohème et de Scandinavie," he showed how, with an agreement in generic characters of the fossils of each Silurian zone—thus indicating a general harmony—there was a great contrast in the species of marine animals in each of the countries compared. By applying this method in a different sense, I may now say that when the Silurian rocks are viewed in their extension through the same latitudes, a remarkable specific agreement is clearly traceable. On the other hand, the Silurian fossils of Bohemia are in accordance with those of France and Spain, or along another and distinct broad southern zone of the same age.

The Silurians of Scandinavia are of the British and American type. In making known the description of the Silurian rocks of Norway by Mr. Tejerault, I have recently shown how remarkable is the persistence of the Lower Silurian types (even in species) when these rocks are followed from Scandinavia into the British Isles, and to how great an extent this resemblance of type is preserved, even when the Atlantic is traversed, and that the same strata in the crust of the globe are again met with in North America. The occurrence in the south of Scotland of the Maclurea magna of Hall, of the Isotelus gigas Deikey in Ireland, and of the fossils of your Calciferous Sand Rock in our Scottish Highlands, are all most satisfactory proofs that the order in Canada and the country of our kinsmen is, with certain modifications, the same as in the ancient realm of Caractacus.

Excuse this hurried letter, and wishing you as successful a meeting as your labors and those of my other eminent friends in the United States deserve,

Believe me to be, yours very sincerely,
RODERICK J. MURCHISON.

To SIR W. LOGAN.

NOTE ON FOSSILS BY J. G. SALTER, F. G. S.

The specimens previously sent from Durness were far from satisfactory, and though clearly palæozoic, could not be appealed to as settling their true place. They might, indeed, have been either Carboniferous or Devonian, although Sir R. Murchison had offered strong geological reasons to lead us to suppose them to be Lower Silurian forms. One cast in particular, which was at first doubtfully regarded as a Maclurea, though it had a right-handed curvature of the whorls, is now more properly referred to Raphistoma or Ophileta. And an Orthoceras present in the same beds could not decide the case. But those lately collected by Mr. Peach leave no doubt as to the true age of the beds. The principal fossil will be particularly interesting to Canadian geologists—being the same as one from the "Calciferous Sand Rock" of Beauharnois, and which, being undescribed, has received the MS. name of *Ophileta compacta*. The genus is doubtful, and the fossil is probably only a subgenus of *Raphistoma* (Hall)—the species of which have a wide umbilicus (bounded by a very prominent ridge) and straight-sided whorls. This species in Canada grow full an inch and a half wide, and had as many as six or seven whorls, flat above, and with a sunk apex and a very broad and wide umbilicus, so that the center of the shell is much attenuated, and the inner whorls would easily break out as in Mr. Hall's figure of *O. cevata*, Pal. 4, 7; Pl. 3, vol. I. fig 4. The whorls of that species are much less carinate below and the umbilicus not nearly so wide. O. compacta will be fully figured and described in a decade of the Canadian fossils—it is unnecessary to say more of it here. It is curious that the Euomphalus *(Maclurea Matutina)* which accompanies the Beauharnois fossil in Canada, is found also in the Highland beds with another thick whorled species. Again, a species of *Pleurotomaria*, known in America as the Trenton Limestone—the *P. Subconica* (Hall)—comes so very near to one of our fossils, that it might well be only a variety of the species. The Highland fossil has rather more numerous whorls, and perhaps a broader band. The genus *Oncoceras*, so characteristic of the Trenton Limestone, also occurs, but of a larger species, with more numerous septa than the *O. Constrictum*. As the calcareous beds in Canada frequently contain the fossils of more than one subdivision of the New-York series, it is not more than we should expect to find the above fossils associated in a single thick band of limestone. It is most satisfactory to find, in the northernmost part of Scotland, the representatives of the Calciferous Sand Rock and the Trenton Limestones—as in the South Scotland, that of the Chazy limestone.† And as the former repose upon a quartz rock with abundance of fucoidal impressions, the suggestion is obvious that such rock *may* occupy the place of the Potsdam sandstone.

NOTE.—Mr. C. Peach is now proceeding, at my special request, to endeavor to collect more fossils, not only at Durness, but throughout the Assynt and other tracts into which the same limestones and quartzites extend.

J. W. SALTER.

Prof. RAMSAY remarked that the Scottish rocks form a portion of the great Scandinavian chain, that the gneissic rocks of that country are overlaid just as in Norway and America, and that the fossils found are the same generically, though differing specifically. He spoke also of the probability arising from a comparison of Bohemian with Scottish and American fossils, that in the Silurian age an isthmus crossed the Atlantic, dividing the north from the south of both Europe and North America, as now the Pacific and Atlantic are separated by the Isthmus of Panama.

NOTICE OF A NEW SYSTEM OF DRESSING METALLIC ORES. By B SILLIMAN, jr., *Professor of General and Applied Chemistry in Yale College.*

The object of this communication was to describe the general principle of a system of ore-dressing devised and put in practice at the copper mines of the Bristol Mining Company, in Connecticut, under the direction of the author.

