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THE

CANADIAN

Naturalist & Geologist,

AND PROCEEDINGS OF THE

NATURAL HISTORY SOCIETY

OF MONTREAL.

CONDUCTED BY A COMMITTEE OF THE NATURAL HISTORY SOCIETY.

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NATURALIST AND GEOLOGIST.

VOLUME III. AUGUST, 1858. NUMBER 4.

ARTICLE XXIV.—*Agassiz' Contributions to the Natural History of the United States.* (Vols. 1 & 2. Boston.)

(Concluded from our last.)

The second chapter is one of the most important in the work. It treats of the actual basis in nature of the various ranks of groups in which animals are arranged,—the *Branch* or *Province*, the *Class*, the *Order*, the *Family*, the *Genus*, the *Species*. Is there any reason in nature why this particular gradation should be adopted, or is it merely an artificial convenience. Agassiz thinks that it is natural, and that naturalists, like many other workers, have reached to a truly scientific system without knowing it. He believes that the successive subdivisions of the animal kingdom are based on the following considerations:—

"Branches or types are characterised by the *plan* of their structure.

Classes by the *manner* in which the plan is executed, as far as ways and means are concerned.

Orders by the *degrees of complication* of structure.

Families by their *form*, as far as determined by structure.

Genera by the *details* of the execution in special parts.

Species by the relations of individuals to one another and to the world in which they live, as well as by the proportions of their parts, their ornamentation, &c."

The very attempt thus to attach a scientific value to these divisions is a great step in advance; for, though such distinctions have almost instinctively fixed themselves more or less strongly on the minds of naturalists, no one has given them full and formal expression as Agassiz now does. The attempt, however, is full of difficulty; and, as might have been anticipated,—and as the author himself fully and modestly admits,—must be regarded as very imperfectly successful; though the whole doctrine of type and homology in nature implies that there must be a definite gradation of groups. Let us examine it in detail; and, in doing so, we would wish to direct the attention of students in natural history to a careful consideration of the subject as set forth in the work itself.

1. Following Cuvier in this, our author justly regards the animal kingdom as separating itself into four great types of structure known as Sub-Kingdoms, Provinces, or, as Cuvier originally called them, "*Branches*." This first distinction is based wholly on the idea of pattern or type. But here the question arises,—type or pattern in what? In art, when we speak of type, pattern or style, we may refer to a spoon, a piece of calico, or a cathedral. In nature, in like manner, each great kingdom has its own sets of types, corresponding to the materials employed and the uses they are to serve. If we speak of animals, then, as one portion of the Creator's works, that we may think correctly of their plan, it is necessary that we first clearly comprehend the material and place in nature of the animal, and its truly essential qualities. This question—what is the animal?—our author scarcely touches, perhaps because it is so constantly and clearly present to his own mind. We may answer it in its most important bearing by the words used by Linnæus to indicate the distinction between the animal and the plant, "Sententia, sponteque moventia," adding the related fact, enforced by modern physiology and chemistry, that, in reference to its sustenance and material, the animal life is based upon the vegetable. The animal is an organised being endowed with sensation and volition, and, as the agents of these powers, with nervous matter and muscular fibre; while to supply the material of these, and maintain their vital powers, it consumes and oxidizes previously organised matter. In other words, the processes necessarily performed by the animal are the assimilation and oxidation of vegetable or animal matter. These processes go on to supply the essential structures of the animal, tele-

graphic nerve and contractile muscle; and these are produced and maintained to subserve its psychical endowments of sensation and voluntary motion.

This being the general and essential nature of the animal, type or pattern may be discovered in any one of these three leading peculiarities: in the psychical nature of the animal; in the arrangement of its nerve and muscle, or, subordinate to them, in the arrangement of the hard parts which protect the former or serve for the attachment of the latter; or lastly, in that of the apparatus employed for nutrition, respiration and circulation. It must happen, that, to a certain extent, these will agree as grounds of arrangement. Thus if the nerve matter be arranged on a given plan, this must indicate something corresponding in the psychical endowments, and may probably require something corresponding in the apparatus for motion, protection, and nutrition. Still, some of these points may be more important than others. For instance, psychical characters, not being material, cannot be accurately measured; apparatus for nutrition has a broad similarity amounting almost to general identity of plan, over the whole animal kingdom, while again it is subject to modification in nearly related species, intended to consume different articles of food. For such reasons, when we study the types of animals, we prefer to take as our chief guide that part of the physical structure which is most independent of the accidents of outward relations, and which is most nearly connected with the intelligence, which is the essence of the animal. Hence Agassiz very justly traces the old division of Aristotle into *enaima* and *anaima*, and that of Lamarck into *vertebrata* and *invertebrata*; not so much to the perceived difference in blood or skeleton, as to the perception, perhaps unconsciously, that there is an essential difference between the plans of structure in those animals that have the nervous matter protected in separate cavities of skull and spinal column, and those that have it confounded, as it were, with the organs of vegetative life. Hence also Cuvier, examining more minutely the nature and value of these differences, proposed the four branches of the Vertebrata, Mollusca, Articulata and Radiata, based on the arrangement of the structures protective of the nervous matter or subserving voluntary motion. Hence also Owen, penetrating more deeply into the real philosophy of the subject, names these branches from the arrangement of the nerve matter itself, Myelencephala, Heterogangliata, Homogangliata, and Nematoneura;

including in this last the Acrita, or those in which a nervous system, existent no doubt, has not yet been distinctly traced.

Agassiz, as we have seen, prefers to take a more general view of the plan of structure as a whole, though accepting the four branches of Cuvier. We confess that we entertain doubts whether this is not, as compared with the position of Owen, a backward step. We might point, for example, to undoubted Radiata even among the Echinodermata and Acalephae, in which the general radiated structure does not exist, while the type of nervous system does. On the other hand, the separation of the Bryozoa, the Rotifera and the Entozoa from the Radiates, now so generally accepted, appears to us very likely to be condemned in the future progress of Zoology, as an error caused by want of attention to dominant structures, as compared with those which pertain to merely vegetative life and accidents of existence.*

Before leaving this subject of the division of Animals into four great branches, we would pause to insist on the fact, that while, as our author very properly insists, this division does not depend on gradation of rank or complexity of structure, it is still inseparably connected with these, just as in art, certain styles are connected with higher and others with lower works. The Vertebrate in no form sinks so low as the Invertebrate; and though the Articulates and Molluscs may be regarded as parallel series, both are higher on the whole than the Radiates and lower than the Vertebrates. These differences are not arbitrary, but apparently based on the inherent capabilities of the types themselves.

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* As an illustration of the reasons for doubt on this subject, we may point to the fact that in Allman's recent able monograph, he admits the difficulty of establishing the homology of the nervous systems in Bryozoa and Tunicates. In short, he finds affinities in the accessories, but fails to find them, or finds them only obscurely, in the essential structures pertaining to sensation and voluntary motion. Huxley, who differs materially from Allman in his explanation of these supposed homologies, finds the same difficulty. On the other hand, some marine worms affect the general aspect of Bryozoa; and we know from personal observation as well as from the statements in the work now before us, that the Vorticellidæ, with no good claim to be regarded as Molluscs, are little else than minute Bryozoa. In our view the radiates should be regarded as not strictly a distinct branch, but as a sort of root-stock of the animal kingdom, approaching in many points in its plans of structure to the plant, and in other points uniting itself closely with the basis of the Molluscous and Articulate branches.

2. *Classes*, we are told, refer to the "ways and means employed" in the structure of animals, or to the "combinations of their different systems of organs",—somewhat vague grounds, which we may perhaps illustrate by an example, all the more clear because very familiar. Let us suppose the animal kingdom, not the living clay from the hand of the Great Potter, but a collection of earthenware vessels appertaining to table uses; and that we have to effect an orderly arrangement of the mass. First we might observe that among this collection of vessels of all shapes and sizes, there were only a few different patterns,—some all white, some white and gold, some with a landscape, some with a flower; and each having in connection with this its peculiar style of form. We might then adopt, as our first basis of arrangement, pattern or type, both for simplicity and as indicating in the highest respect the mind of the artist. Having formed four great heaps on this ground, we should find that we had in each, vessels differing in material, in shape, in use, in complexity of parts; and we might carry out our farther division on any of these grounds. According to our author, we take the material, whether common earthenware or china, for instance, as our ground, this corresponding to ways and means of construction. Just, however, as we found that type could not be dissociated from rank, so neither can ways and means; and these moreover have a direct relation to use, and until we had read the views of Prof. Agassiz, we had supposed that this, or perhaps more generally, position in the economy of nature, was the predominant idea in the class. Let us place before our minds the classes of Invertebrates as proposed by Agassiz:—

Radiata.	*Mollusca.*	*Articulata.*
1. Polypi.	1. Acephala.	1. Worms.
2. Acalephae.	2. Gasteropoda.	2. Crustacea.
3. Echinodermata.	3. Cephalopoda.	3. Insects.

Now, it is quite evident that in these several classes the ground insisted on by our author, the manner of combination of the structures, is highly distinctive, and affords a good ground for discrimination in practical Zoology; but it appears to us that there is a higher reason in the distinction of these groups, which refers to the idea of modification of the type with reference to uses or place in nature. First, then, we would observe that there is a manifest gradation in elevation of rank. The Echinoderm, Cephalopod, and Insect, are respectively at the head of their branches, representing, therefore their highest perfection; the Polypi, Acephala and Worms are respectively at the lowest or simplest portion of each branch. Secondly, it is manifest that the three highest classes have each a special reference to the highest development of the psychical powers of the branch, and of its organs of sense and nervous system. The three middle classes represent the highest adaptation of the type to variety of locomotion and habitat. The three lowest classes represent the modification of the type with especial reference to the highest development of the mere vegetative life. Class, then, represents the expression of the general intention of the Creator in the construction of the members of a branch. Ways and means, or combinations of organs, are the indications of that intention which we most readily perceive. In this limited sense we are quite willing to accept the definition of our author.

In the ordinary division of the vertebrates, even the popular mind, we think, has all along recognised this principle. The Mammal, the Bird, the Reptile and the Fish, differ not merely in structure; but the first is the expression of the Vertebrate type in relation to its highest psychical powers, the second in relation to extent of locomotive powers, the third and fourth in relation to mere vegetative life in air and in water respectively.

3. *Orders* have been fruitful causes of difference among naturalists. The ground on which they should stand is thus stated:

"To find out the natural characters of orders from that which really exists in nature, I have considered attentively the different systems of Zoology in which orders are admitted and apparently considered with more care than elsewhere, and in particular the *Systema Naturæ* of Linnæus, who first introduced in Zoology that kind of groups, and the works of Cuvier, in which orders are frequently characterised with unusual precision, and it has appeared to me that the leading idea prevailing everywhere respecting orders, where these groups are not admitted at random, is that of a definite rank among them, the desire to determine the relative standing of these divisions, to ascertain their relative superiority or inferiority, as the same order, adopted to designate them, already implies. The first order in the first class of the animal kingdom, according to the classification of Linnæus, is called by him *Primates*, expressing, no doubt, his conviction that these beings, among which Man is included, rank uppermost in their class. Blainville uses here and there the expression of "degrees of organization," to designate orders. It is true Lamarck uses the same expression to designate classes. We find, therefore, here as everywhere, the same vagueness in the definition of the different kinds of groups adopted in our systems. But if we would give up any arbitrary use of these terms, and assign to them a definite scientific meaning, it seems to me most natural, and in accordance with the practice of the most successful investigators of the animal kingdom, to call orders such divisions as are characterised by different degrees of complication of their structure, within the limits of the classes. As such, I would consider, for instance, the Actinoids and Halcyonoids in the class of Polypi, as circumscribed by Dana; the Hydroids, the Discophoræ, and the Ctenoids among Acalephs; the Crinoids, Asterioids, Echinoids, and Holothuriæ among Echinoderms; the Bryozoa, Brachiopods, Tunicata, Lamellibranchiata among Acephala; the Branchifera and Pulmonata among Gasterpods; the Ophidians, the Saurians, and the Chelonians among Reptiles; the Ichthyoids and the Auoura among Amphibians, etc."

It would be injustice to the author not to state that in the succeeding paragraph he carefully guards the reader against supposing that he denies or ignores distinction of rank in other groups, as in classes, for instance; but he holds that here it is predominant. We could have wished that the view had been followed farther into detail; for, taking orders as we now have them, there are some evident exceptions. In the birds, for instance, the orders differ far more markedly in adaptation to conditions of life and structures depending on these, than in grade. In the orders of insects there is the same idea, along with that of type or pattern in a subordinate form; for we must bear in mind that type, and the homologies which express type, descend in different degrees through all our sub-divisions from the great leading types to the genera. It is expressed as distinctly in the elytra of beetles and the scales of butterflies as in the skeletons of vertebrata or articulata; it is curious, too, that naturalists have differed so very much as to the rank of the orders of insects. In other groups again, as the reptiles, the idea of rank is quite patent in the orders, but is much obscured when we add the fossil forms to those now living. In the orders of Mammals, as lately proposed by Owen, it is clearly exhibited. Dana has well shewn its existence in the Crustacea. It is pretty evident also in the orders of the several classes of Molluscs, and is very manifest in the Echinoderms. On the whole, we are willing to accept this view as at least one leading idea to be expressed by orders in the animal kingdom.

4. *Families* are characterised by general external form; and here we see no reason to differ from our author. The family is in short one of the most obvious and easily recognised relationships among animals, is almost instinctively perceived by us, and on this very account should have much more attention given to it in systematic Zoology than it has yet received, as one of the most useful aids in the determination of species.

"Unless, then, form be too vague an element to characterise any kind of natural groups in the animal kingdom, it must constitute a prominent feature of families. I have already remarked, that orders and families are the groups upon which zoologists are least agreed, and to the study and characterising of which they have paid least attention. Does this not arise simply from the fact, that, on the one hand, the difference between ordinal and class characters has not been understood, and only assumed to be a difference of degree; and, on the other hand, that the importance of the form, as the prominent character of families, has been entirely overlooked? For, though so few natural families of animals are well characterised, or characterised at all, we cannot open a modern treatise upon any class of animals without finding the genera more or less naturally grouped together, under the heading of a generic name with a termination in *idæ* or *inæ* indicating family and sub-family distinctions; and most of these groups, however unequal in absolute value, are really natural groups, though far from designating always natural families, being as often orders or sub-orders, as families or sub-families. Yet they indicate the facility there is, almost without study, to point out the intermediate natural groups between the classes and the genera. This arises, in my opinion, from the fact, that family resemblance in the animal kingdom is most strikingly expressed in the general form, and that form is an element which falls most easily under our perception, even when the observation is made superficially. But, at the same time, form is most difficult to describe accurately, and hence the imperfection of most of our family characteristics, and the constant substitution for such characters of features which are not essential to the family. To prove the correctness of this view, I would only appeal to the experience of every naturalist. When we see new animals, does not the first glance, that is, the first impression made upon us by their form, give us at once a very correct idea of their nearest relationship? We perceive, before examining any structural character, whether a Beetle is a Carabicine, a Longicorn, an Elaterid, a Curculionid, a Chrysomeline; whether a Moth is a Noctuelite, a Geometrid, a Pyralid, etc.; whether a bird is a Dove, a Swallow, a Humming-bird, a Woodpecker, a Snipe, a Heron, etc., etc. But before we can ascertain its genus, we have to study the structure of some characteristic parts; before we can combine families into natural groups, we have to make a thorough investigation of their whole structure, and compare it with that of other families. So form is characteristic of families; and I can add, from a careful investigation of the subject for several years past, during which I have reviewed the whole animal kingdom with reference to this and other topics connected with classification, that form is the essential characteristic of families. I do not mean the mere outline, but form as determined by structure; that is to say, that families cannot be well defined, nor circumscribed within their natural limits, without a thorough investigation of all those features of the internal structure which combine to determine the form."

5. *Genera*, also, are well and ably characterised:

"I have stated before, that in order to ascertain upon what the different groups adopted in our systems are founded, I consulted the works of such writers as are celebrated in the annals of science for having characterised with particular felicity any one kind of these groups, and I have mentioned Latreille as prominent among zoologists for the precision with which he has defined the genera of Crustacea and Insects, upon which he has written the most extensive work extant. An anecdote which I have often heard repeated by entomologists who knew Latreille well, is very characteristic as to the meaning he connected with the idea of genera. At the time he was preparing the work just mentioned, he lost no opportunity of obtaining specimens, the better to ascertain from nature the generic peculiarities of these animals, and he used to apply to the entomologists for contributions to his collection. It was not show specimens he cared to obtain, any would do, for he used to say he wanted them only "to examine their parts." Have we not here a hint, from a master, to teach us what genera are and how they should be characterised? Is it not the special structure of some part or other, which characterises genera? Is it not the finish of the organization of the body, worked out in the ultimate details of structure, which distinguishes one genus from another? Latreille, in expressing the want he felt with reference to the study of genera, has given us the key-note of their harmonious relations to one another. Genera are most closely allied groups of animals, differing neither in form, nor in complication of structure, but simply in the ultimate structural peculiarities of some of their parts; and this is, I believe, the best definition which can be given of genera. They are not characterised by modifications of the features of the families, for we have seen that the prominent trait of family difference is to be found in a typical form; and genera of the same family may not differ at all in form. Nor are genera merely a more comprehensive mould than the species, embracing a wide range of characteristics; for species in a natural genus should not present any structural differences, but only such as express the most special relations of their representatives to the surrounding world and to each other. Genera, in one word, are natural groups of a peculiar kind, and their special distinction rests upon the ultimate details of their structure."

We could have wished in this place some remarks on the tendency at present prevalent to sub-divide the old genera into a multitude of new ones, characterised by the most trivial and evanescent differences, a process which threatens to reduce some departments of Zoology to a mere chaos; and which, from the differences of view that arise, as a matter of course, when a natural genus is thus broken up, loads science with an odious and vexatious synonymy. There appears to be a prevalent idea that a genus should necessarily contain few species; but this is obviously an error, since the number of species generically related to each other varies between large limits in different groups of animals. Nor is a genus to be created merely to include species related to each other in a very near degree; but for those portions of a natural family in which the details of execution in the more important parts correspond, however many the species so agreeing, may be. In such a genus there may be many minor sub-divisions established for convenient reference, or to express minor distinctions; but these should not be characterised as distinct genera. Attention to this is all the more important, because the generic name is attached to the species and should tell something of its affinities. In order to appreciate natural genera, some breadth of mind is required, as well as familiarity with details of structure. Unfortunately many naturalists are deficient in this. Hence they regard a good natural genus such as a mind like that of Linnæus could found, not as one, but as several; their mental vision not enabling them to see the whole of it at once, though they can see little trifling distinctions. They break it up, attach names to the fragments, and believe themselves discriminating interpreters of nature, until the discovery of a few more species or the glance of some higher intellect throws the whole again into one, and nothing remains except a shoal of obsolete synonymes, against which young students may wreck themselves. We could fill our pages with instances, but it is better not to enter into particulars. The subject is, however, so important to the progress, and especially to the diffusion of science, that it demands at least an energetic protest against the genus-makers as a body. We are glad to see in some good modern text books, as in Woodnaid's Mollusca, many useless genera restored to their proper places.