The main features of this system are: 1. The perfect separation of the finer portions of the product of stamping and crushing (commonly known as "*slime ores*") from the coarser portions, without the aid of sieves or screens; 2. The application of the well-known system of "jigging" (by the use of Bradford's patent continuous-acting jiggs) directly to the stamped ore, which hitherto has been incapable of this mode of treatment; 3. The adoption of such mechanical means as have rendered the whole process of ore-dressing one continuous and self-sustaining system, in which human labor bears an exceedingly small ratio to the results obtained, compared with any system hitherto devised. In this system the waste or refuse material is disposed of exclusively by gravity and running water, without handling, while the ore is brought up to the highest mercantile percentage, howevr poor the original ore may be, no appreciable quantity of ore escaping in the water.

The first of the above results (1) is accomplished by the use of a new and exceedingly simple hydrostatic apparatus, devised by Mr. L. Stadtmuller, Mining Engineer to the Bristol Mining Company. A model and sectional drawings of this apparatus were shown to the Section. The efficient cause of its success is the movement of a current of water, in an inverted cone of iron, having an annular space, surrounding an inner cone; the ore is admitted at the top and is distributed over a conical surface to meet the ascending current of water, which is so adjusted in volume and force by a proper valve and by a nice proportioning of the parts, that all the finer and more muddy portion of the ore are carried over the upper lip of the apparatus, while at the bottom escape with a more forcible current of water, through an adjustable orifice, all the coarser ore and metallic particles. These are entirely free from all slime, and are dressed upon a continuous arrangement of self-acting jiggs, and are carried immediately to a percentage suitable for market. The proportion of the ore, about one-half, which escapes at the upper portion of the hydrostatic cone, is treated by alternate subsidence in large conical vats, the denser portions from the bottom of which are dressed upon Bradford's ore separator (a pan of copper having the reciprocal motion of the miner's dressing shovel), which have been found, when served with only the class of ores properly adapted to them, admirably successful and economical. The ores too fine or small in size for the separators are treated upon large conical tables of circular form, by means of a very gentle current of water spread in a thin sheet over the table, thus cleansing the last traces of ore from the finer particles of mud with which they are mingled.

This communication was illustrated by models and drawings, and by samples of the ore thus dressed, showing in a very decided manner the beauty and efficiency of the system.

Col. WHITTLESEY mentioned the great loss of metal in the processes used at Lake Superior, and asked if Prof. S. could assure him that by his method there is absolutely no mineral loss.

Prof. SILLIMAN was sure that no mechanical means could be devised of such perfection as to secure such a result. Loss is an inevitable necessity, but by the new process this loss is reduced almost to its lowest terms, certainly beyond anything hitherto known. At the Bristol mine the loss cannot be more than one-tenth, while by the old processes it reached 30 to 50 per cent. At Lake Superior modifications would doubtless be necessary in the machine.

Col. WHITTLESEY'S experience corresponded with that of Prof. S. Fine particles of copper under the Lake Superior washing machines rise even though they are pressed beneath the surface, and float off, in such quantities that they have been found a quarter of a mile distant, to the amount of two or three pounds per tun of the copper saved.

Prof. HORSFORD inquired if a small amount of soda might not be used in the process of cleaning ores.

Prof. SILLIMAN said, the objection is that the amount which would be required is too great, as the weight of water used in the process of cleaning is greater even than that of the ores. We cannot spend a dollar to save a sixpence.

Prof. HORSFORD—In case of sulphurets, why not roast them and use poor sulphuric acid in cleansing?

Prof. SILLIMAN—If much sulphate of iron be present, it might be done here as in Germany; but in the Bristol Mine the amount of sulphur is too small.

Sir WM. LOGAN read a paper on "The Probable "Subdivision of the Laurentian Series of the Cana-"dian Rocks." The Canadian rocks are now divided into two grand divisions—those with much lime, and those without. His paper was intended to show—from observations which have been made upon a limestone deposit which emerges in two bands at Grenville, L. C., and which he has traced some eighty miles—the probability that the first grand division may be subdivided, and that the Labradorite may be found to extend from one end of the British Provinces to the other, which, with the rocks associated with it, may be marked upon the map, and receive some new appellation.

* NOTE.—I examined this tract last year, in company with Mr. Jukes, Mr. Griffith, and Mr. Salter. Mr. Du Noyer has ably mapped and delineated the country.

† Quarterly Journal, Geological Society, November, 1855.

* Journal Geological Society, about to be published.

† The great *Maclurea* of Girvan, in Ayrshire, has been identified with the *M. Magna* (Hall) by Prof. McCoy.

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EVENING SE

At 8 o'clock the Association
eulogies on the late Prof. J. W
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AMUSEME

ACADEMY CONCERTS.—Mr.
all the English critics agree,
English players on the violin,
famous Classic Quartet Assoc
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Messrs. Stuart and Bourcicau
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LAURA KEENE'S.—The Ma
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