6. *Species.*—In this most important department of the subject a large number of naturalists will at once join issue with Agassiz; and we think that the interests of truth demand a careful sifting of the views put forth, not only in the short section under this head, but also in the introductory chapters. The general definition, which we have already quoted, is so vague in its terms that it hardly serves to give the author's view. The "relations of individuals to each other" may, for instance, mean much or very little; and on the interpretation of this expression hangs the whole question here in dispute between Agassiz and other naturalists. The precise view intended to be conveyed may perhaps be best gathered from the following passages:—

"The species is an ideal entity, as much as the genus, the family, the order, the class, or the type; it continues to exist, while its representatives die, generation after generation. But these representatives do not simply represent what is specific in the individual, they exhibit and reproduce in the same manner, generation after generation, all that is generic in them, all that characterises the family, the order, the class, the branch, with the same fullness, the same constancy, the same precision. Species then exist in nature in the same manner as any other groups, they are quite as ideal in their mode of existence as genera, families, etc., or quite as real. But individuals truly exist in a different way; no one of them exhibits at one time all the characteristics of the species, even though it be hermaphrodite, neither do any two represent it, even though the species be not polymorphous, for individuals have a growth, a youth, a mature age, an old age, and are bound to some limited home during their lifetime. It is true species are also limited in their existence; but for our purpose, we can consider these limits as boundless, inasmuch as we have no means of fixing their duration, either for the past geological ages, or for the present period, whilst the short cycles of the life of individuals are easily measurable quantities. Now as truly as individuals, while they exist, represent their species for the time being, and do not constitute them, so truly do these same individuals represent at the same time their genus, their family, their order, their class, and their type, the characters of which they bear as indelibly as those of the species."

In this general statement, with the explanations elsewhere given of it, in relation to the capacity of species for intermixture. and the supposed original creation of numbers of representatives of the same species in different places, we see much that is objectionable, and a want of that accuracy of thought which is essential in treating of such a subject.

First, we cannot admit the high standing here given to the individual animal. The individual is here confounded with an entirely different thing, namely, the *unit* of the science. As has been well stated above, the individual rarely represents the species as a whole. To give this we have to employ a series of individuals, including the differences of age and sex, and the limits of variation under external circumstances. The individuals representing these varieties are therefore only fractional parts of a unit, which is the species. Let it be observed, also, that the relation here is different from that which subsists between the species and the genus. Each species should have all the generic characters with those that are specific; but each individual, as a fraction of the species, need not necessarily possess all the mature characters of the species; and this is one reason of the indistinct notion in many minds that the limits of species are more uncertain than those of genera. On the other hand, the idea of specific unity is expressed by our attaching the specific name to any individual that we may happen to have; and even popular speech expresses it when it says the grisly bear, the Arctic fox.

Secondly, the species is not merely an ideal unit: it is a unit in the work of creation. No one better indicates than our author the doctrine of the creation of animals; but to what is it that creation refers?—not to genera and higher groups, they express only the relations of things created,—not to individuals as now existing, they are the results of the laws of invariability and increase of the species,—but to certain original individuals, protoplasts, formed after their kinds or species, and representing the powers and limits of variation inherent in the species—the potentialities of their existence, as Dana well expresses it. The species, therefore, with all its powers and capacities for reproduction, is that which the Creator has made, his unit in the work, as well as ours in the study. The individuals are merely so many masses of organised matter, in which, for the time, the powers of the species are embodied; and the only animal having a true individuality is man, who enjoys this by virtue of mental endowments, over-ruling the instincts which in other animals narrowly limit the action of the individual. To this great difference between the limitations imposed on animals by a narrow range of specific powers, and the capacity for individual action which in man forces even his physical organisation, in itself more plastic than that of most other animals, to bend to his dominant will, we trace not only the varieties of the human species, but the changes which man effects upon those lower animals which in instincts and constitution are sufficiently ductile for domestication.

Thirdly, the species is different, not in degree, but in kind, from the genus, the order, and the class. We may recognise a generic resemblance in a series of line engravings representing different subjects, but we recognise a specific unity only in those struck from the same plate; and no one can convince us that the resemblance of a series of coins, medals, or prints, from different dies or plates, is at all of the same kind with that which subsists between those produced from the same die or plate. In like manner, the relation between the members of the brood of the song sparrow of this spring, is of a different kind as well as different degree from that between the song sparrow and any other species of sparrow. So of the brood of last year to which the parent sparrows may have belonged; so by parity of reasoning of all former broods, and all song sparrows everywhere. The species differs from all other groups in not being an ideal entity, but consisting of individuals struck from the same die, produced by continuous reproduction from the same creative source. Nor need we suppose with our author—for as yet it is merely an hypothesis—that species may have sprung from two or several origins. We cannot be required to assume a cause greater than that which the effect demands; and if one pair of the American crow or Canada goose would now be sufficient, in a calculable number of years, to supply all America with these species, we need not suppose any more. Even in those cases where one centre of creation appears to be insufficient, this may only be a defect in our information, as to the precise range of the species, its capabilities for accommodating itself to external differences of habitat, and the geological changes which may have occurred since its creation. Take the example given at p. 40 of the "Contributions." The American Widgeon and British Widgeon, and the American and British red-headed Ducks are distinct species. The Mallard and Scaup Duck are common to both sides of the Atlantic. The inference is that since the distinct species of widgeons and red ducks were probably created on the opposite sides of the Atlantic, so were the Mallards, though specifically identical. To prove this is obviously altogether impossible; but even to establish some degree of probability in its favor, it would be necessary to show that the Widgeons and Red Ducks equal the Mallard and Scaup Duck in hardiness, in adaptability to different conditions of climate and food, in migratory instinct and physical powers of migration, and farther, that these species are equally old in geological time. We do not happen to know, in reference to this last particular, which species is the oldest, if there is any difference; but remains of ducks have been found in the later deposits, and if it should prove that the species now more widely distributed existed at a time when the distribution of land and water was different from that which now prevails, we should have a case quite parallel to many known to geologists, and utterly subversive of the view before us. The Mallard is also an unfortunate instance, from its well-known adaptation for domesticity, and consequently proved capability of sustaining very different conditions of existence. The Scaup Duck, hardy and carnivorous, a sea-duck and a good diver, and Asiatic as well as European, is probably far better fitted for extensive migration than the Widgeon. It is on such grounds, incapable of positive proof, and with palpable flaws in even the negative evidence, that we are required to multiply the miracle of creation, rather than submit patiently to investigate the psychical, physiological and physical agencies involved in one of the most interesting problems of Zoology, the geographical distribution of animals.

One farther remark is rendered necessary by the illustration above referred to. No one knows better than Agassiz that to compare, in reference to their geographical distribution, animals nearly related, may often lead to errors greater than those likely to result from the comparison of creatures widely different in structure but adapted for somewhat similar external conditions of existence. It is a fact very curious in itself, independently of this application, that we find closely related species differing remarkably in this respect; and that, on the other hand, animals of very different grades and structures are equally remarkable for wide geographical ranges. The causes of these differences are often easily found in structural, physiological, or psychical peculiarities, but in many cases they depend on minute differences not easily appreciable, or on the effects of geological changes.

Fourthly.—Our author commences his dissertation on species by taunting those who maintain the natural limits set to hybridity with a petitio principii. The accusation might be turned against himself. The facts shewing that species in their natural state do not intermix, and that hybrids are only in exceptional cases fertile, so enormously preponderate over the few cases of fertile hybridity, that the latter may be regarded as the sort of exception which proves the rule. The practical value of this character in ascertaining the distinctions of species in difficult cases is quite another question, as is the precise nature of the resemblances in distinct species which most favour hybridity, and the greater or less fixity of the barrier in the case of species inhabiting widely separated geographical areas, when these are artificially brought together. Nor is the specific unity to be broken down by arguments derived from the difficulty of discriminating or of identifying species. The limits of variability differ for every species, and must be ascertained by patient investigation of large numbers of specimens, before we can confidently assert the boundaries in some widely distributed and variable species; but in the greater number this is not difficult, and in all may be ascertained by patient inquiry.

Fifthly,—The above considerations, in connection with the doctrines of created protoplasts, and the immutability of species, as so ably argued by Agassiz himself, we hold irresistibly compel us to the conclusion of Cuvier, that a species consists of the "beings descended the one from the other or from common parents"; or at least to that of De Candolle, that the individuals of a species must "bear to each other so close a resemblance as to allow of our supposing that they may have proceeded originally from a single being or a single pair." This being admitted, it must be only on the most cogent grounds, to be established in every individual case, that we can admit a difference of origin either in geological time or in space, for animals that on comparison appear to be specifically identical.

It may be objected that this is a merely hypothetical definition; but we contend that it is as practical as the opposite view, that it is indeed essential to any trustworthy determination of species. If we have given to us a number of individuals absolutely similar, we do not doubt their specific unity, or, as we even sometimes venture to call it, identity; but if there are differences which we suppose may be specific, we inquire whether these differences exceed those known to occur in individuals of common parentage. If we are informed that these same diversities occur in individuals of the same brood or litter, in individuals that have been transferred to different conditions of life, or in individuals of different age or sex, we discard them as specific distinctions. If we cannot obtain these facts as to the species in question, we compare large numbers of specimens to ascertain the gradations that occur, or we refer to the known facts in allied species, or in those which may be supposed similar in tendency to variation. We always suspect determinations which, on the one hand, require us to believe specific diversity in forms no farther apart than those known to be connected by parentage; or, on the other, unity where the differences are greater than this. Other considerations, of course, enter into such questions; but the identity of the protoplast, or mould, is one essential element in our complete mental conception of the species.

We could, on the other hand, state practical evils injurious to the mere technical accuracy of Zoology, likely to arise from the opposite view. One of these may suffice. It is their tendency to take it for granted that forms must be new specifically, merely because they are found in new places—a mischievous laxity, likely to prevail where so loose views as to species are held by a great leading naturalist; too wise himself to be so misled, but unable to communicate his own largeness of mind to followers who eagerly adopt a view tending to increase their chance of becoming species-founders, or at all events their freedom to commit errors in this matter, without being liable to the charge of separating individuals connected by actual descent from common ancestors.

It only remains on this subject to remark that the practical difficulty of the discrimination of species occurs only in exceptional cases. When we endeavour by external characters, such as proportions of parts, external ornamentation, &c., accurately to distinguish forms of the same origin, we may, it is true, be deceived in some rare cases by the similarity of really distinct species, or the variations of the individuals of the same species. But, when we consider the well-defined limits of form, ornament, &c., in the greater number of animals, we cannot doubt that accurate attention to all the facts bearing on these will enable us eventually to solve the most intricate cases, without having recourse to any hypothesis destructive of the true unity of the species.

We have aimed in the above remarks only to show that grave difficulties beset the view of species advocated by Agassiz, and that such views, if carried to their legitimate results, would destroy all certainty in Zoology, quite as effectually as that opposite view which would so enlarge the limit of specific unity as to admit that any number of species may have descended from a common parentage.

As might have been expected, a mind so familiar with nature as that of Agassiz clings to the truth on this practical view of the subject, however far from it in the mere theory of species. Hence the able reasoning in this work on the immutability of species, their range of distribution in time and space, and the care necessary in their discrimination and description. On these last subjects the following paragraphs are well worthy of attention, though some of the considerations referred to are vastly more important than others:—

"If we would not exclude from the characteristics of species any feature which is essential to it, nor force into it any one which is not so, we must first acknowledge that it is one of the characters of species to belong to a given period in the history of our globe, and to hold definite relations to the physical conditions then prevailing, and to animals and plants then existing. These relations are manifold, and are exhibited: 1st. in the geographical range natural to any species, as well as in its capability of being acclimated in countries where it is not primitively found; 2d. in the connection in which they stand to the elements around them, when they inhabit either the water, or the land, deep seas, brooks, rivers and lakes, shoals, flat, sandy, muddy, or rocky coasts, limestone banks, coral reefs, swamps, meadows, fields, dry lands, salt deserts, sandy deserts, moist land, forests, shady groves, sunny hills, low regions, plains, prairies, high table-lands, mountain peaks, or the frozen barrens of the Arctics, etc.; 3d. in their dependence upon this or that kind of food for their sustenance; 4th. in the duration of their life; 5th. in the mode of their association with one another, whether living in flocks, small companies, or isolated; 6th. in the period of their reproduction; 7th, in the changes they undergo during their growth, and the periodicity of these changes in their metamorphosis; 8th, in their association with other beings, which is more or less close, as it may only lead to a constant association in some, whilst in others it amounts to parasitism; 9th, specific characteristics are further exhibited in the size animals attain, in the proportions of their parts to one another, in their ornamentation, etc. and all the variations to which they are liable.

"As soon as all the facts bearing upon these different points have been fully ascertained, there can remain no doubt respecting the natural limitation of species; and it is only the insatiable desire of describing new species from insufficient data which has led to the introduction in our systems of so many doubtful species, which add nothing to our real knowledge, and only go to swell the nomenclature of animals and plants already so intricate.

"Assuming, then, that species cannot always be identified at first sight, that it may require a long time and patient investigations to ascertain their natural limits; assuming further, that the features alluded to above are among the most prominent characteristics of species, we may say, that species are based upon well determined relations of individuals to the world around them, to their kindred, and upon the proportions and relations of their parts to one another, as well as upon their ornamentation. Well digested descriptions of species ought, therefore, to be comparative; they ought to assume the character of biographies, and attempt to trace the origin and follow the development of a species during its whole existence. Moreover, all the changes which species may undergo in course of time especially under the fostering care of man, in the state of domesticity and cultivation, belong to the history of the species; even the anomalies and diseases to which they are subject belong to their cycle, as well as their natural variations. Among some species, variation of color is frequent, others never change, some change periodically, others accidentally; some throw off certain ornamental appendages at regular times, the Deers their horns, some Birds the ornamental plumage they wear in the breeding season, etc. All this should be ascertained for each, and no species can be considered as well defined and satisfactorily characterised, the whole history of which is not completed to the extent alluded to above. The practice prevailing since Linnæus of limiting the characteristics of species to mere diagnoses, had led to the present confusion of our nomenclature, and made it often impossible to ascertain what were the species the authors of such condensed descriptions had before them. But for the tradition which has transmitted, generation after generation, the knowledge of these species among the cultivators of science in Europe, this confusion would be still greater; but for the preservation of most original collections it would be inextricable. In countries, which, like America, do not enjoy these advantages, it is often hopeless to attempt critical investigations upon doubtful cases of this kind. One of our ablest and most critical investigators, the lamented Dr. Harris, has very forcibly set forth the difficulties under which American naturalists labor in this respect, in the Preface to his Report upon the Insects Injurious to Vegetation."

We have been led by the great interest of the subject into so long a discussion of the points already referred to, that it will be impossible to notice many others equally important, as for instance the application of the general views above discussed; or to say anything of the more special subject of the volume, the Embryology of the American Tortoises, so ably described and beautifully illustrated. Nor will it be possible to enter on the views given of the relation of embryonic development to classification and geological sequence,—a most tempting subject, though at present encompassed with a crowd of difficulties and apparent exceptions that await for their solution and explanation such investigations as those which now occupy Agassiz.

In conclusion, every true naturalist will endeavour not only to read but carefully to study this work, the high merits of which we do not wish to depreciate, however we may be constrained to differ from some of its more general doctrines. Agassiz himself will be the last to require an implicit assent to his views, merely because he holds them; and we know that he values truth too much, and is too deeply imbued with reference for nature and its

Maker, wilfully to misrepresent the smallest fact, or arrogantly to oppose the most full discussions of his results.

J. W. D.

GEOLOGICAL GLEANINGS.

1. *Sir Edmund Head on the temple of Serapis at Pozzuoli.* The Geologist is only a sort of pre-adamite antiquarian; but it is not often that the researches of the historical antiquary and scholar throw light on his pursuits. The paper named above, and published by the Society of Antiquaries is an exception. The building to which it relates is of exceeding geological interest, as showing in its erect columns perforated by lithodomous mullusks, that the ground on which it stands has been dry land, then submerged and again elevated since the erection of the temple. It is a curious instance of the peculiarities of the civilization and science of classical antiquity and the middle ages, that no distinct record remains of the nature and date of these remarkable changes of level. The little mussels that bored their burrows in the marble, were the only geologists of those days. Sir Edmund endeavours to supply this lack of testimony by pointing out a number of references more or less direct to the edifice and its fortunes, which have occurred to him in his reading. The following extract shows the mode of treating the subject, and contains one of the most curious results of the inquiry, namely, the possibility that part of the deposits covering the floor of the old temple may be artificial.

"At Pozzuoli a building of some sort occupied the centre of the area. Whether, as in Egypt, the image of the god was placed there, or behind the four columns to which the ruin owes its modern celebrity, may be uncertain. The lowness of situation must have deprived our temple of subterranean passages, and the underground arrangements so elaborately provided in the Egyptian model. The possession, however, of a natural hot spring just behind the temple must have made up for many disadvantages. No appendage could be more appropriate for the temple of a god who among his many attributes usurped those of Æsculapius.

"This warm spring, however, suggests another curious question with reference to a passage in Pausanias. After mentioning several cases of fresh springs in the sea, and the hot springs in the channel of the Mæander, Pausanias proceeds as follows:—

'Before Dicæarchia of the Tyrseni (Pozzuoli) there is water boiling up in the sea, and for the sake of it an island made with hands, so that not even this water is wasted, but serves people for warm baths.'

"May not this spring be the very one now existing behind the Temple of Serapis?

"Had the hot spring of Pausanias originally discharged itself into the sea, it does not seem likely that it would have been used at all; but if its virtues had been long known to the inhabitants of Pozzuoli, and a gradual encroachment of the sea, or rather a depression of the land, deprived them of the benefit of the baths to which they had become accustomed, what could be more natural than that a small mound or island should be made by hand in the shallow water, in order that the baths might be again available?

"Pausanias does not indeed say that these baths were connected with a temple of Serapis, but this is immaterial.

"On this theory a number of curious questions present themselves.

"Which is the pavement of the building existing at the time of Pausanias? What, relatively to the floor as now seen, was the level of the original building submerged in the sea? Is it represented by the mosaic pavement found five feet below the floor of the temple? If so, it would be important to examine the soil between the two pavements, and to ascertain whether it appears to warrant the supposition that it was a part of a mound constructed artificially.

"The intervention of the hand of man in filling up or raising this spot of ground, may complicate most materially the solution of the several changes of level.

"It should be stated that, according to the general notion, mosaic pavements were not in common use at Rome before the time of Sylla—that is, about eighty years before Christ; but it does not follow that a mosaic pavement may not have been added after that date to a building existing before it: so that the mosaic pavement in question may have been part of the Temple of Serapis mentioned in the "Lex Parieti faciundo." Pausanias lived in the time of Hadrain, as has been already stated, and, according to this view, the submergence of the first baths or temple must have taken place between the time of Sylla and that date. We cannot, I presume, suppose that a mosaic pavement would be originally laid under water.

"The level below the water of the Mediterranean of the old mosaic pavement must correspond pretty accurately with that of the base of the columns of the submerged "Temple of the Nymphs" in the neighbouring bay. Did this submergence take place at the time of the great eruption of Vesuvius which overwhelmed Pompeii and Herculaneum, A.D. 79?

"Statius was born A.D. 61, and was therefore about nineteen at the time of the eruption of 79. As a native of Naples he may be presumed to have been conversant with all the phenomena which then took place. His lines on the subject of the destruction of the cities are very striking.

> "Hæc ego Chalcidicis ad te, Marcelle, sonabam
> Littoribus, fractas ubi Vesvius egerit iras,
> Æmula Trinacriis volvens incendia flammis.
> Mira fides! credetne virûm ventura propago,
> Cum segetes iterum, et jam hæc deserta virebunt,
> Infra urbes, populosque premi? proavitaque toto
> Rura abiisse mari? necdum letale minari
> Cessat apex——"

"The latter part of this passage seems to me to mean "lands tilled by our ancestors (proavita) have disappeared in the body of of the sea" (toto mari). The commentator in the Variorum edition (Lugd. Bat. 1671) appears to understand the word "proavita" as referring to the restoration of these districts hereafter "proavita dicit respectu futuræ posteritatis"—which seems to me absurd. How were posterity to get the lands out of the sea again? Such is not the use of the word when applied to Hector:—

> "Pugnantem pro se, proavitaque regna tuentem."
> *Ovid. Metamorph.* xiii. 416.

"I infer from the expressions of Statius that considerable tracts of land had been sunk in the sea by some sudden depression of the ground.

"May not this have been the time when the Temple of the Nymphs, and the first baths or temple of Serapis, were covered with shallow water? Is it not possible that between this convulsion and the time when Pausanias wrote the inhabitants of Pozzuoli may have made the island in the sea (*cheiropoieton*), and have erected on it a second temple—the one of which the ruins still puzzle the geologist?

"It may be worth while adding, that there exist three fragments of Latin verse, by a certain Regianus (or Regilianus), whose age does not appear to be known. One of these is entitled "de Baiis," another is "de Thermis." The latter contains this line—

"In regnis, Neptune, tuis Vulcanus anhelat."

"Considering the proximity of Baiæ to Puteoli, it is not improbable that this last verse may refer to the baths described by Pausanias."

2. *Professor Ramsay,on the geological causes that have influenced the Scenery of Canada and the North Eastern States.* This lecture read at the Royal Institution in London, is one of the results of Professor Ramsay's visit last year. We take the following sketch from the published abstract of the lecture.

"The island of Belleisle and the Laurentine chain of mountains between the shores of Labrador and Lake Superior consist of gneissic rocks older than the Huronian formation of Sir Wm. Logan. This gneiss is probably the equivalent of the oldest gneiss of the Scandinavian chain, and of the north-west of Scotland, underlying that conglomerate, which, according to Sir Roderick Murchison, in Scotland represents the Cambrian strata of the Longmynd and of Wales. The mountains of the Laurentine chain present those rounded contours that evince great glacial abrasion; and among the forests north of the Ottawa the mammillated surfaces were observed by the speaker to be often grooved and striated, the striations running from north to south. The whole country has been moulded by ice. Above the metamorphic rocks, in the plains of Canada and the United States south of the St. Lawrence, and around Lake Ontario and Lake Erie, the Silurian and Devonian strata lie nearly horizontally, but slightly inclined to the South. Consisting of alternations of limestone and softer strata, the rocks have been worn by denudation into a succession of terraces, the chief of these forming a great escarpment, part of which, by the river Niagara, overlooks Queenston and Lewiston, and capped by the Niagara limestone, extends from the neighbourhood of the Hudson to Lake Huron. Divided by this escarpment the plains of Canada bordering the lakes, and part of the United States, thus consist of two great plateaux, in the lower of which lies Lake Ontario, Lake Erie lying in a slight depression in the upper plain or table land, 329 feet above Lake Ontario. The lower plain consists mostly of Lower Silurian rocks, bounded on the north by the metamorphic hills of the Laurentine chain. The upper plain is chiefly formed of Upper Silurian and Devonian strata. East of the Hudson, the Lower Silurian rocks that form the lower plain of Canada become gradually much disturbed and metamorphosed, and at length rising into bold hills trending north and south, form in the Green Mountains part of the chain that stretches from the southern extremity of the Appalatchian Mountains to Gaspé, on the Gulf of St. Lawrence. Between the plains of the lakes and this range, the steep terraced mass of the Catskills, formed of old red sandstone, lies above the Devonian rocks facing east and north in a grand escarpment.

"The whole of America south of the lakes, as far as latitude 40°, is covered with glacial drift, consisting of sand, gravel, and clay, with boulders, many of which, during the submergence of the country have been transported by ice several hundred miles from the Laurentine chain. Many of these are striated and scratched in a manner familiar to those conversant with glacial phenomena. When stripped of drift all the underlying rocks are evidently ice-smoothed and striated, the striations generally running more or less from north to south, indicating the direction of the ice-drift during the submergence of the country at the glacial period. The banks of the St. Lawrence, near Brockville, and all the Thousand Islands, have been rounded and *moutonnée* by glacial abrasion during the drift period.

"The submergence of the country was gradual, and the depth it attained is partly indicated in the east flank of the Catskill mountains. This range, near Catskill, runs north and south, about 10 or 12 miles from the right bank of the Hudson. The undulating ground between the river and the mountains is seen to be covered with striations wherever the drift has been removed. These have a north and south direction; and ascending the mountains to Mountain House, the speaker observed that their flanks are marked by frequent grooves and glacial scratches, running not down hill, as they would do if they had been produced by glaciers, but north and south horizontally along the slopes, in a manner that might have been produced by bergs grating along the coast during submergence. These striations were observed to reach the height of 2850 feet above the sea. In the gorge, where the hotel stands at that height, they turn sharply round, trending nearly east and west; as if at a certain period of submergence, the floating ice had been at liberty to pass across its ordinary course in a strait between two islands. During the greatest amount of submergence of the country, the glacial sea in the valley of the Hudson must have been between 3000 and 4000 feet deep, and it is probable that even the highest tops of the Catskills lay below the water.

"In Wales, it has been shown that during the emergence of the country in the glacial epoch, the drift in some cases was ploughed out of the valleys by glaciers; but though the Catskill mountains are equally high, in the valleys beyond the great eastern escarpment the drift still exists, which would not have been the case had glaciers filled these valleys during emergence in the way that took place in the Passes of Llanberis and Nant-Francon, and in parts of the Highlands of Scotland.

"It has been stated above that the upper plain around Lake Erie, and the lower plain of Lake Ontario, are alike covered with drift. Part of this was formed, and much of it modified during the emergence of the country. In the valley of the St. Lawrence, near Montreal, about 100 feet above the river, there are beds of clay, containing Leda Portlandica, and called by Dr. Dawson of Montreal, the *Leda clay*. Dr. Dawson is of opinion that when this clay was formed, the sea in which it was deposited washed the base of the old coast line that now makes the great escarpment at Queenston and Lewiston, overlooking the plains round Lake Ontario. It has long been an accepted belief that the Falls of Niagara commenced at the edge of this escarpment, and that the gorge has gradually been produced by the river wearing its way back for seven miles to the place of the present Falls.* In this case, the author conceives that *the Falls commenced during the deposition of the Leda clay, or near the close of the drift period*, when during the emergence of the country the escarpment had already risen partly above water. If it should ever prove possible to determine the actual rate of recession of the Falls, we shall thus have data by which to determine approximately the time that has elapsed since the close of the drift period; and an important step may thus be gained towards the actual estimate of a portion of geological time."

3. *Sir Charles Lyell on the formation of Continuous Tabular Masses of stony Lava on steep slopes.*—The question as to whether volcanic cones have originated from the deposition of successive sheets of the ejectamenta of their vents, or from the bulging up-

* The details on which this belief is founded, may be found in the writings of Professor Hall, of Albany, and Sir Charles Lyell.

ward of the crust by subterranean force has long been agitated, and Sir Charles Lyell has long upheld the former view. In the present paper Sir Charles removes an objection derived from the steep slopes of the beds of lava and scoriæ in some volcanic cones. In connection with this subject, the remains of a more ancient vent than the present crater of Etna and the probable antiquity of the mountain, are noticed.

"The question whether lava can consolidate on a steep slope, so as to form strata of stony and compact rock, inclined at angles of from 10° to more than 30°, has of late years acquired considerable importance, because geologists of high authority have affirmed that lavas which congeal on a declivity exceeding 5° or 6° are never continuous and solid, but are entirely composed of scoriaceous and fragmentary materials. From the law thus supposed to govern the consolidation of melted matter of volcanic origin, it has been logically inferred that all great volcanic mountains owe their conical form principally to upheaval or to a force acting from below and exerting an upward and outward pressure on beds originally horizontal or nearly horizontal. For in all such mountains there are found to exist some stony layers dipping at 10°, 15°, 25°, or even higher angles; and according to the assumed law, such an inclined position of the beds must have been acquired subsequently to their origin.

"After giving a brief sketch of the controversy respecting "Craterrs of Elevation," the author describes the results of his recent visit (October, 1857) to Mount Etna, in company with Signor Gaetano G. Gemmellaro, and his discovery there of modern lavas, some of known date, which have formed continuous beds of compact stone on slopes of 15°, 36°, 38°, and, in the case of the lava of 1852, more than 40°. The thickness of these tabular layers varies from 1½ foot to 26 feet; and their planes of stratification are parallel to those of the overlying and underlying scoriæ which form part of the same currents. The most striking examples of this phenomenon were met with—1st, at Aci Reale; 2ndly, in the ravine called the Cava Grande near Milo, where a section of the lava of 1689 is obtained; 3rdly, in the precipice at the head of the Val di Calanna, in the lava of 1852-53; and 4thly, at a great height above the sea near the base of the Montagnuola.

"Sir C. Lyell then alludes to the extraordinary changes which had taken place in the scenery of the Valley of Calanna and the Val del Bove since his former visit to Mount Etna in 1828—

changes effected by the eruption of 1852–53, one of the greatest recorded in history. A brief account is given, extracted from contemporary narratives and illustrated by a map, compiled with the assistance of Dr. Giuseppe Gemmellaro, of the course taken in 1852–53 by various streams of lava, some of them six miles in length, flowing during nine successive months from the head of the Val del Bove to the suburbs of Zafarana and Milo. The present aspect of this lava-field, parts of it still hot and emitting vapour, and the numerous longitudinal ridges and furrows on its surface are described. As to the origin of these superficial inequalities, the author inquires whether they may be due to the flowing of lava in subterranean tunnels, or whether they be anticlinal and synclinal folds caused by fresh streams pouring over preceding and half-consolidated ones, so that these last may be bent and crumpled by the newly superimposed weight, like soft yielding ground on which a railway embankment has been made. The cascade of the lava of 1852, descending a precipitous declivity 500 feet high, called the Salto della Giumenta, and the stony character of the layers which encrust the steep slope at angles of more than 35° and even 45°, are commented upon. This lava has overflowed that of 1819, which congealed on the same precipice; and it is shown that in such cases the junction-lines separating two successive currents must be obliterated, the bottom scoriæ of the newer dovetailing into the upper scoriæ of the older current.

"The structure of the nucleus of Etna, as exhibited in sections in the Val del Bove, is next treated of, and the doctrine of a double axis is deduced from the varying dip of the beds. The strata of trachyte and trachytic agglomerate in the Serra Giannicola seen at the base of the lofty precipice at the head of the Val del Bove are inclined at angles of 20° to 30° N. W *i. e.* towards the present central axis of eruption. Other strata to the eastwards (as in the hill of Zoccolaro) dip in an opposite direction, or S.E., while, in a great part of the north and south escarpments of the Val del Bove, the beds dip N.E. or N., and S.E. or S. respectively. There is, therefore, a quàquâversal dip away from some point situated in the centre of the area called the Piano di Trifoglietto. Here a permanent axis of eruption may have existed for ages in the earlier history of Etna, for which the name of the axis of Trifoglietto is proposed, while the modern centre of eruption, that now in activity, may be called the axis of Mongibello. The two axes, which are three miles distant the one from the other, are illustrated by an ideal section through the whole of Etna, passing from west to east through the Val del Bove, or from Bronte to Zafarana. Touching the relative age of the two cones, it is suggested that a portion only of that of Mongibello may be newer than the cone of Trifoglietto. The latter when it became dormant, was entirely overwhelmed and buried under the upper and more modern lavas of the greater cone. This doctrine of two centres, originally hinted at by the late Mario Gemmellaro, had been worked out (unknown to Sir C. Lyell at the time of his visit) by Baron Sartorius v. Waltershausen, and has been since supported in the fifth and sixth parts of his great work called "The Atlas of Etna" both by arguments founded on the quâquâversal dip of the beds as above explained, and by the convergence of a certain class of greenstone dikes towards the axis of Trifoglietto. Von Waltershausen has also shown that the superior lavas and volcanic formations crowning the precipices at the head of the Val del Bove, from the Serra Giannicola to the Rocca del Corvo, inclusive, are unconformable to the highly inclined beds in the lower half of the same precipice, the superior beds being horizontal, or, when inclined, dipping in such directions as would imply that they slope away from the higher parts of Mongibello."

"According to Sir C. Lyell, the alleged discontinuity between the older and modern products of Etna is, in truth, only partial, and almost confined to that flank of the mountain, where its physical geography has been altered by three causes: 1st, the interference of the two foci of eruption (Trifoglietto and Mongibello); 2ndly, the truncation of the cone of Mongibello; and 3rdly, the formation of the Val del Bove. The truncation of the mountain here alluded to is proved by the remains of the upper portion of a cone, traceable at intervals around the borders of an elevated platform between 9000 and 10,000 feet high. These remains bear the same relation to the highest and active cone, nearly in the centre of the platform, which Somma bears to Vesuvius. The manner in which the north and south escarpments of the Val del Bove diminish in altitude as they trend eastward from the high platform, is appealed to as showing that the great lateral valley had no existence till after the time when Mongibello had attained its fullest development and height.

"The double axis of Etna is then compared to the twofold axis of the island of Madeira, as inferred from observations made in 1854 by M. Hartung and the author. In that island the principal chain of volcanic vents, running east and west, and 30 miles long, attains at one point a height of 6000 feet. Parallel to it, at the distance of two miles, a shorter and lower secondary chain once existed, but was afterwards overflowed and buried to a great depth by lavas issuing from the higher and dominant chain. The space between the two axes, like the space which separated the two cones of Etna, has been filled up with lavas in part horizontal. On the north side of Madeira, as probably on the west side of Etna, where no secondary centre of eruption interfered with the slope of the volcanic formations, and where the order of their succession and superposition is uninterrupted, there occur, both in Madeira and Etna, deep crateriform valleys (the Curral and the Val del Bove) intersecting the products of the two axes of eruption.

"In concluding this part of his memoir, Sir C. Lyell observes, that the admission of a double axis, as explained by him, is irreconcileable with the hypothesis of "craters of elevation;" for it implies that, in the cone-making process, the force of upheaval merely plays a subordinate part. One cone of eruption, he says, may envelope and bury an adjoining cone of eruption; but it is obviously impossible that one cone of upheaval should mantle round and overwhelm another cone of upheaval.

"An attempt is then made to estimate the proportional amount of inclination which may be due to upheaval in those parts of the central nucleus of Etna where the dip is too great to be ascribed exclusively to the original steepness of the flanks of the cone. The highest dip seen by the author was on the rock of Musarra, where some of the strata, consisting of scoriæ with a few intercalated lavas, are inclined as 47°. Some masses of agglomerate and beds of lava in the Serra del Solfizio were also seen inclined at angles exceeding 40°. Some of these instances are believed to be exceptional and due to local disturbance; others may have an intimate connexion with the abundance of fissures, often of great width, filled with lava, for such *dikes* are much more frequent near the original centres of eruption than at points remote from them. The injection of so much liquid matter into countless rents may imply the gradual tumefaction and distension of the volcanic mass, and may have been attended by the tilting of the beds, causing them to slope away at steeper angles than before, from the axis of eruption. But instead of ascribing to this mechanical force, as many have done, nearly all, or about four-fifths of the whole class, one-fifth may, with more probability, be assigned as the effects of such movements.

"The alleged parallelism and uniformity of thickness in the volcanic beds of the Val del Bove, when traced over wide areas, is next considered, and the author remarks that neither in the northern nor southern escarpments of the great valley, could he and his companion verify the existence of such parallelism. Example of a marked deviation from it are given, both in cliffs seen from a distance, and in others which were closely inspected, even in cases where these last, when viewed from far off, appeared to contain regular and parallel strata.

"The direction and position of the dikes in the Val del Bove is then spoken of, both in reference to the two ancient centres of eruption, and to the question of the altered inclination of the intersected beds. In regard to the arrangement also of the lateral cones of eruption, the question is entertained, whether they are disposed in linear zones, or are in some degree independent of the great centre of Mongibello.

"The origin of the Val del Bove has been variously ascribed to engulfment, explosion, and aqueous erosion. Admitting the probable influence of the two first causes, the author calls attention to the positive evidence in favour of aqueous denudation afforded by the accumulation of alluvium in the low country at the eastern base of Etna between the Val del Bove and the sea. This rudely stratified deposit, 150 feet thick and several miles in length and breadth, contains at Giarre, Mangano, Riposto and other places, fragments, both rounded and angular, of all the rocks, ancient and modern occurring in the escarpments of the Val del Bove, and it implies the continuance there for ages of powerful aqueous erosion. The alluvium of Giarre is therefore supposed to bear the same relation to the Val del Bove that the conglomerate of the Barranco de las Angustias bears to the Caldera of Palma in the Canaries; and those two craterlike valleys, as well as the Curral of Madeira, are believed to have been shaped out in great part by running water. But to render this possible, the suspension, for a long period, of the outpouring of lava on the eastern flank of Etna must be assumed."

"The author fully coincides in the generally received opinion that the accessible parts of Etna are of subaërial origin, and refers to some fossil leaves presented to him by MM. Gravina and Tornabene of Catania, as well as to others collected by himself *in situ*, from the volcanic tuffs of Fasano and Licatia, which have been determined by Prof. Heer to belong to terrestrial plants, of the genera Myrtle, Laurel, and Pistachio, now living in Sicily. These tuffs, together with the general mass of Etna, repose on marine strata of the newer Pliocene period in which 150 species of shells, nearly nine-tenths of them identical with species now existing in the Mediterranean, have been found. A very modern marine breccia, with shells of living species extending to the height of thirty feet on the coast along the eastern base of Etna, was pointed out to the author by Signor G.G. Gemmellaro near Trezza, and in the Island of the Cyclops. The same formation has been traced together with lithodomous perforations by Dr. Carlo Gemmellaro and Baron v. Waltershausen along the sea-shore as far north as Taormina, beyond the volcanic region of Etna. From these and other data enlarged upon in the memoir, Sir C. Lyell concludes, first, that a very high antiquity must be assigned to the successive eruptions of Etna, each phase of its volcanic energy, as well as the excavation of the Val del Bove, having occupied a lapse of ages compared to which the historical period is brief and insignificant; and secondly, that the growth of the whole mountain must nevertheless be referred, geologically, to the more modern part of the latest Tertiary epoch."

4. *Arctic Geology.*—We are indebted to Silliman's Journal for the following Summary of Prof. Haughton's classification of the geological formations of Arctic America as observed in McClintock's voyage.

"(1.) *Granitic or crystalline rocks:* over eastern North Devon, long. 80°—82½°, lat. 74½—75¾°; western North Somerset, near long. 95°; in scattered boulders over many other parts of the islands.

"(2.) *Upper Silurian and Devonian:* over the northern part of Cockburn Island, 73°—73¾° N., and 75°—90° W.; the larger part of North Somerset; Cornwallis Island; all but the eastern part of North Devon.

"(3.) *Carboniferous limestone:* over the islands or parts of islands lying *north* of lat. 76°, from Grinnell Land on the east (93° W.) to Prince Patrick Land on the west. This limestone is stated to *overlie* the coal-bearing standstones.

"(4.) The *Coal-bearing sandstones* (referred to Subcarboniferous): over the same islands as the limestone, but *south* of 76°: including Bathurst Land, 75°—76° N., 99½°—104° W.; Melville Island, from its southern shore to 75° 50′ N.; Byam Martin Island between Bathurst and Melville; part of Eglinton Id., west of Melville, south of 75° 50′; Baring (or Banks) Land, 72½°—74½° N., 115°—125° W.

"(5.) *Jurassic rocks:* over a small peninsula on the eastern side of Prince Patrick Land; also at islets Exmouth and Talbe, north of Grinnell Land; in long. 95° W., lat. 77° 10′ N.

"Viewing the range or direction of the whole, the line between the "*Carboniferous* limestone" and the "coal-bearing sandstones," according to the map, is nearly straight between E. 5° N. and W. 5° S. In the coal-bearing sandstone region, two parallel outcrops of coal are marked as existing on Bathurst Land and southeastern Melville Island, and on the intervening island of Byam Martin, the distance between the two lines eight or ten miles; also a third outcrop in Melville Island, and along the same line in Baring Land to the southwest. The strike is represented as uniform between E.N.E. and W.S.W., and is deduced from the observed occurrence of coal at Cape Hamilton on Baring Island, Cape Dundas on Melville Island, also Bridport Inlet and Skene Bay on Melville Island; on Byam Martin Id.; and at Schomberg Point and Graham Moore Bay on Bathurst Island."

In addition to this series there are interesting tertiary deposits containing lignite, described in the following extract from Dr. Armstrong's voyage of the Investigator. The wood is probably like that of the present arctic sea, drift trunks.

"On ascending one of these hills, about a quarter of a mile from the beach on its side, about 300 feet high from the sea-level, we discovered the wood of which we were in search. The ends of trunks and branches of trees were seen protruding through the rich loamy soil in which they were embedded. On excavating to some extent, we found the entire hill a ligneous formation, being composed of the trunks and branches of trees; some of them dark and softened, in a state of semi-carbonization. Others were quite fresh, the woody structure perfect, but hard and dense. In a few situations, the wood, from its flatness and the pressure to which it had for ages been exposed, presented a laminated structure, with traces of coal. The trunk of one tree, the end of which protruded, was 26 inches in diameter by 16 inches; that of another, a portion of which was brought on board, was 7 feet in length, and 3 feet in circumference: and dense in structure, although pronounced then to be pine.* Other pieces, although still preserving the woody struc-

* "A section of this piece of wood is to be seen in the Museum of the Royal Dublin Society, Dublin. To the obliging kindness of its able

ture, had a specific gravity exceeding that of water, in which they readily sunk, from their having undergone an incipient stage of impregnation with some of the earthy products of the soil. Numerous pine cones and a few acorns were also found in the same state of silicification. The trunks apparently extended a considerable distance into the interior of the hill, and were bituminous and friable. Many of those which were embedded crumbled away on being struck with a pickaxe, which readily found its way into any part of them, rendering their removal impossible; some of them were in such a state of carbonization as to approach lignite in character. The whole conveyed the idea of the hill being entirely composed of wood. As far as our excavations were carried, nothing else was met with, except the loamy soil in which they were embedded; but the decay of the wood in some places appeared to form its own soil. The petrifactions, with numerous pieces of wood, were found strewn everywhere over the surface of this and many of the contiguous hills. Many specimens of these were obtained, varying from one to fourteen inches in length, the longest not exceeding five or six in circumference; they consisted of portions of the branches of trees. Some of them were impregnated with iron (brown hæmatite), had a distinct metallic tinkle when struck, and were heavier than other pieces, without the metallic impregnation or sound; they were simply silicified, the sand entering into the composition of the soil being silicious or quartzose. Several smaller pieces of fresh wood were also found strewn about, which had not been, perhaps, subject to the petrifying influence of the water. The numerous small rills which issued from the interior, similar to those I had seen in the morning, flowed over the surface, and the constituents of the water, largely impregnated as it was with iron and sulphur, indicated from whence the metallic agency in the petrifaction was derived; this also possessed a dull yellowish-brown discoloration of the sulphur, (? oxide of iron,) and the stones everywhere over which the water flowed were coated with the same.

Director (Dr. Carte) I am indebted for a knowledge of this fact; who has also kindly informed me, that he submitted it to the examination of Drs. Steele and Joseph Hooker, both of whom pronounced it to be coniferous wood. The latter thought it of the white pine species; and one of the semifossilized cones has been pronounced by Dr. Harvey, Professor of Botany, Trinity College, Dublin, to be similar to the present Spruce of North America."

"On several of the neighbouring hills I observed distinct stratifications of wood running horizontally in a circular course, formed by the protrusion of the ends of the trunks of trees, to some of which the bark still adhered; and large pieces of this, cropping out and hanging loosely, frequently led in other situations to our detection of the wood to which the bark adhered in the soil. Any attempt to remove these with the hand or other slight means failed; and excavation ever established the fact that the hills were entirely composed of wood—the appearances met with being identical with those first mentioned. On subsequent occasions, when exploring the land several miles in the interior, observation led me to infer that a precisely similar state of things there existed. The situation in which our first excavation was made was in lat. 74° 27′ N., long. 122° 32′ 15″ W., and about a quarter of a mile from the beach. The distance, inland, whence similar appearances were observed, embraced a circuit from eight to ten miles in diameter."

5. *Age of remains found in Deltas.*—All geologists are aware how much uncertainty attends any reasoning as to the age of remains found in alluvial deposits, based on the depth at which they are imbedded; but very incautious inferences are sometimes drawn from such facts. The following from the *Athenæum* shows the extent of error possible in such reasoning.

"*Pottery in the Bowels of the Earth.*—In a late number of the *Athenæum* it was, I think, stated that a traveller in Egypt, having lately found a piece of pottery at some 30 feet below the present surface of the soil on the banks of the Nile, came to the conclusion that, because the annual deposit of earth by the stream would have required so many centuries to lay down so many feet of earth,—therefore, the bit of pottery found must have been manufactured some 13,000 years before the beginning of the Christian era. Does the following statement of facts bear at all on such a theory? Having lived for many years of my life on the banks of the river Ganges, I have seen the stream encroach on a village, undermining the bank where it stood, and deposit as a natural result bricks, pottery, &c. in the bottom of the stream. On one occasion, I am certain that the depth of the stream where the bank was breaking was above 40 feet; yet in three years the current of the river shifted so much that a fresh deposit of soil took place over the *débris* of the village, and the earth was raised to a level with the old bank. Now, had our traveller then obtained a bit of pottery from where it had lain for only three years, could he reasonably draw the inference that it had been made 13,000 years before?"

6. *New View of the Zoological relations of certain ancient corals by Prof. Agassiz.* The following appears in Silliman. If confirmed by farther investigation it will place nearly all our Silurian corals in a different class of the Radiata, from that to which they have hitherto been supposed to belong.

"I have seen in the Tortugas something very unexpected. Millepora is not an Actinoid polyp, but a genuine Hydroid, closely allied to Hydractinia. This seems to carry the whole group of Favositidæ over to the Acalephs, and displays a beautiful array of this class from the Silurian to this day."

"The drawings of Professor Agassiz which have been sent to us for examination, are so obviously Hydractiniæ in most of their characters that no one can question the relation. With regard to the reference of *all* the Favositidæ (a group including Favosites, Favistella, Pocillopora etc., as well as the minuter Mellepora, Chætetes, etc.) to the Acaleph class, direct evidence is not yet complete, as the animal of the Pocillopora has not been figured by any author on zoophytes.* On this point Professor Agassiz observes in a subsequent letter, after observing that the Sideroporæ obviously are polyps:

"There are two types of radiating lamellæ, which are not homologous. In true Polyps (excluding Favositidæ as Hydroids), the lamellæ extend from the outer body wall inward, along the whole height of that wall, and the transverse partitions reach only from one lamella to the other, so that there is no continuity between them, while the radiating lamellæ are continuous from top to bottom in each cell. In Milleporidæ the partitions are transverse and continuous across the cells and so are they in Pocillopora and in all Tabulata and Rugosa, while the radiating lamellæ, where they exist, as in Pocillopora and many other Favositidæ, rise from these horizontal floors and do not extend through.

"* From the specimens of the species of this genus which I procured in the Pacific I never obtained a clear view of the polyps, and hence made no figure. The brief description on page 523 of my Report, may be reasonably doubted until confirmed by new researches. The much larger size of the cells in Pocillopora, Favosites and Favistella than in Millepora, and the frequently distinct rays in these cells, are the characters I had mentioned to Prof. Agassiz as suggesting a doubt as to their being Acalephs, and to this what follows above relates.—J. D. D."

the transverse partitions; indeed they are limited within the spaces of two successive floors, or to the upper surface of the last. A careful comparison of the corallum of Millepora and Pollicopora with that of Hydractinia has satisfied me that these radiating partitions of the Favositidæ far from being productions of the body-wall are foot secretions, to be compared to the axis of the Gorgonia, Corallium, etc., and their seeming radiating lamellæ to the vertical grooves or keels upon the surface of the latter, which reduced to a horizontal projection, would also make impression of radiating lamellæ in the foot of the Polyp. If this be so, you see at once that the apparent radiating lamellæ of the Favositidæ do no longer indicate an affinity with the true Polyps, but simply a peculiar mode of growth of the corallum; and of these we have already several types, that of Actinoids, that of Halcyonoids, that of Bryozoa, that of Millepora and other Corallines, to which we now add that of the Hydroids. Considering the subject in this light, is there any further objection to uniting all the Favositidæ with the Hydroids,—Sideropora and Alveopora being of course removed from the Favositidæ. It is a point of great importance in a geological point of view, and for years I have been anticipating some such result, as you may see by comparing my remarks in the Amer. Journal, May, 1854, p. 315. If all the Tabulata and Rugosa, are Hydroids, as I believe them to be, the class of Acalephs is no longer an exception to the simultaneous appearance of all the types of Radiata in the lowest fossiliferous formations and the peculiar characters which these old Hydroid corals present appears in a new and very instructive aspect."

The Bowmanville Coal Case.—The newspapers inform us that this bubble has at last burst, and has proved to have been a gross and deliberate fraud. As we did not give credence to the pretended discovery, we do not need to join in the outcry which now pursues the authors of the imposture. Such men usually begin by being themselves misled by appearances which they do not understand, and having gone a certain length under this influence, and finding themselves elevated into popular lions and a ready belief given to their statements, they are easily induced by the desire to maintain their credit and by the prospect of profit to go any length in deception. We trust that this lesson will not soon be forgotten; and that those of our contemporaries who eulogised the self-taught practical man, ignorant of the "jargon" of geology, who made this great discovery, will confess themselves little less in fault than the poor sinner who, out of pocket and of work in a strange land, lends himself to deceive a too-credulous public and to afford scoffers at the hardly-earned results of scientific investigation a short-lived triumph.

SCIENTIFIC MEETING IN GERMANY.

Communicated by A. Gordon Esq.

The thirty-third annual meeting of German naturalists and physicists was held last September in Bonn; and having had an opportunity of witnessing a portion of the proceedings, it has occurred to me that a short account of what came under my notice may possess some interest for the readers of the Canadian Naturalist. Many of them are no doubt aware that it is to these meetings that the plan of the British Association owes its origin. The late Professor Oken is the man to whom the Germans are indebted for their first organization, and he himself received his idea from Switzerland. In noticing the proceedings of the Swiss naturalists in his Isis, Oken frequently took occasion to represent the advantages which Germany might derive from similar reunions, where the members, becoming personally acquainted, could interchange their opinions, communicate and endeavour to resolve each others' doubts, and afford each other mutual encouragement in the path of scientific inquiry. The first meeting took place at Leipzig in 1822, but it was several years before the number of participators rose so high as thirty. The stream, however, if not broad, was deep from the outset. Gradually it became wider. The recent meeting in Bonn though by no means so numerously attended as that held in 1856 at Vienna, mustered to the number of nine hundred and sixty, and included many of the most eminent names of Europe in the various departments of science. In the geological section, of which I formed an unworthy member, I observed Merian, Rose, Von Carnall, Blum, Noeggerath, Murchison, Elie de Beaumont.

The proceedings of the first general meeting were opened on 18th September by Professor Noeggerath, who greeted the assembly with genunine German *bonhommie*. His appearance reminded me of a weather-beaten column of basalt, which seemed to bid eternal defiance alike to time and to tempest. Dr. Kilian then read various letters of compliment or apology, the most interesting of which was a note from Alexander von Humboldt, who had been specially invited to assist at the proceedings, but excused himself on the ground of the necessity he felt himself to be under at his advanced period of life, to employ every available moment of his time in the completion of the works which he had now in progress. On Professor Noeggerath's motion, the whole assembly rose up, with acclamation, to testify their respect for the illustrious veteran; and a telegraphic message was despatched to him in the instant informing him of this grateful tribute of homage.

After the proceedings had been duly opened, Professor Schulzenstein delivered an address on the value of the natural sciences as a means of educating the human mind. Professor Mädler of Dorpat then read a contribution on the subject of the fixed stars. The motions, he said, of certain fixed stars were not compatible with the assumption of a central sun; nor did the assumption of partial systems appear admissible, inasmuch as, for the explanation of the size of the measured motions of individual fixed stars, the central masses—if such existed—must possess a mass incredibly great. The centre of gravity of the fixed siderial system, which may possibly lie in empty space, was to be regarded as the centre of motion. If the system possessed a globular form, with a nearly uniform distribution of the masses in the interior of the globe, the period of revolution of the various masses would be of nearly similar length, so that the whole viewed from one of the stars in conjunct motion, must appear nearly immoveable. A more definite decision was to be expected only from later centuries enriched with the spoils of long series of observations. The speaker considered it probable that the central point lay in the region of Taurus, perhaps in the group of the Pleiades, the apparent motions of which seemed best to harmonise with that assumption.

Dr. Hamel, of St. Petersburgh, then delivered a discourse, in which he endeavoured to trace the history of the invention of the Electric Telegraph. The first telegraphic apparatus worked by galvanism was that exhibited by Soemmering on the 29th August 1809, before the Academy of Sciences at Munich, in which the mode of signalling consisted in the development of gas bubbles from water placed in a series of glass tubes, each of which denoted a letter of the alphabet. Baron Schilling, attached to the Russian Embassy at Munich, was a particular friend of Soemmering's, and a frequent visitor at his laboratory in 1807 and 1808, when he was occupied with his galvanic telegraph. When Oersted in 1820 published his important discovery, it occurred to Schilling that the instant declination of the magnetic needle on the application of a stream of galvanism through a surrounding wire might be applied to telegraphic purposes; and although Ampére, no doubt, so early as the autumn of 1820, had announced an application of Oersted's discovery to telegraphy as something that was perhaps possible, Schilling was the first to realise the idea by *actually producing* an electro-magnetic telegraph, simpler in construction than that which Ampère had *imagined.* By degrees he succeeded in producing an apparatus with which, by means of a wire several (German) miles long, he was able successfully to transmit electro-magnetic signals, previously sounding an alarm when required. His journey to Mongolia (commenced in May 1830) interupted for a time his telegraphic labours, but he speedily resumed them upon his return home in 1832. The services of Professor Weber of Göttingen in the same cause in 1833 Dr. Hamel passed over as already known to his auditory. In May 1835 Baron Schilling left St. Petersburgh on a tour through Germany, France, and Holland, and he attended the meeting of German naturalists which took place that year in Bonn. At the sitting of the Physical Section on the 23d September, of which the President for the day was Professor Muncke of Heidelberg, Schilling exhibited and explained his telegraphic apparatus, with which Muncke was greatly taken. He frequently spoke of it after his return to Heidelberg, and on the 6th March following (1836) he explained the whole thing to William Fothergill Cooke, who was then occupied at the Anatomical Museum with Professor Tiedemann's sanction, in the preparation of wax models for his father, then recently appointed Professor of Anatomy in the University of Durham. Cooke, although he had never previously studied physics or electricity, was so struck with what Muncke told him, that he instantly resolved on abandoning the work he was engaged on, and on endeavouring to introduce electro-magnetic telegraphs upon the English railways. With this object in view he reached London on the 22d April. On the 27th of February 1837, he became acquainted with Professor Wheatstone of King's College; and early in May the two gentlemen resolved to labour in common for the introduction of the Telegraph into

England—an object which they successfully accomplished. On the 12th of June they obtained their patent, and on the 25th July the first trial was made at the London terminus of the North-Western Railway with a wire a mile and a quarter long. About a fortnight previously, Steinheil of Munich had placed the buildings of the Academy of Sciences in electric communication with the Observatory at Bogenhausen; and his discovery, the following year, of the possibility of bringing the galvanic current in telegraphing through the earth, back to the battery, deserves greater recognition than it has yet received.

Schilling, on his return to St. Petersburgh, had renewed his efforts to turn his telegraph to useful account with more energy than ever. After a series of experiments, he believed he had succeeded in effecting a sufficient isolation of the conducting wire to admit of the transmission of signals through water, and he proposed to unite Cronstadt with St. Petersburgh by means of a submarine cable. He had got a rope prepared with several copper wires isolated agreeably to his instructions, when death put a stop to his labours on the 7th August 1837.

In the course of the summer of that year intelligence reached America of what had been done in Germany and England in the way of electric telegraphy. This news stimulated Samuel F. B. Morse to construct, with the assistance of Dr. Gale, Professor of Chemistry, an apparatus with which he hoped to be able to telegraph. The subject was not at that time quite new to Morse. He had been twice over in Europe to improve himself in his profession as a painter, and in the course of his second homeward voyage in 1832, he had had his attention awakened to the possibility of electro-magnetic telegraphy by Dr. Jackson, his fellow-passenger on board the Sully. On the 4th September—a month after Schilling's death—he made what he termed a "successful attempt." The speaker was in possession of a sketch prepared by Morse himself of the apparatus with which this successful attempt was effected. By means of a set of flat-toothed types there was impressed upon a sheet of paper moved horizontally over a cylinder a set of zigzag marks like the teeth of a saw, which were meant to denote figures. In this manner a set of numbers, was presented to the eye, each denoting a certain word or number for the ascertainment of which the receiver of the despatch required to consult a voluminous dictionary. The strip of paper operated upon on the 4th September 1837, represented, in teeth shaped somewhat like the letter V, the following numbers, viz.:—215, 36, 258, 112, 04, 01837, which, according to the dictionary, denoted "Successful experiment with telegraph September 4, 1837." This cumbrous process, of course, never came into actual use; but notwithstanding this, Morse boldly terms himself the inventor of electric telegraphy, and dates his invention from the year 1832. Nay more, the Supreme Court of the United States pronounced a judgment in 1854, finding that in this respect he had the priority of all Europe. It may possibly be worth while to observe that Morse is not, as seems to be commonly supposed, a Professor of Physics. In 1835 he was appointed "Professor of the Literature of the Arts of Design" in the educational institution termed the University of New York; but he never delivered a single lecture. The instrument now known by the name of Morse's Telegraph was brought to perfection by degrees, long subsequently to 1837, and after Morse had made two more voyages to Europe.

In November 1839, Cooke and Wheatstone executed in London a contract of copartnery, and on the 12th December they gave in their specification. Their process was founded essentially on the same principle as Schilling's, only giving the needle a vertical instead of a horizontal position. In August 1839 there were completed thirteen miles—namely, from Paddington to Drayton—of a telegraphic line along the Great Western Railway, then in progress. Other extensions followed, and in 1845 Cooke suddenly received commissions for a number of lines in various directions throughout the country. The telegraph had received a sudden accession of popularity from the aid it had afforded in the discovery and apprehension of John Tawell the murderer. In 1846 Cooke succeeded in forming the Electric Telegraph Company, which afterwards amalgamated with the International. Their head station is at Lothbury, and down to the present day most of the apparatus employed by them are constructed on the principle originally applied by Schilling, though now greatly improved by Wheatstone. From these apparatus proceed 150 different wires at the least, which run below the pavement to various localities.

Thus it was Baron Schilling of Cannstadt who was the first man by whom electro-magnetic telegraphy was really applied; and it was the telegraphic seed from St. Petersburgh which, after finding its way *viâ* Bonn and Heidelberg to England, struck its roots in London—roots from which a tree has sprung up whose gigantic branches, laden with golden fruit, now stretch and ramify over land and sea.

After the delivery of Dr. Hamel's address, and a few words upon the subject of it from Colonel von Siebold and Dr. Drescher, the meeting separated into the various sections, where the only business performed was the election of their respective presidents. The afternoon was pleasantly and profitably consumed in eating and drinking.

On Saturday (September the 19th), the proceedings of the Geological Section commenced with some observations by Dr. Jäger of Stuttgart, on the origin of regular forms in rocks, which he referred to processes of crystallisation in the sedimentary masses. Dr. Otto Volger, of Frankfort exhibited a series of specimens with the view of demonstrating the results of his inquiries (some of which had been already published) on the history of the development of mineral bodies, and the mode in which the various rocks originate.

Dr. Volger maintained that these specimens afforded direct and irrefragable proof that Feldspath and Quartz were formed in nature under circumstances which utterly excluded the notion of a high temperature having been one of the concurrent causes of their formation. The specimens had been taken from the crystalline rocks of the Alps formerly regarded as "primitive rocks" (Urgebirge) but afterwards claimed partly as plutonic lava rocks, partly as masses belonging to the first period of refrigeration of the globe from its original state of igneous fusion. According to the speaker's investigations, these were nothing else than metamorphic rocks that had arisen from the regular development depending upon chemical processes, of various mineral bodies particularly Feldspath and Quartz, which had come in the place of limestone masses contemporary with the jurassic formation. The speaker, in reference to this and to another more general and important result of his inquiries, namely, that the *silicates* so far from being primary formations, or even in the general case possessing a high degree of antiquity, as Geology had hitherto supposed, were always *younger than the carbonates*, and that the history of the development of the former constantly pre-supposed the earlier existence of the latter; he shewed by means of the specimens in question, on the largest and on the smallest scale, that Feldspath and Quartz had grown upon and between Carbonates of lime (Kalkspathen), which last were still to be found in a portion of specimens, well preserved, and without exhibiting the slightest trace of the operation of heat, partly surrounded by Feldspath and

Quartz crystals, and partly, where effaced through subsequent dissolution and lixiviation, leaving their impression on these crystals in the distinctest manner possible.

Dr. Pichler, of Innsbruck, exhibited a geognostic map of the northern limestone Alps of the Tyrol, from the borders of the Voralberg to the borders of Saltzburg, and spoke at some length upon the different formations. Dr. Von Dechen gave information with respect to the geognostical map of Rhenish Westphalia, of which eleven sections had already appeared and nine others were in course of preparation. Professor Plieninger spoke upon the difference in the formation of the teeth between the *microlestes antiquus*, from the upper breccia (betwixt the keuper and the lias) of Wurtemberg, and the *Plagiaulax* of the Purbeck oolite. Herr Von dem Borne discoursed on the geology of Pomerania, referring to the alluvium, the diluvium, the tertiary strata, and the Jura formations. The alluvium is found chiefly on the sandy coasts, greatly changed by currents. It is washed away from the Pomeranian and deposited on the Prussian coast. In the diluvium he distinguished a disturbed recent formation and a regularly deposited older one.

On Monday 21st September, Professor Gustav Rose made some observations on the gneiss which forms the north-western limit of the granitite of the Riesengebirge, and of the granite which occurs in it; he also spoke of the relation of granite to gneiss in general. The boundaries betwixt the two could, he said, be very distinctly drawn in the Riesengebirge. In 1856 at Vienna the learned Professor gave an account of some recent investigations which he had made in the Riesengebirge and Isergebirge, with a a view to determine the exact limits betwixt granitite and granite, and assigned the reasons which had induced him to regard the former as a separate species of rock from the latter. These reasons were—first, the distinct mineral composition—the white mica of the granite being entirely wanting; secondly, the accurate limits which can be drawn betwixt it and the granite of the Isergebirge: and, thirdly, the circumstance that mixtures of a similar composition to the granite of the Riesengebirge and Isergebirge occurred in the most diverse localities. From the relations of the granitite to the granite the Professor considered that the former must have penetrated to the surface more recently than the latter. [See also a contribution by Rose "Ueber die zur Granitgruppe gehörigen Gebirgsarten" in the first volume of the "Zeitschrift der deutsch-geologischen Gesellschaft."]

Sir Roderick Murchison laid before the meeting the most recent publications of the Geological Survey, consisting of maps, sections, &c., as illustrative of the Silurian or older palæozoic rocks, the coal measures, and the secondary and tertiary deposits; and he also referred to the records of the School of Mines and the Decades of Organic Remains, which exhibited the labours of various distinguished English geologists. M. E. de Verneuil observed that, whilst Sir R. Murchison had borne such willing testimony to the distinguished merits of his colleagues, he had entirely overlooked his own services; and pointed out that, in regard especially to the School of Mines, Sir Roderick had had the greatest share in its extension and results, both through the great works which he had himself accomplished, and through what others had accomplished under his guidance and superintendence.

Herr Von Carnall exhibited a copy of the new edition of his geognostical map of Upper Silesia, and explained in what respects it differed from the first edition. He took occasion to remark that of the ironstone rocks of Upper Silesia it was only a portion that could be regarded as middle-Jurassic; the portions of this formatian lying to the north and west of Oppel, and the great Rybnik and Rattibor portions, must be regarded as tertiary-miocene. Under these strata lay the Upper Silesian gypsum and marl rocks (tegel) with traces of salt, which are now in the course of being investigated.

Professor Von Zepharovich of Cracow, spoke of the progress that had recently been made in the knowledge of Austrian minerals, and pointed out the necessity of collecting and arranging the results of inquiries made during long periods of time in order to obtain a synoptical view of what had really been accomplished. He next exhibited a few printed sheets of a large work of this description applicable to the Austrian empire, and mentioned that the work itself would probably be published in the course of next year. He then handed the President a piece of fossil iron from Chotzen in Bohemia. Thereupon Dr. O. Volger, with reference to the aqueous origin of iron, mentioned the fact that Herr Von Baer had found in a fossil tree imbedded in the turf of a floating island on the coast of Sweden, which only occasionally emerged from the water, that the mass by which the cells had been replaced consisted of native iron.

The proceedings of the day were concluded by a few short but exceedingly interesting remarks from Professor Blum (Heidelberg), on the causes of the formation of different combinations of crystals in the same species of mineral. On this subject, he observed, our knowledge was exceedingly scanty. We had scarcely a single observation or inquiry to which we were able to refer. Experiment alone presented us with facts by the aid of which we might possibly make some progress. It was a familar fact that when an easily soluble salt (alum) crystallised from a pure solution, the forms exhibited differed from those which were obtained from impure solutions. This fact was sufficient of itself to show beyond a doubt that *the medium* in which substances crystallise exerts an influence upon the form of the crystal. Taking this for our principle, and applying it to nature, we find it to be a fact that certain minerals, when they occur in certain rocks, appear under one and the same form of crystal—when magnetic iron ore, for example, occurred in chlorite-schist, it was found in the general case to occur in the form of an octohedron. The subject was worthy of careful investigation, and might turn out to be of very great importance in a geognostic point of view.

At the sitting of Tuesday (September the 22nd), Professor Daubrée, of Strasburg, spoke on the formation of sulphuret of copper and apophyllite from the thermal springs of Plombières. In the course of certain excavations, undertaken with the purpose of fencing in these springs, the speaker had found two recent substances, which were of geological interest from the resemblance they bore to certain minerals. On a bronze cock, of Roman workmanship, which had been lying amidst the rubbish of ancient buildings for more than fifteen centuries, sulphuret of copper had been formed in the shape of beautiful crystals. They belonged to the hexagonal system, and could not be distinguished from natural crystals. From a similar composition, artificial crystals belonging to the regular system had already been obtained. The circumstances under which they had been formed seemed to differ from those under which the formation of similar crystals occurred in veins. The ancient mortar into which the warm water percolates includes in its cavities colourless crystals identical in form and composition with apophyllite. They owe their formation to the operation of the silicate of potash from the hot springs on the lime of the mortar. The formation both of the apophyllite and of the hexagonal sulphuret of copper had here taken place in water of which the temperature did not exceed 70 deg. C.

Dr. Volger gave an account of the result of his observations on the phenomena of earthquakes in Switzerland, and especially the earthquake of 25th July 1855 in the Visp-Thal, Canton of Valais. An investigation of the manner in which this earthquake operated showed the opinion which refers these phenomena to the development of subterranean gases, or to fluctuations of the earth's (hypothetical) fiery-fluid interior, to be mechanically inadmissible. On the other hand, there existed, in the structure of the Valais mountains, conditions which necessarily led to the movement of portions of the mountain masses. These were strata of gypsum underlying slate and jurassic masses of immense thickness, and thermal springs containing large quantities of this gypsum in solution. This was withdrawn from the earth; the underlying stratum was eroded; and the sinking of the overlying strata became inevitable.

Of the twenty springs of Leuk, a single one conveyed away from the soil of Valais no less than 60,000 cubic feet of gypsum annually. With the efforts of the subsidence of an undermined mass, and of the propagation in the strata of the earth of the impetus thereby conveyed to the solid substratum, the phenomena exhibited in the Valais earthquake entirely corresponded. The results of the speaker's inquiries were given in detail in a work of which two volumes had already appeared, and the third was now in the press.

The map belonging to this third volume, exhibiting the diffusion, intensity, and directions of movement of the Valais earthquake, together with the tables belonging to the two first volumes, with graphic representations of the relative frequency of earthquakes in different years and at different periods of the year in the various districts of Switzerland, were laid before the meeting.

Dr. Abich spoke on the subject of mud volcanoes, and their importance for geology. He founded this importance on an analysis of the history of the development of these formations as they occur in the environs of the Caucasus, particularly in the two Caucasian peninsulas Taman and Apsoheron and endeavoured to establish the following propositions:—1. The stratographic facts of the before named localities afford a proof that the structure of these formations, notwithstanding the Neptunian origin of the masses of which they are composed, is determined by precisely the same laws which regulate the various forms of mountains composed of strictly Vulcanic masses that have arisen in the mode of igneous fluidity. 2. The distribution of those small independent systems of mountains is most distinctly subordinate to the grand lines which determine the direction of mountain ranges, and therewith the fundamental features of our continents. 3. The linear grouping and serial arrangement of these mountains in accordance with these lines of elevation, was regulated by the same laws which regulated the foundation and successive completion of the mountain systems and ranges of every portion of the earth's surface. In conformity with these principles, Dr. Abich maintained that every view was to be rejected which might incline to refer the eruptive phenomena which still retain their permanent seat in the bosom of these formations to so-called secondary causes, that is, in the present case, to any other causes than such as depend upon Vulcanism.

Herr Ignatius Beissel spoke on the marl of Aix-la-Chapelle, and laid before the section a geological collection from the Friedrichsberg and the Willkommsberg, in the neighbourhood of that city. The distinction hitherto assumed between the Aix and Bohemian chalk on the one hand, and the Westphalian on the other, grounded on the occurrence of polythalami and cirrhipoda in the former, must now be done away with. Ehrenberg's discovery that marl consists of organic bodies is confirmed. The green sand has arisen from a marly rock by the loss of its carbonate of lime. Down to the present time the marl is passing into sandbeds under the influence of fresh water. The proofs which he adduced were:—1. Those fossils which characterise the green sand are found in banks of sandstone which have lost every particle of lime, in banks of sandstone containing lime, in the banks of Dumont's psammite glauconifère. 2. The speaker had himself found the characteristic fossils of the upper beds of the Aachen chalk in dry deposits of green sand. 3. The glauconite granule is in most cases the result of the formation of a stone nucleus in the shells of polythalamiæ. 4. On dissolving the marl in muriatic acid we obtain a residuum of green sand. That the lower portions of the chalk are precisely those which have lost their lime is explained by the circumstance that, being the last to be elevated above the sea, they were the longest exposed to the influence of the sea-water; moreover the meteoric waters flow over the clay strata of the Aachen sand, and thus fill the lower division while they merely filter through the upper. The speaker then discussed the residuum of the marl and green sand:—1. The double refracting siliceous splinter; 2. The single-refracting spongiolites. The siliceous splinters originate:—1. From spongiolites which become crystalline on the change of the amorphous silica; 2. From the disintegration of the white stone granules of polythalamiæ; 3. From glauconite granules which have burst and lost their colouring matter, and of which the amorphous silica had been changed into crystalline. The speaker's collections, and especially his microscopic preparations of the finest organisms, excited in the section the utmost admiration.

At the sitting of Wednesday (September 23) General von Panhuys explained a small geological map of the southern portion of the Duchy of Limburg, which he had prepared in 1850, by instructions of the Dutch War Office. The object had been to ascertain whether the coal measures extended to the Dutch territory. The speaker endeavoured to show that the Bardenberg district, north of Aix-la-Chapelle, is connected with the Liege coal trough, and forms a portion of it. Were this the case—a fact that can be perfectly ascertained only by borings—Limburg would be in possession of two square miles of coal measures, of which one-half is covered merely by green sand and the other half by green sand and by chalk.

Herr von der Marck spoke on the subject of some petrifactions of the Westphalian chalk, and exhibited a number of well-preserved fossils—amongst others, the remains of huge Saurians from the Schöppinger Berg, near Münster.

Herr Heymann spoke of the changes of certain constituents that had occurred in trachytic and basaltic rocks in the Siebengebirge. He exhibited specimens of oligoklas transmuted into kaolin and red Ehrenbergit; of hornblende transmuted into steatite; of transmuted augite and olivine in the basalt of the Menzenberg, near Honnef; radiated mesotype from the basalt of the Minderberg was also partly changed into a steatitic mass.

Professor Noeggerath denied that the black mica in the trachytes was altered hornblende.

Herr Max Braun observed that the occurrence of blende at the Wetternsee in Sweden, was something very different from what it is in our known veins and beds in the district of the Rhine. In Sweden the blende formed beds which were imbedded in the gneiss, following the gneiss strata, with similar strike and dip, for a considerable extent, and with a thickness of 15 to 20 feet or more. The blende is for most part finely granular, and always intimately mixed with more or less feldspath. In these beds of blende are found concretions of green feldspath and of quartz, including crystalline particles of blend. The gneiss in immediate contact with the blende contains a bed of granular lime, containing garnet and pistazite and thin layers of Wollastonite. Parallel to the blende strata is a bed of brown garnet, containing mica and dichroite, and in like manner subordinate to the gneiss. There were similar layers of white cobalt and copper pyrites imbedded in quartzose mica-slate. This occurrence of zinc blende is peculiar, and does not seem to harmonise well with our common views regarding mineral veins.

Sir Roderick Murchison exhibited the plates of a new edition of his Siluria, and explained the most important additions that had been made to our knowledge of the Silurian rocks during the last three years. He maintained that it was now proved, both by physical and zoological facts, that the Bala beds of Wales were identical with the Caradoc beds, resting similarly upon the Llandeilo formation, in the lower division of which a number of new fossil species had been discovered. He then referred to the group of the Llandovery rocks in South Wales (containing the *Pentamerns Oblongus*) lying between the lower and upper Silurian, and closely connected with each. Finally, he exhibited figures of gigantic crustaceans (pterygotus) found in the upper Silurian beds, which had been published by Mr. Salter in the Decades of the Geological Survey.

M. Ch. St. Claire Deville exhibited his topographical map of the island of Guadaloupe. In the centre rises the cone of the Sonfriere, surrounded by a crater of elevation. The latter consists of dolerite; the central one of a trachyte, the feldspath of which approaches in chemical composition to Labrador. The Sonfriere is an extinct volcano. At the request of Sir Roderick Murchison and Mr. Merian, the speaker then communicated his views with regard to the volcanoes of Italy and their mode of action. He held Von Buch's theory of elevation, but laid considerable stress upon *étoilement.* Vesuvius and Etna, as central volcanoes, he regarded as the points of intersection of radiating fissures, in which volcanic action burst forth. The Phlegrean fields, the Rocca Monfina, the Lago d'Amsanto, Ischia, and other points he considered as lying upon these fissures.

Herr von Carnall exhibited maps of the coal formation in Russian Poland on a scale of 1-20,000, and of Lower Silesia, at which Beyrich, Rose, and Roth had been working for years, on a scale of 1-100,000.

Director Nauck, with reference to the question agitated on Monday by Professor Blum, reported the result of a series of experiments undertaken with a view to the arbitrary production of secondary surfaces on artificial crystals. He described the method employed by him, by means of which he found that the number of surfaces became greater in proportion to the slowness with which crystallisation proceeded, a fact of which he cited several examples. He stated, in conclusion, that his experiments should be continued.

Professor Römer communicated the result of a survey of the Jurassic Wesergebirge between Hameln and Osnabrück. He referred especially to the striking alterations which the members of the Jura formation composing the range undergo in the course of their extent. In consequence of such a change, for example, the Oxford appears in the western spurs of the chain as compact quartz, whilst in a section of the Porta Guestphalica it is developed in layers of loose sandy marl schist, which crumbles to pieces in the atmosphere. As something altogether peculiar to the Wesergebirge, and differing from anything to be found either in other parts of North Germany or in any other district, he denoted the occurrence of thick beds of brown sandstone in the uppermost member of the series, which is distinguished chiefly by *exogyra virgula*, the member which in North Germany has hitherto been denoted as Portland, but would more properly be termed Kimmeridge. Such sandstone strata may be observed in the neighbourhood of Lübbecke and of Preussisch Oldendorff.

At the last sectional meeting (24th September), Berghauptman von Dechen gave an account of the progress that had been made in preparing the geognostical map of Germany, and received the thanks of the meeting for his own trouble in that work. In Dr. Ewich's absence, he also made some observations regarding the mineral spring in the Brohlthal and its future importance. He concluded with a short report on the thermal springs of Neuenahr near Beuel in the Ahrthal, recently discovered by Professor Bischof.

Dr. Volger pointed out the error that was committed when recent geological tendencies were characterised as "a revival of Neptunism." The new tendency had nothing in common with Neptunism except this, that it was the opposite of Plutonism. In a positive sense it partook no more of Neptunism than Plutonism had retained of the Neptunistic doctrine; nay, in essential points it deviated from these still more widely than Plutonism itself did. Neptunism assumed the crystalline rocks,—the Basalts, the Gneisses, the Granites—to be immediate sedimentary deposits in water, just as it assumed that mode of deposit for sandstone, clay, and limestone. The new geology entertained no doubts regarding the affinity of basalts with the lavas of active volcanoes; but it supposed these basalts, after their eruption in the form of lava, to have undergone chemical alterations in their masses, by virtue of which they now appear as basalts and not as lavas. The new geology, whilst, no doubt, absolutely denying the Vulcanic, or, if the term be more agreeable, the "Plutonic" origin of Gneiss, Granite and other crystalline rocks, was yet very far from regarding these as being therefore immediate sediments. On the contrary, it supposed these rocks to have proceeded, by means of complete chemical changes, from sediments which were originally of a totally different constitution;—to have proceeded, e. g. from limestone strata by processes capable of exact demonstration by means of the pseudomorphoses, the relative antiquity of the various minerals composing the rocks, and other aids to investigation. Again, no Plutonist had ever called in question that sandstone, clay, and stratified limestone were immediate deposits from water, just as their formation was conceived in Werner's Neptunism. The new Geology was not so neptunistic, but here too pointed out a number of chemical processes caused by the sediments partly in the act of their deposit and partly immediately afterwards. Whilst Plutonism, e. g. had never scrupled to assume that limestone strata had been formed and were still in process of formation, partly from the evaporation of water holding lime in solution, partly from the liberation of the carbonic acid by means of which the water held the lime in solution, the new Geology showed that this process so little occurs in nature that by no possibility could sedimentary limestone ever have arisen in such a manner. Sea water contained so much free carbonic acid that it could dissolve ten times the quantity of lime that it contains; and, far from being able to deposit lime for want of carbonic acid, it must operate as a solvent upon all masses of lime with which it comes in immediate contact. According to the results attained by the new geology, the mode in which sedimentary lime was formed was as follows: Its materials were furnished not only by the (Carbonate of) lime contained in the water, but also by the gypsum (sulphate of lime) which is such a singularly universal constituent of all the waters of the Earth and in sea-water especially is contained in great abundance. The business of separating the lime from the water was performed partly by plants, partly by animals. The former secreted the (carbonate of) lime by absorbing the carbonic acid by means of which it was held in solution in the water, and decomposing it in their change of matter, whilst by their organic materials themselves they protected the secreted lime from immediate contact with the water and thereby from being re-dissolved. The latter took up the gypsum, employed its sulphuric acid in the formation of such of their organic materials as require sulphur (flesh, blood, &c:) and combined the calcareous earth thus robbed of its acid with the carbonic acid constantly produced in their bodies by respiration. The carbonate of lime thus formed they deposited in their organs, especially in their skin, in the form of shell. It was of accumulations of these shells (interpenetrated with organic tissues and materials) and of the masses of lime secreted by plants, that all limestone strata originally consisted. The lowest classes of plants and animals, especially the microscopic (the one-celled Algæ—Diatomace or Bacillariæ—and the Foramenifera), are in this respect of by far the greatest importance in nature. Hence, in the apparently compact limestone masses, their origin from the incrustations of plants and the shells of animals generally escaped the naked eye and required the aid of the microscope for its demonstration. After the deposition of these calcareous sediments they were continually undergoing transpositions in consequence of the decomposition of organic materials which was going on within them. In this manner the traces of their origin became more and more obliterated; but even in limestones of the oldest formations, we could occasionally observe those traces to such an extent that it was impossible to mistake them. The speaker elucidated his observations by laying before the meeting a series of specimens from the miocene formation of the basin of Mainz taken from the locality of Frankfort.

The agreeable, though for me somewhat presumptuous, task which I undertook I have now performed to the best of my ability. I do not profess to have furnished anything like a complete outline of the proceedings; but I trust that I may have been the humble means of conveying to such readers of the *Naturalist* as take an interest in the proceedings of foreign geologists a slight idea of the contents of some of the more important communications, which will be found reported *in extenso* when the transactions of the meeting shall have been published.

ART. XXV.—*Geological Survey in Great Britain and her Dependencies.*

Extracted from the *Saturday Review* of 3rd July.

In 1769 there was born to a yeoman of Oxfordshire, named John Smith, a son, who in due course was christened William. William Smith, as he grew into boy's estate, delighted to wander in the fields collecting "poundstones (*Echintes*,) "pundibs" (*Terebratulæ*), and other stoney curiosities; and, receiving little education beyond what he taught himself, he learned nothing of classics but the name. Grown to be a man, he became a land surveyor and civil engineer, and by-and-by in the western parts of England was much engaged in constructing canals. While thus occupied, he observed that all the rocky masses forming the substrata of the country were gently inclined to the east and south-east—that the red sandstones and marls above the *coal-measures* passed below the beds provincially termed lias clay, and limestone—that these again passed underneath the sands, yellow limestones, and clays that form the table land of the Cotteswold-Hills—while they in turn plunged beneath the great escarpment of chalk that runs from the coast of Dorsetshire northward to the Yorkshire shores of the German Ocean. Gifted with remarkable powers of observation, he further observed that each formation of clay, sand, or limestone held to a very great extent its own peculiar suite of fossils. The "snakestones" (*Ammonites*) of the lias were different in form and ornament from those of the inferior oolite; and the shells of the latter, again, differed from those of the Oxford clay, cornbrash, and Kimmeridge clay. Pondering much on these things, he came to the then unheard-of conclusion that each formation had been in its turn a sea-bottom, in the sediments of which lived and died marine animals now extinct, many of them specially distinctive of their own epochs in time.

Here indeed was a discovery—made, too, by a man utterly unknown to the scientific world, and having no pretension to scientific lore. He spoke of it constantly to his friends, and at breakfast used to illustrate the subject with layers of bread and-butter, placed with out-cropping edges to represent the escarpments that mark the superposition of the strata. He talked of it wherever he went—at canal boards, county meetings, agricultural associations, and Woburn sheep-shearings—and once much astonished a scientific friend and clergyman of Bath by deranging the zoological classification of his cabinet of fossils, and rapidly re-arranging them all in stratigraphical order:—"These came from the blue lias, these from the overlying sand and freestone, these from the fuller's earth, and these from the Bath building-stones." A new and unexpected light was thrown upon the whole subject, and thenceforth the Rev. Samuel Richardson became his disciple and warmest advocate. But "Strata Smith" was too obscure and unscientific to be at once received as an apostle by the more distinguished geologists of the day. Could a country land surveyor pretend to teach them something more than was known to Werner and Hutton? He might preach about strata and their fossils through the length and breadth of England, but the structure of the Earth was not to be unravelled in this unlearned manner. Established geologists therefore pooh-poohed him, and it took many a long year before his principles, working their way, took effect on the geological mind. This long-delayed result was chiefly due to the discrimination of the now venerable Doctor Fitton; and the first geologists of the day learned from a busy land surveyor that superposition of strata is inseparably connected with the succession of life in time. The grand vision indulged in by the old physicist Hook was at length realized, and it was indeed possible to "build up a terrestrial chronology from rotten shells" embedded in the rocks. Now there could be no mistake that the time had arrived to do him honour, and through Sedgwick, the President of the Geological Society, William Smith was presented with the Wollaston medal, and hailed as "the Father of English Geology;" and his reputation still further ripening, he was ultimately created LL.D. by the University of Oxford.

But during all this time he did not confine himself to the promulgation of his doctrines by words alone. By incessent journeys to and fro, on foot and on horseback, in gigs, chaises, and on the tops of stage coaches, he traversed the length and breadth of the land, and, maturing his knowledge of its rocks, constructed the first geological map of England. It was a work so masterly in conception, and so correct in general outline, that in principal it served as a basis not only for the production of later maps of the British Islands, but for geological maps of all other parts of the world, wherever they have been undertaken; and thus the faintly expressed hope of Lister (1683) was accomplished, that if such and such soils and the underlying rocks were mapped, "something more might be comprehended from the whole, and from every part, than I can possibly foresee." In the apartments of the Geological Society Smith's map may yet be seen—a great historical document, old and worn, calling for renewal of its faded tints. Let any one conversant with the subject compare it with later works on a similar scale, and he will find that in all essential features it will not suffer by the comparison—the intricate anatomy of the Silurian rocks of Wales and the north of England by Murchison and Sedgwick being the chief additions made to his great generalizations. In 1840 he died, having, in his simple earnest way, gained for himself a name as lasting as the science he loved so well. Till the manner as well as the fact of the first appearance of successive forms of life shall be solved, it is not easy to surmise how any discovery can be made in geology equal in value to that which we owe to the genius of William Smith.

Since the publication of Smith's map, many others have appeared—the noble compilation for England by Greenough, the great original map of Scotland by Macculloch, and the yet finer map of Ireland by Sir Richard Griffith. The last is a work only less remarkable than Smith's in this—that, when commenced, the principles of geology were established, and he followed instead of leading the way. To these, of various dates, may be added the maps by Professor Phillips, Sir Roderick Murchison, and Knipe, and many others of districts in detail—an example first set by Smith in his geological maps of counties. But the most remarkable result of this appreciation of the growing value of the subject was the establishment of the Government Geological Survey of Great Britain, under the late Sir Henry De la Beche, to whom the whole honour is due of having commenced, and for many years successfully carried on, this great undertaking. From small beginnings in Cornwall he gradually extended his operations, and, aided by Government, he gradually trained or selected a corps of skilled geologists, who, ere his death in 1855, had already mapped and published nearly a half of England and Wales and part of the South of Ireland. The maps employed in this survey are the one-inch Ordnance sheets for the southern half of England, and the six-inch maps for Ireland, the north of England and Scotland. Each fault, each crop of coal, and every geological boundary is traced so minutely, that on some of the roughest and loftiest hills in Wales, twenty geological lines may be counted in the space of an inch, corresponding to one mile of horizontal measurement; and all the country is traversed by numerous measured sections on which the structure and disposition of the rocky masses is laid down in still more precise detail. On the death of Sir Henry De la Beche the office of Director General was conferred on Sir Roderick Murchison, himself a geological workman whose field of operations has extended from the Atlantic to the Caspian Sea.

The Government School of Mines and Geological Museum in Jermyn-street is an offshoot of the Survey. There, in addition to the published maps, other substantial proofs of the progress of the Survey are preserved and exhibited. Ores, metals, rocks, and whole suites of fossils are stratigraphically arranged in such a manner, that, with an observant eye for form, all may easily understand the more obvious scientific meanings of the succession of life in time and its bearing on geological economics. It is perhaps scarcely an exaggeration to say that the greater number of so-called educated persons are still ignorant of the meaning of this great doctrine. They would be ashamed not to know that there are many suns and material worlds besides our own; but the science, equally grand and comprehensible, that aims at the discovery of the laws that regulated the creation, extension, decadence, and utter extinction of many successive species of genera and whole orders of life is ignored, or if intruded on the attention, is looked on as an uncertain and dangerous dream—and this in a country which was almost the nursery of geology, and which, for fifty-one years, has boasted the first Geological Society in the world. Several other governments have followed the example of that of Great Britain. Similar Surveys have long been established in France, Belgium, Austria, and the United States; and others will certainly be founded as knowledge progresses, and as those branches of material prosperity advance on which the subject immediately bears. A direct result, perhaps not at first foreseen by the founder of the British Survey, was the establishment of kindred undertakings in our possessions abroad. In 1843, a systematic geological survey was commenced in Canada, in 1846 in India, and at later dates in Australia, the Cape of Good Hope, and Trinidad; and all of these sprang from the parent institution in which the chief Colonial geologists were trained in the field, while both the Survey and the School of Mines supplied many of the younger officers. We have before us a pile of Blue-books, Reports, and a large Atlas of the Geological Survey of Canada, published by order of the Legislative Assembly, and probably almost unknown in England except to a few scientific geologists. From them it appears that Sir William Logan, the Director of the Survey, and his assistants, have traversed and examined for 1500 miles, every part of Canada, from Gaspé to the head of Lake Superior, following the Lakes and the great and small rivers, and penetrating the forest-clad interior, often in districts utterly unvisited by settlers. The result is, that all the great geological features of Canada are laid down on the map, and in many districts, the most interesting new topographical and geological details have been inserted with unrivalled skill.

But those who merely look at the result have little idea of the difficulties that attend such an undertaking in a country the greater part of which is yet unreclaimed. From the want of accurate maps to serve as a foundation for geological work, Sir William and his assistants have actually been obliged in almost all cases to construct topographical plans—truly very different operations from those of an Ordnance Survey in fertile England, where houses and steeples, hill-tops and beacons, afford innumerable points for accurate triangulation, while all the minor field operations are carried on almost mechanically by well-trained Sappers and Miners. Though like in result also, their labour is yet very different in kind from English field-work in geology, where the explorer has road sections and railway cuttings, open rivers, quarries and coal-pits, all waiting to afford him data. If the lowlands of England were partly, and the highlands of Scotland and Wales entirely, covered with lofty and almost impenetrable forests, and if the most experienced English geologists were turned loose upon these countries, and required to unravel all the intricacies of their stratifications, they would have some idea of a kind of geological labour not to be met with in any part of Europe out of Russia. On a gigantic scale, the great Laurentine chain, extending from Labrador to Lake Superior, might represent the highlands of Scotland—Gaspé the mountains of Wales—and the flat Silurian strata bordering the St. Lawrence, the Ottawa, and Lakes Ontario, Erie, and Huron, might be compared, in their broad terraced arrangement, to the escarpments of the oolitic rocks and chalk in the centre of England. Geology is a delightful science, but it may be questioned if gentleman who live at home at ease would in all cases be enthusiastic enough to devote themselves to it were they obliged, for half of every year, for half a lifetime, to rough it in dreary pine forests—to navigate newly-discovered rivers in birch-bark canoes made by Indian assistants on the spot—to sleep in birch-bark tents with their feet to nightly fires at the entrance—to be thankful when they fell in with a few wild onions to flavour their daily salt pork—to have their paths disputed by occasional bears in quarries, on the river banks, or the shores of the desolate Anticosti—and, worst of all, to have but little of that direct sympathy and clear appreciation of the scientific value of their labours of which men of science who work amid their peers daily experience the value. The Government of Canada may well be proud of Sir William Logan and his well-selected staff, and the mother country has equal cause of gratulation that the great Imperial colony has emulated her example in founding, on a scale so large and efficient, a national work which no civilized country should be without.

ART. XXVI.—*Figures and Descriptions of Canadian Organic Remains.* Decade III. 8vo. Pp. 102, with 12 plates, price $1. Montreal: B. Dawson & Son.

In a scientific point of view, this is the first instalment of work of the Canadian Survey. The reasons for the early appearance, of this the third part, and other matters connected with it, are thus explained by Sir W. E. Logan in the preface:—

"One of the subjects comprehended in the recommendation of the Select Committee appointed by the House of Assembly, on the Geological Survey, in 1854, was the publication of figures and descriptions illustrative of such new organic forms as might be obtained in the progress of the investigation. In compliance with this recommendation, it was determined that the publication should be made in parts or decades, after the mode adopted by the Geological Survey of the United Kingdom, each part to consist of about ten plates, with appropriate descriptive text, and to comprehend one or more genera or groups of allied fossils, or the description of several species, for the illustration of some special point in geology.

"The first part or decade was confided for description, in 1855, to Mr. J. W. Salter, one of the Palæontologists of the Geological Survey of the United Kingdom. This comprehends different genera and species from one locality. Of these several are new, while others are more perfect forms of species already partially described; and the general object is to exhibit a commingling of forms heretofore supposed to belong to distinct epochs. The plates of this decade are the work of Mr. W. Sowerby, from drawings by Mr. R. C. Bone. The engravings are on steel; nine of the plates are finished, and it is expected the tenth will be completed in a short time.

"The second decade was undertaken also in 1855, by Mr. Jas. Hall of Albany, so justly celebrated for his works on the Palæontology of New York. It will comprehend the description of a large number of remarkable new forms of *Graptolithus* and allied genera from the Hudson River group. The drawings are by Mr. F. B. Meek. Six plates have been engraved on steel by Mr. J. E. Gavit, and ten more plates are in the engraver's hands. The number of species will probably be twenty-four, of which Mr. Hall has already given a description in the Report of Progress for the year 1857.

"On the appointment of Mr. E. Billings as Palæontologist of the Survey, in 1856, his first duty was to effect an arrangement of the Museum. This being accomplished, he devoted his attention to a third decade. This comprehends all the Cystideæ and Star-fishes, as well as all the Entomostraca, of the collection. With the view of obtaining the plates necessary for the illustration of these, Mr. Billings in the month of February last, carried his fossils to London. Finding that considerable delay was likely to attend the publication of the decade should he illustrate it by engravings on steel, he determined to have recourse to lithography. Although minute detail cannot be so finely given by this mode, nor so large an edition be obtained, it is yet perfectly suitable for all practical purposes. It is occasionally used for the fossils of the British Survey, and very generally for the illustration of the best palæontological works on the continent of Europe. The twelve plates which illustrate the third decade are the work of several well-known artists, who have all their respective merits. One of the plates is by Mr. R. C. Bone, two of them by Mr. J. Dinkle, four by Mr. Tuffen West, three by Mr. H. S. Smith, one by Mr. W. Sowerby, and one by Mr. G. West. Of the descriptive part, the Cystideæ and Star-fishes are by Mr. E. Billings; the genus Cyclocystoides by Mr. Salter and Mr. Billings; and the Entomostraca by Mr. T. R. Jones, assistant-secretary of the Geological Society of London, who is considered the best authority on this particular family of animals, and had previously described a large number of the Canadian species.

"While Mr. Billings was attending to the progress of his decade in London, it appeared doubtful which of the three that were in hand would be first ready for publication. He, in consequence, caused to be registered on the plates, as the number of the decade, the figure which indicates the order in which it was commenced. It therefore appears as the third decade, but being the first ready, and the subject quite distinct from those of the other two, no hesitation is experienced in placing it first before the public.

"Mr. H. S. Smith, who, as already stated, supplied three of the plates, has been induced to come out to Canada with the design of devoting his attention to the representation of the fossils of the Provincial collection; and it will therefore in future be unnecessary to go out of the country for the illustration of them, unless it be to procure the aid of the best authority on some special subject.

"Of the third decade an edition of 2000 copies is issued. Of these 500 copies are reserved for the members of the Legislature; and it is intended to fix upon the remainder a moderate price, and dispose of them to the public through some respectable bookseller. By this means it is hoped that they will fall into the hands of those who will really appreciate them. The same course will be pursued in respect to the first and second decades, when they are ready.

"A fourth decade is now in hand which will illustrate the Crinoids of the collection."

The first and most important paper in the work is that by Mr. Billings on the Cystideæ; an able essay in which Mr. Billings is emphatically on his own ground, and gives an earnest of much good work in Canadian Palæontology. We cannot do better than allow Mr. Billings to explain the nature of these curious denizens of the ancient seas, only remarking that to introduce them in a popular style, is in the best possible taste. In a national work published at the public expense, it is more than pedantry to refrain from such popular explanations as may enable the non-scientific reader to understand at least the nature of the subject. Yet this has too often been done, much to the detriment as we believe of science, and we are glad that a better example is here set.

"As several elaborate and beautifully illustrated memoirs upon the structure and affinities of the Cystideæ have appeared during the last few years, it would be superfluous, on the present occasion, to enter upon a re-examination of the subject, were this decade designed to circulate only among scientific men, for whom it would be sufficient to give nothing more than the most concise technical descriptions of the species. But being intended also for the use of the students of Canadian geology—whose number is rapidly increasing throughout the Province—it appears necessary to commence with a general summary of what has been ascertained up to the present time concerning the zoological characters and distribution in time and space of this somewhat extraordinary group of extinct organisms. By this course it is hoped that, while the foreign geologists will receive all the intimation he desires of what we are doing, the growth of science in our own country will also be promoted.

"The Cystideæ were a race of small marine animals, which flourished vigorously during the Silurian period, but totally disappeared before the commencement of the Carboniferous era. They were closely allied to that interesting family, the lily encrinites, or Crenoids, and, like them, entirely covered, as with a coat of mail, by a dermal or external skeleton of thin calcareous plates, which were sometimes richly ornamented with radiating ridges or striæ. Attached to the lower extremity of the body was a short flexible stalk, usually called the column, that served to anchor the animal securely to one spot on the bottom of the ocean throughout life; and at the opposite, or upper end, a set of arms, which, in addition to their other functions, may have assisted in the collection of food by exciting currents of water towards the mouth. This latter organ was a circular or oval aperture, situated in the side, below or near the summit, and in some species must have been also the passage through which such matter as could not be digested was thrown out. The young were developed from eggs, which were, there is good reason to believe, generated in the grooves of the arms, or pinnulæ, where, as has been ascertained by actual observation, the organs of reproduction are situated in the Crinoids that exist in some of the seas of the present time.

"Concerning the food, habits, or other particulars of the natural history of the Cystideæ, we can never hope to acquire any great amount of information, as the race wholly perished many ages ago, and the only evidences we have of its existence are, with few exceptions, very imperfect skeletons, which exhibit nothing except the structure of the external hard parts. It is only probable that their nourishment was derived from minute particles of animal or vegetable matter diffused through the waters in which they lived. The structure and position of the mouth are such, that they could not have been highly carnivorous, while their nearly sedentary condition would altogether preclude the capture of any prey except such as might float by chance within their reach. Animals rooted to the ground like a plant would fare ill were they organized to support life by the predacious mode only.

"The fossil remains of the Cystideæ consist for the greater part of mere fragments of the plates and columns; but these, in certain localities, occur in such prodigious abundance, that they constitute the principal portion of strata of rock several feet in thickness. Of many of the species specimens of the bodies are exceedingly rare, and when these are discovered they are usually more or less crushed and distorted. While the fossil Corals, Brachiopods and Gasteropods may be collected in hundreds, few cabinets can boast of half-a-dozen good Cystideans, even in those countries where whole formations of rock are composed of the exuviæ of the race.

"With respect to their distribution in time, they have been discovered in Bohemia, by M. Barrande, in beds which lie in the very bottom of the oldest rocks containing traces of animal life; and therefore, according to the present state of our knowledge of the primeval fauna, they were among the first living things that made their appearance upon the surface of this planet. The Lower Silurian formation, in the several countries where it has been most studied, has at its base a great thickness of stratified rocks which are altogether without fossils—at least none have been discovered in them up to the present time. Then follows in conformable succession a series in which organic remains do occur, but not in any great abundance. This is the lower half of the fossiliferous portion of the Lower Silurian. In Great Britain these strata are the Lingula Flags of Sir Roderick Murchison; in Bohemia the Primordial Zone of Barrande; and in Norway and Sweeden the Alum Slates, or Regions A and B, of M. Angelin, the leading palæontologist of that country. In America they have not been distinctly recognized, although it is doubtfully anticipated that the Potsdam sandstone and the lowest sandstones of the western states may be of the same age. It is more probable that some of the ancient schists in the eastern states, where a large trilobite of the genus *Paradoxides* has been found, are of the age of this "primordial zone of life." In whatever way this point may be decided hereafter, it is only in Bohemia that Cystideæ have been found so low down in the geological series. Four species have there been discovered, together with twenty-seven species of Trilobites, one

Brachiopod (*Orthis Romingeri*, Barrande,) and one Pteropod (*Pugiunculus primus*, Barrande,) but no Crinoids.

"In Scandinavia the Primordial Zone has not yet yielded traces of either Crinoids or Cystideæ, but seventy-one species of trilobites, and eight Brachiopods of the genera *Lingula*, *Orbicula*, *Orthis* and *Atrypa*, have been discovered, with one or two graptolites and a small orthoceratite, near the top.

"In England the Lingula Flaga, which are regarded as the equivalents of the Bohemian and Scandinavian deposits, have furnished a very similar fauna of trilobites and rare mollusca, with one or two graptolites; but up to this date only a fragment of a crinoidal column and no Cystideans. It is also to be observed, that in none of these countries have any corals been detected in these lowest fossiliferous strata.

"In the upper half of the Lower Silurian, organic remains become exceedingly abundant, and it is in this part of the geological series that the Cystideæ attain their greatest development, both in the numbers of the species and of the individuals. This deposit is represented in England by the Llandeilo and Bala or Caradoc groups of Murchison; in Bohemia by the stage D. containing the "second fauna" of Barrande; in Scandinivia and Russia by the Regions BC, C and D of Angelin, and the "Pleta" or Orthoceratite limestone; and in Canada by all the groups from the base of the Calciferous Sandrock up to the top of the Hudson River group.

"While these rocks were slowly being deposited, the Cystideæ literally covered the bottom of the ocean in dense swarms in certain localities which were favorable to their existence, one generation growing upon the remains of another, until thick beds were formed In Russia, Norway and Sweden, Sir Roderick Murchison discovered them in the Pleta limestone, which appears to be of the age of the Chazy, Bridseye, Black River and Trenton limestones, packed together like "bunches of enormous grapes;" and in Bohemia M. Barrande has found them equally abundant. He says that the Crinoids and Star-fishes have left only insignificant traces, but the Cystideæ form entire beds of from one to two yards in thickness.

"In Canada they make their appearance rarely in the Calciferous Sandrock, but in the Chazy and Trenton their remains are more common, consisting however mostly of the detatched plates packed together in thick strata. They are not very generally distributed, but confined to certain localites. Throughout extensive regions occupied by these formations scarcely a vestige of a Cystidean is to be found; but in other places, such as the neighbourhoods of the cities of Montreal and Ottawa, they are exceedingly plentiful. Everywhere however good specimens are rare.

"M. Barrande, in comparing the European rocks of this age, observes that in Bohemia the Cystidean zone occurs about the centre of his stage of Quartzites D, which would be also the equivalent of Angelin's group C. In England the corresponding level would be about the Bala limestone, where the principal masses of Cystideæ are found. The abundance of their remains in the Chazy and Trenton of Canada confirms the views of M. Barrande, and at the same time tends to shew that these two American formations should be paralleled with the Bala rather than with the Llandeilo. This question however cannot be decided without more perfect lists of fossils than can be at present procured.

"The number of species of Cystideæ that occur in this zone are as follows, so far as I can ascertain, in these countries respectively:

Scandinavia and Russia........................	20
Great Britain	13
Bohemia, about..................................	8
Canada..	21
New York..	1
	63

"In consequence of the imperfection of the specimens and some confusion in the descriptions of different authors, the above numbers may not be exactly correct; but from what I have seen it appears to me that there are more than sixty species, described and underscribed, belonging to this period.

"In the Upper Silurian there are in Great Britain nine species, and in Canada and New York about the same number, but none in either Bohemia or Scandinavia have yet been made public.

"According to the present state of our knowledge, then, in the lower half of the Lower Silurian there are four species, in the upper half sixty-three, and in the Upper Silurian eighteen.

"Very little dependence however can be placed upon numerical comparisons, such as the above, in dealing with questions relating to the Cystideæ or Crinoideæ, for the reason that new discoveries are every year being made which very materially change the aspect of these computations. For instance, six years ago only eleven Crinoids, one Cystidean, and one Star-fish, were known in the Lower Silurian of New York and Canada, but in the collection of

Montreal Natural History Society in account current with James Ferrier, Jr., Acting Treasurer.

Dr.

1858.	RECAPITULATION.	£	s.	d.
May 1.	—To Cash for Salaries,	107	0	0
	Commissions,	7	14	3
	Repairs,	43	5	0
	Fuel,	41	19	0
	Gas,	9	6	6
	Water,	3	0	0
	Furniture,	5	13	5
	Birds, per Mrs. Broome and Hunter,	9	6	3
	Postages, &c., per Dr. Hingston's act.,	4	3	9
	Express Charges,	1	4	5
	Advertising and Printing,	77	10	2
	Insurance,	12	10	0
	Interest,	36	6	3
	Incidentals,	13	12	1
	H. H. Whitney, Treas. Amer. Assoc'n,	150	0	0
	A. N. Rennie, account of Services,	25	0	0
	C. Alexander, Refreshment account,	82	19	5
	Mr. Sprake, Band Services,	10	0	0
	J. C. Spence, Decorating Hall,	7	10	0
	Sundry persons, service at Soiree,	5	2	6
	" Balance to New Account,	43	4	4
		£696	7	4

Cr.

1857.	RECAPITULATION.	£	s.	d.
May 1.	—By Balance in Treasurer's hands,	10	0	5
1858.				
May 1.	—By Cash from Subscriptions and Diplomas,	128	5	0
	By " " Government Annual Grant,	50	0	0
	By " " " Special "	500	0	0
	By " " J. Hearle, 2 mos. rent of Lecture Room,	5	0	0
	By Interest from Montreal Savings Bank,	3	1	11
		£696	7	4

E. & O. E.

JAMES FERRIER, Jr., *Treasurer.*

Montreal, 1st May, 1858.

MONTHLY METEOROLOGICAL REGISTER, SAINT MARTIN'S, ISLE JESUS, CANADA EAST, (NINE MILES WEST OF MONTREAL,) FOR THE MONTH OF APRIL, 1858.

Latitude, 45 degrees 32 minutes North. Longitude, 73 degrees 36 minutes West. Height above the level of the Sea, 118 feet.

BY CHARLES SMALLWOOD, M.D., LL.D.

Day of Month.	Barometer corrected and reduced to 32° F. (English inches.)			Temperature of the Air. F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.		
	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.
1	30·060	29·950	29·961	28·4	51·9	40·0	·117	·302	·188	·76	·82	·77
2	29·916	811	761	37·0	60·2	46·2	199	283	·238	·90	·54	·77
3	770	771	724	41·6	60·1	37·0	·212	·310	·178	·82	·60	·81
4	828	718	651	32·0	48·9	46·7	143	242	262	79	74	84
5	714	657	579	43·6	55·5	46·7	231	315	286	83	71	92
6	710	726	932	33·4	42·6	25·5	175	134	100	94	50	74
7	30·073	929	30·061	16·0	34·8	30·2	059	138	150	65	71	78
8	120	30·155	29·925	21·1	48·0	34·0	080	236	162	71	70	83
9	29·659	29·549	510	28·4	31·5	30·6	117	168	161	76	95	95
10	674	868	950	28·4	37·9	34·3	135	171	155	88	76	79
11	29·997	961	970	24·4	42·3	35·0	083	177	162	66	66	80
12	874	850	729	29·6	47·9	39·0	105	212	188	66	62	77
13	598	464	467	37·2	43·0	40·3	178	261	241	81	96	98
14	332	256	360	38·1	43·5	41·5	229	271	251	99	96	96
15	327	378	476	36·9	47·0	44·3	207	249	282	98	77	97
16	370	614	635	38·1	56·1	37·0	208	308	184	92	69	85
17	720	714	830	33·4	42·2	33·0	162	134	150	84	50	80
18	900	929	070	29·0	48·7	37·0	093	120	116	59	36	53
19	203	175	164	29·5	53·0	37·7	129	136	171	80	35	76
20	045	793	655	33·5	50·6	36·2	175	186	170	94	51	80
21	29·283	423	615	33·5	42·6	36·1	162	177	170	84	66	80
22	730	686	548	34·0	51·5	45·0	182	289	251	95	76	84
23	591	498	581	45·0	59·6	44·1	182	258	218	61	71	76
24	603	592	760	34·5	35·5	32·0	155	177	088	79	85	49
25	875	900	30·000	30·0	36·1	31·0	154	149	112	94	71	84
26	006	29·934	30·031	29·6	41·9	35·3	105	169	177	66	65	85
27	29·912	847	862	30·0	55·0	39·1	130	157	131	78	38	55
28	624	510	648	34·5	49·0	34·5	138	086	142	71	24	70
29	690	562	541	36·0	57·3	47·5	170	112	249	80	30	77
30	329	286	556	39·9	43·5	43·8	188	271	269	77	96	90

Day of Month.	Direction of Wind.			Mean Velocity in Miles per hour.			Amo'nt of Rain in inches.	Amo'nt of Snow in inches.
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.		
1	E. N. E.	N. E. by E.	E. N. E.	1·75	0·57	2·65	....	....
2	S. E.	S. W.	S. S. W.	0·00	0·00	0·00	....	....
3	S. W. by S.	E. by N.	E. by N.	0·00	0·00	0·00	....	....
4	N. E. by E.	S. E. by E.	S. E.	0·00	0·00	0·00	....	....
5	S. S. E.	S. E.	S. by E.	0·00	0·00	0·00	Inapp.	....
6	W. S. W.	W. by N.	W. N. W.	0·00	0·00	0·00	....	....
7	W. N. W.	W. S. W.	W. N. W.	0·00	20·10	21·50	....	....
8	N. E.	S. E.	N. E. by E.	21·30	14·90	16·25	....	....
9	N. E. by E.	N. E. by E.	N. by E.	1·47	0·85	0·45	0·573	....
10	N. E. by E.	N. W.	N. W.	8·82	15·21	9·62	Inapp.	....
11	N. by W.	N. N. W.	N. N. E.	0·86	2·73	0·32	....	....
12	N. E.	E. S. E.	N. E. by E.	8·77	8·23	6·27	....	....
13	N. E. by E.	N. E. by E.	N. E. by E.	4·00	3·31	2·14	0·600	....
14	N. E. by E.	N.	W. by N.	10·37	6·85	6·52	Inapp.	....
15	S. S. E.	W. S. W.	S. W. by S.	2·90	5·52	0·09	....	....
16	S. W.	S. S. W.	W. S. W.	0·20	10·41	5·61	0·040	....
17	W. S. W.	W.	W. by N.	4·86	11·22	7·42	....	....
18	W. N. W.	N. W.	W. N. W.	7·80	15·90	8·97	....	....
19	N. N. E.	N. by E.	S. by E.	0·02	7·02	9·43	....	....
20	E.	S. E. by E.	S. E.	0·88	1·01	1·33	0·253	....
21	E. by S.	E. by N.	S. W. by S.	0·48	7·97	7·52	0·310	2·80
22	S. E. by S.	S. E. by S.	S. by W.	6·45	0·80	0·02	....	....
23	S. W.	W.	W. N. W.	6·02	1·98	3·27	0·263	....
24	W.	S. W.	S. W. by W.	10·96	18·13	8·93	....	....
25	N. N. W.	W.	S. by W.	3·20	8·63	19·36	....	....
26	N. E. by E.	S. W.	S. S. W.	3·62	4·00	3·75	....	....
27	W.	S. E. by S.	N. by E.	0·51	1·92	0·32	....	....
28	N. W.	W. N. W.	W.	0·31	0·42	0·57	....	....
29	W.	W. by N.	S. by W.	10·82	8·10	16·23	....	....
30	N. E. by E.	N. by E.	S. S. E.	9·48	32·02	6·16	....	....
				7·08	8·05	1·90	0·803	....

Weather, Clouds, Remarks, &c., &c. [A cloudy sky is represented by 10, a cloudless one by 0.]

Day of Month.	6 a. m.	2 p. m.	10 p. m.
1	Clear.	Clear.	Clear.
2	C. Str. 10.	"	"
3	" 10.	"	Clear. Aurora Borealis.
4	Clear.	C. C. Str. 10.	Str. 4.
5	Ni. 10.	" 6.	C. Str. 10.
6	Clear.	C. Str. 4.	Clear.
7	"	Clear.	
8	"	Str. 4.	C. Str. 9. Aurora Borealis.
9	Ni. 10.	Ni. 10.	C. Str. 10.
10	C. Str. 10.	C. Str. 4.	Clear. Aurora Borealis.
11	Clear.	Clear.	" Aurora Borealis.
12	"	C. C. Str. 6.	C. Str. 9. " "
13	C. Str. 10.	Ni. 10.	Ni. 10.
14	" 10.	C. Str. 10.	C. Str. 10.
15	" 10.	C. C. Str. 6.	Ni. 10.
16	Str. 2.	C. Str. 4.	Clear. Aurora Borealis.
17	Clear.	" 8.	Clear.
18	"	Clear.	"
19	"	"	Light Cirri. Lunar Halo.
20	C. Str. 8.	C. Str. 10.	Rain.
21	Snow.	" 10.	C. Str. 10.
22	C. Str. 2.	" 10.	Clear.
23	C. C. Str. 8.	Ni. 10.	C. Str. 10.
24	C. Str. 6.	C. C. Str. 6.	Clear.
25	" 10.	C. Str. 6.	"
26	Clear.	" 10.	C. Str. 8.
27	"	C. C. Str. 8.	Cirr. Cum. 6.
28	C. Str. 10.	C. Str. 10.	Clear.
29	Clear.	Clear.	C. Str. 6.
30	C. Str. 10.	Ni. 10.	" 10.

REPORT FOR THE MONTH OF MAY, 1858.

Day	Barometer 6 a. m.	2 p. m.	10 p. m.	Temperature 6 a. m.	2 p. m.	10 p. m.	Tension 6 a. m.	2 p. m.	10 p. m.	Humidity 6 a. m.	2 p. m.	10 p. m.
1	29·762	29·877	30·065	41·0	54·2	41·1	·190	·206	·169	·74	·69	·65
2	30·316	30·265	306	34·1	49·6	59·0	·162	·175	·131	·80	·50	·55
3	494	212	194	29·0	57·3	42·5	136	242	215	83	52	79
4	150	29·985	29·980	36·5	71·6	50·6	191	572	300	90	76	85
5	29·831	718	647	46·0	68·1	53·6	262	380	375	83	56	93
6	597	617	699	54·1	56·5	50·0	396	449	309	90	99	85
7	759	748	782	43·1	69·6	53·6	254	690	375	92	68	93
8	895	662	684	42·3	78·2	58·1	222	550	337	83	58	70
9	625	583	537	58·5	72·9	67·2	476	559	626	97	72	95
10	737	739	866	41·0	54·5	45·2	190	231	218	74	55	76
11	914	814	701	36·2	50·1	46·8	170	283	305	80	78	99
12	395	411	505	45·4	55·0	44·7	293	382	241	93	96	84
13	616	812	30·020	43·3	52·0	42·2	222	232	177	83	60	61
14	990	911	29·818	40·1	58·4	47·0	182	282	273	73	58	85
15	677	588	641	44·5	65·2	47·4	251	490	292	84	81	92
16	860	873	971	39·0	49·7	42·1	158	182	149	68	53	53
17	894	816	798	46·0	58·1	45·0	269	282	251	88	58	84
18	762	723	856	43·5	47·5	48·0	254	320	282	92	96	96
19	855	797	850	44·1	67·2	53·0	265	487	328	92	69	83
20	655	600	643	49·1	52·4	47·2	345	334	320	99	86	98
21	593	708	751	45·3	50·0	46·0	275	315	298	92	89	96
22	884	909	30·003	44·0	60·4	48·0	279	330	219	99	76	89
23	959	792	29·569	47·2	67·6	52·5	256	407	361	81	63	93
24	365	410	590	52·4	61·6	55·7	361	338	515	94	65	77
25	724	819	824	47·4	61·1	50·5	276	310	309	86	60	85
26	823	825	892	51·7	73·0	56·3	296	416	336	79	52	75
27	819	845	947	54·6	75·1	57·8	308	409	268	74	50	56
28	30·060	995	946	51·9	74·2	60·1	221	487	462	59	53	90
29	017	907	811	52·1	77·6	59·0	282	475	358	73	49	73
30	29·918	805	876	58·1	76·3	61·0	323	343	456	74	39	88
31	910	675	608	50·0	79·9	70·1	283	772	436	78	78	57

Day	Wind 6 a. m.	2 p. m.	10 p. m.	Velocity 6 a. m.	2 p. m.	10 p. m.	Rain	Snow
1	N. W. by N.	W. by N.	N. W. by W.	5·37	4·22	6·70	....	....
2	N. W. by N.	N. W.	N. by W.	5·20	0·51	1·47	....	....
3	W. by N.	S.	S. by E.	0·64	0·70	1·15	....	....
4	E.	S. E. by E.	E. S. E.	0·00	0·20	0·00	....	....
5	E. by N.	S. E. by E.	S. by E.	0·00	1·38	0·21	Inapp.	....
6	S. E. by S.	N. E. by N.	N. E. by N.	0·25	5·80	9·81	0·300	....
7	N. E. by N.	E. by S.	S. E. by S.	4·90	1·80	0·15	....	....
8	E.	S. E. by S.	S. E. by S.	0·20	0·00	0·01	....	....
9	S. E. by S.	S. S. E.	S.	1·43	3·60	6·60	0·253	....
10	W. by N.	W.	E. N. E.	16·06	10·40	2·70	....	....
11	N. E.	N. E. by E.	N. E. by E.	0·20	0·93	11·86	0·100	....
12	N. E. by E.	N. E. by E.	S. W. by W.	5·25	6·19	3·58	1·266	....
13	W. N. W.	W.	N. W.	17·40	14·17	8·00	....	....
14	N. E. by E.	S. S. E.	S. E.	1·46	0·66	1·60	....	....
15	E. N. E.	E.	N. W.	3·56	2·31	8·08	Inapp.	....
16	N. by W.	S. E. by E.	E.	9·60	13·77	15·07	....	....
17	W.	W.	S. by W.	1·20	1·48	4·70	....	....
18	S. E.	S. by W.	W. S. W.	11·99	0·00	0·71	0·486	....
19	W.	S. by W.	S.	1·71	1·11	1·19	0·646	....
20	S.	W. S. W.	N. by W.	4·31	6·81	4·20	0·112	....
21	N. E.	S. W. by W.	N. E.	5·51	6·46	0·20	0·203	....
22	E. N. E.	W. N. W.	W. N. W.	7·15	1·22	4·05	0·103	....
23	W. N. W.	W. by S.	S. S. W.	3·00	3·72	9·45	0·203	....
24	N. E. by E.	S. S. W.	N. E. by E.	7·40	12·17	3·62	1·606	....
25	N. E. by E.	N. E.	E. S. E.	1·46	8·11	3·51	....	....
26	N. E. by E.	S. E. by S.	S. E. by S.	2·05	6·65	1·90	....	....
27	E. by N.	N. E. by E.	N. E. by E.	0·20	1·43	1·41	....	....
28	W. N. W.	E. by N.	S. E.	5·13	0·42	0·16	....	....
29	E.	S. E.	S. E. by S.	0·12	0·92	2·15	....	....
30	S. E.	S. E.	S. E.	0·62	3·90	1·42	....	....
31	S. E.	S. S. E.	S. S. E.	0·12	8·90	10·42	Inapp.	....

Day	6 a. m.	2 p. m.	10 p. m.
1	Clear.	Cirri. 2.	Str. 2.
2	"	" 1.	Clear.
3	"	Clear.	"
4	"	"	"
5	C. Str. 10.	Rain.	C. Str. 10.
6	" 10.	C. Str. 10.	Clear.
7	Clear.	Clear.	Cirr. Str. 4. Aurora Bor's.
8	"	Cir. Str. 4.	C. Str. 10.
9	C. C. Str. 10.	C. Str. 6.	Cirr. Str. 2. Aur. Borealis.
10	C. Str. 6.	" 4.	C. Str. 6.
11	Cirr. 4.	" 8.	Rain.
12	Rain.	Rain.	C. Str. 10.
13	C. Str. 4.	C. Str. 2.	Clear.
14	Clear.	Clear.	"
15	C. Str. 10.	C. Str. 10.	C. Str. 6.
16	" 10.	Cirr. 2.	Clear. Aurora Borealis.
17	Str. 4.	C. C. Str. 6.	C. Str. 6.
18	Ni. 10.	Rain.	Rain.
19	C. Str. 8.	C. Cuml. 4.	Cirr. Cum. 6. Lunar Halo.
20	Rain.	C. Str. 10.	C. Str. 10.
21	C. Str. 8.	Rain.	" 9.
22	" 8.	C. Str. 4.	C. C. Str. 7. Lunar Halo.
23	Cumulus. 4.	C. C. Str. 10.	Rain.
24	Rain.	C. Str. 8.	C. Str. 10.
25	C. C. Str. 6.	Cir. Cum. 4.	C. C. Str. 6.
26	" 6.	" 4.	Str. 10.
27	Str. 4.	C. Str. 6.	Clear.
28	Clear.	Clear.	"
29	Cirri. 2.	"	"
30	Clear.	"	"
31	Cirri. 4.	C. Str. 6.	C. Str. 6.

REMARKS FOR APRIL, 1858.

Barometer. ...... Highest, the 19th day, 30·203 inches. Lowest, the 14th day, 29·256 " Monthly Mean, 29·757 inches. Monthly Range, 0·947 "

Thermometer. Highest, the 2nd day, 61°1. Lowest, the 7th day, 16°0. Monthly Mean, 39°06. Monthly Range, 45°1.

Mean of humidity, ·717.
Greatest intensity of the Sun's rays, 94°1.
Lowest point of terrestrial radiation, —14°7.
Amount of Evaporation in inches, 2·310.
Rain fell on 11 days, amounting to 2·832 inches; it was raining 7 hours, and accompanied by thunder on 1 day.

Snow fell on 1 day, amounting to 2·80 inches; it was snowing 5 hours and 40 minutes.
Most prevalent wind, W. N. W. Least prevalent wind, N.
Most windy day, the 7th day; mean miles per hour, 17·45.
Least windy day, the 2nd day; mean miles per hour, 0·00.
Aurora Borealis visible on 6 nights. Lunar Halo visible 1 night.
The Electrical state of the atmosphere has indicated high tension.
Ozone was in rather large quantity.
Frogs first heard on the 15th day.
Swallows first seen on the 15th day.
Errata.—In Reports for February and March, 1858, instead of "Amount of *Snow* in Inches," read Amount of *Rain* in Inches; and instead of "Amount of *Rain*," read Amount of *Snow*.

REMARKS FOR MAY, 1858.

Barometer ...... Highest, the 3rd day, 30·104 inches. Lowest, the 24th day, 29·365 " Monthly Mean, 29·751 inches. Monthly Range, 1·039 "

Thermometer ... Highest, the 31st day, 80°5. Lowest, the 14th day, 30°6. Monthly Mean, 53°02. Monthly Range, 49°9.

Greatest intensity of the Sun's rays, 99°9.
Lowest point of terrestrial radiation, 30°1.
Mean of humidity, ·764.
Amount of Evaporation in inches, 2·89.

Rain fell on 14 days, amounting to 5·387 inches; it was raining 97 hours 25 minutes, and was accompanied by thunder on 1 day.
Most prevalent wind, N. E. by E. Least prevalent wind, W.
Most windy day, the 13th day; mean miles per hour, 13·19.
Least windy day, the 4th day; mean miles per hour, 0·06.
Aurora Borealis visible on 3 nights.
Lunar Haloes visible on 2 nights.
Ozone was present in large quantity.
The Electrical state of the atmosphere has indicated high tension.
Shad first caught on the 29th day.
Frost occurred on the morning of the 14th day.

MONTHLY METEOROLOGICAL REGISTER, AT MONTREAL, (LATITUDE 45° 30′ N., LONGITUDE 73° 36′ W.,) FOR THE MONTH OF FEBRUARY, 1858.

HEIGHT ABOVE THE LEVEL OF THE SEA, 57·07 FEET.

BY A. HALL, M. D.

Day of Month.	Barometer, Corrected and reduced to Fah., 32°.			Temperature of the Air.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction and Force of the Wind, from 0, Calm, to 10, Violent Hurricane.			Amo'nt of Snow in Inches.	Amo'nt of Rain in Inches.	Clouds and their Proportion, in Numbers, from 0, Cloudless, to 10, perfectly Overcast.			OBSERVATIONS.
	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.			7 a. m.	2 p. m.	9 p. m.	
1	30 299	30·272	30 159	-1·0	+10 0	+6 0	·028	·039	·028	·68	·57	·51	W 1	N 1	N 4	....	....	Cu. St. 10	Cu. St. 1	Cu. St.	Slight Fog early A. M. Snow during the night.
2	29·754	29·421	29·540	+13·5	22·0	20·0	·057	·112	·091	·72	·93	·85	N N E 1	N 2	N 2	....	11·5	Nim. 10	Nim. 10	Nim.	Snow.
3	654	764	909	25·0	27·0	28·0	·117	·111	·417	87	75	76	W 3	W S W 2	W S W 2	....	5·0	Nim. 10	Cu. St. 4	Cu. St.	
4	30·005	961	30·002	18·0	23·0	19·8	·082	·073	·081	84	59	77	W S W 1	W S W 2	W S W 2	....	....	Strat. 2	Strat. 6	Cu. St.	
5	016	952	29·978	13·0	17·0	11·8	048	078	045	62	83	60	N W 2	N W 2	N W 1	....	....	Cu. St. 10	Cu. St. 10	Cu. St.	Lunar Corôna.
6	069	30·091	30·093	9·7	18·8	10·2	045	077	039	68	76	57	W N W 1	W 2	W 1	....	....	Strat. 10	Cir. St. 3	0	Bright Zodiacal Light.
7	29·837	29·741	29·850	17·0	22·2	24·6	078	101	117	83	86	87	W S W 1	N N W 1	N N W 1	....	0·75	Nim. 10	Nim. 10	Nim.	Snow.
8	991	30·122	30·151	17·0	12·0	7·0	078	045	017	83	60	29	N N W 1	N N W 1	N N W 2	....	1·25	Cu. St. 10	0 0	0	Bright Zodiacal Light.
9	30·109	29·866	29·471	-3·0	5·9	17·0	041	029	078	96	51	88	N N W 2	N 2	N 3	....	....	Fog.	Nim. 10	Nim.	Snow.
10	29·293	302	579	±13·0	20·0	5·0	048	108	027	62	100	49	S W 1	W S W 6	W S W 2	....	9·75	Strat. 1·5	Nim 10	Strat.	Snow. Faint Zodiacal Light.
11	898	988	30·146	-12·0	-3·0	-5·0	013	071	022	51	74	63	N 3	W 3	W 3	....	0·25	Cum. 0·5	0 0	0	Bright Zodiacal Light.
12	30·225	30·217	281	-17·0	+0·3	-2·4	002	017	022	9	39	63	W 1	W 1	W 1	....	....	Pog.	Strat. 3	0	
13	400	362	316	-11 4	-2·0	-5·5	007	014	015	29	34	43	N 1	N 1	N 1	....	....	0 0	0 0	0	" " "
14	185	018	29·962	-7·2	+2·1	+4·5	014	020	027	34	43	49	N E 3	N N E 2	N E 2	....	....	Strat. 2	Cu. St. 10	Nim.	Solar Halo. Rad. 22°.5.
15	006	030	30·110	-2·0	9·8	6·0	014	039	029	34	57	51	N W 2	W 3	W 2	....	Inap.	Strat. 2	Cu. St. 4	0	Imperfect Solar Halo. Bright Zodiacal Light. Auroral Bank.
16	29·996	29·837	29 917	+1·0	11·0	6·2	014	042	029	34	59	51	W N W 1	W 2	N W 2	....	....	Strat. 0·5	Cu. St. 8	0	Faint Zodiacal Light.
17	30·005	30·006	30·129	-1·8	8·5	1·9	014	022	020	34	35	43	W 3	W 3	W 2	....	....	Strat. 1	Strat. 4	0	
18	057	069	200	-2·3	5·0	2·9	014	027	022	34	49	45	W N W 2	W 2	W 2	....	....	Cu. St. 10	Cir. 6	0	Faint Auroral Light.
19	349	298	254	-9·4	1·8	-1·0	015	025	028	43	43	68	N W 1	N 1	N 1	....	....	0 0	0 0	Cir. Str.	
20	079	29·819	29·777	-9·9	9·0	+12·7	023	045	048	76	68	62	N 1	N 1	N 1	....	....	Strat. 2	Cu. St. 10	Cu. St.	
21	29·737	588	638	+13·0	24·0	24·5	048	094	117	62	73	87	S W 1	S W 1	W S W 2	....	....	Cu. St. 10	Nim. 10	Nim.	Snow.
22	30·031	30·054	30·111	6·0	12·0	6·0	029	045	029	51	60	51	W 1	W 1	W 1	....	Inap.	0 0	0 0	0	Lunar Corona. Faint Auroral Light.
23	270	330	342	-4·4	11·2	6·8	022	036	017	63	49	29	N N W 2	W S W 2	W S W 2	....	....	0 0	0 0	0	Hazy, A. M. Lunar Corona.
24	285	29·964	29·805	-1·8	21·0	21·0	014	074	074	34	83	83	S S W 1	S 2	S W 2	....	....	Cir. St. 2	Cu. St. 9	Cu. St.	Hazy, A. M. Solar Halo. Rad. 22°.5.
25	29·716	655	757	+22·5	32·8	28·0	119	182	123	93	95	82	S S W 1	W 2	W N W 1	....	0·50	Nim. 10	Nim. 10	Cu. St.	Slight snow during day.
26	893	901	877	19·6	26·0	17·3	081	111	078	77	81	83	N N W 1	W N W 1	W S W 1	....	0·50	Cu. St. 7	0 0	0	
27	671	565	650	22·8	39·0	32·0	106	195	143	86	82	79	S S W 1	S S W 1	S S W 1	....	....	Cu. St. 10	Cir. St. 10	Cu. St.	Lunar Eclipse, seen from Dr. Smallwood's house, St. Martins.
28	709	555	496	32 9	34·0	33·0	176	196	188	94	100	100	W S W 1	N N E 1	N N E 5	0·08	....	Nim. 10	Nim. 10	Nim.	Rain, sleet, snow.

REPORT FOR THE MONTH OF MARCH, 1858.

Day	Barometer 7 a. m.	2 p. m.	9 p. m.	Temp. 7 a. m.	2 p. m.	9 p. m.	Tension 7 a. m.	2 p. m.	9 p. m.	Humidity 7 a. m.	2 p. m.	9 p. m.	Wind 7 a. m.	2 p. m.	9 p. m.			Clouds 7 a. m.	2 p. m.	9 p. m.	Observations
1	29 689	29·785	29 785	28·0	30 0	24·0	·117	·148	·094	·76	·89	·73	N 1	N 1	N 1	0·38	1·5	Cir. 10	Cu. 9	Cu. St.	
2	629	518	671	10·0	20·0	10·0	·057	·108	·057	·79	·100	·79	N 3	W N W 3	W N W 1	....	0·25	Nim. 10	Nim. 10	Cu. St.	Snow.
3	895	30·032	30·144	2·0	8·0	1·0	·034	·034	·019	·71	·54	·42	W N W 2	W S W 2	W S W 2	....	2·00	Strat. 1	0 0	0	Dense Fog at 2.30 A. M. Lunar Corôna.
4	30·210	186	190	-8·0	10·5	3·0	025	033	009	80	48	18	N 0·5	N 0·5	N 0·5	....	....	0 0	0 0	0	Faint Zodiacal and Auroral Lights. Lunar Corôna.
5	140	29·917	29·821	-5·5	10·5	8·0	015	015	040	43	69	64	W N W 1	W N W 3	W N W 3	....	....	Cu. St. 10	Cu. St. 6	Nim.	Snow.
6	29·851	782	761	+6·0	14·4	8·9	029	061	051	51	73	77	W 2	W 2	W 2	....	1·40	Cu. St. 10	Cu. St. 10	Cu. St.	
7	701	609	611	7·5	18·0	15·2	012	167	055	19	68	64	W 2	W 2	W 1	....	....	0 0	Cir. St. 9	0	Lunar Corona.
8	673	604	511	6·0	14·0	10·0	029	051	039	51	63	57	N W 2	N W 2	S 2	....	....	Strat. 2	0 0	Cu. St.	
9	324	235	312	11·5	22·0	15·0	051	084	070	70	71	82	N N W 3	W 2	W 2	....	Inap.	Cu. St. 10	Cu. St. 9	Cu. St.	Slight Snow, A. M.
10	459	522	633	12·0	25·0	21·0	078	117	096	83	87	85	W N W 3	W 2	W 2	....	Inap.	Cu. St. 10	Cir. St. 6	0	" " " Faint Auroral Light.
11	453	296	738	22·0	38·0	24·0	101	229	094	86	100	73	S 1	S W 2	W N W 2	....	0·75	Nim. 9	Nim. 10	Cu.	Snow, Rain, Sleet. " " "
12	30·024	979	30·019	·9·8	28·0	22·0	031	135	101	46	88	86	S W 2	S W 2	W S W 2	Inap.	Inap.	0 0	Cu. St. 10	0	Snow. Brilliant Aurora, with streamers.
13	412	30·412	357	9·0	21·0	13·0	022	096	063	35	85	81	N 2	W 2	W 2	....	Inap.	0 0	0 0	Strat.	Bright Aurora.
14	114	29·991	096	14·2	23·3	22·2	067	119	101	81	93	86	N N W 2	N 2	N 1	....	1·50	Cu. St. 10	Nim. 10	Cu. St.	Snow. Bright Aurora.
15	165	30·175	118	35·0	44·3	37·0	149	189	199	74	64	90	W 1	W N W 1	W S W 1	....	2·50	Cu. St. 10	Cu. St. 10	Nim.	Solar Eclipse invisible in consequence of clouds.
16	066	29·939	29·779	36·5	44·6	41·0	212	282	257	100	96	100	E 0·5	E S E 0·5	S W 1	....	....	Fog.	Cu. St. 10	Nim.	Rain.
17	29·645	523	416	42·2	53·0	43·0	267	369	254	100	90	92	S W 0·5	S W 0·5	S W 0·5	0·71	....	Cu. St. 10	Cu. St. 10	Cu. St.	Rain. Faint Auroral Light early A. M. of 18th.
18	323	476	861	43·0	44·7	39·0	231	228	131	83	76	55	W S W 4	W 3	W 2	Inap.	....	Cu. St. 4	Cu. St. 10	Cu. St.	Snow during night.
19	30·179	30·314	30·461	29·8	33·3	26·5	111	150	105	67	80	75	N 2	N N E 2	N N E 4	0·18	Inap.	Strat. 3	0 0	0	Rain during day. [Melodia first heard.
20	360	124	29·861	24·0	42·3	35·0	077	134	191	60	50	90	W S W 1	W S W 1	S W 1	....	....	0 0	0 0	0	Faint Auroral Light. Rain beginning about midnight. Fringilla
21	29·402	29·117	170	38·0	40·2	39·0	229	248	238	100	100	100	S 2	S W 2	W 6	0·15	....	Nim. 10	Cu. St. 10	Cu. St.	Rain.
22	534	762	956	29·0	32·5	25·0	160	181	117	100	100	87	N W 5	N W 2	N W 2	0·28	Inap.	Cu. St. 10	0 0	0	Auroral Light. Lunar Corôna. High wind during night.
23	30·106	30·035	30 038	18 5	28·0	26·2	087	117	076	84	76	52	N N W 3	W 1	S S W 0·5	....	....	0 0	0 0	0	Lunar Halo. Rad. 30°. Auroral Light.
24	078	29·964	29·987	19·4	33·0	25·0	055	131	105	53	70	75	N N E 1	S W 2	N N W 2	....	....	Strat. 3	0 0	0	Double Lunar Corôna.
25	29·884	661	628	30·0	35·5	30·0	130	142	130	78	70	78	N N W 1	S W 1	N W 3	....	....	Cir. St. 7	Cu. St. 5	Cu. St.	" " "
26	803	786	851	27·0	32·0	28·0	111	143	117	75	79	76	N 1	W N W 2	N 4	....	....	Cu. St. 10	Cu. St. 4	Cu. St.	Lunar Corôna.
27	879	761	741	23·0	35·0	32·0	089	142	143	72	70	79	W 2	W S W 2	W S W 1	....	....	Cu. St. 8	Cu. St. 5	Cu. St.	Lunar Halo. Rad. 42°5.
28	720	724	763	29·5	43·0	38·6	117	142	124	72	51	51	N 2	N 1	W S W 0·5	....	....	Strat. 1	0 0	0	Lunar Corôna. Saw a Butterfly.
29	857	884	962	30·6	46·0	41·0	136	286	147	78	92	57	Calm.	N 1	N N W 2	....	....	0 0	Cu. St. 3	Cu. St.	
30	30·025	30·081	30·104	40·0	47·0	40·0	139	156	182	56	48	73	N N E 2	N E 1	E 1	....	....	0 0	Cu. St. 0·5	Cir.	
31	178	138	174	38·0	48·0	41·0	136	189	169	62	56	65	N N W 1	N 1	N 1	....	....	0 0	0 0	0	Faint Auroral Light.

REMARKS FOR FEBRUARY, 1858.

Barometer ...... Highest, the 13th day: 30·400 inches; Lowest, " 10th " 29·293 "; Monthly mean, 29·9513 inches; Monthly range, 1·107 "

Thermometer.. Highest, 27th day: +44°0.; Lowest, 12th " —20°0.; Monthly mean, +10°95.; Monthly range, 64°0.

Warmest day was the 28th, its mean temperature being 35°30.
Coldest " " 11th, " " " —6°56.
Greatest intensity of the sun's rays, 78 2, on the 27th day.
Mean of humidity, ·637.

It rained on 1 day during 13 hours. There fell 0·08 inches. It snowed on 9 days during 74 hours 5 minutes. There fell 29·50 inches, which melted yielded an equivalent to rain of 2·51 inches. Conjoined melted snow and rain equivalent to 2·59 inch's.

The most prevalent wind was the W.
The least prevalent wind was the S.
The mean monthly Dew Point is —1°5.
The most windy day was the 11th.
There was no calm day.
There is no record of wind from the E.N.E., E., E.S.E., S.E., and S.S.E.
Cloudless days occurred on the 13th, 22nd, and 23rd.
The Aurora was seen on 3 nights, but faintly. It was not visible on 10 nights.
The Zodiacal Light was seen on 8 nights. On one night particularly fine and bright.
An eclipse of the moon took place on the 27th.
Ozone was in moderate proportion.

N. B. The rain and snow guages are noticed each morning at 10 a. m.

REMARKS FOR MARCH, 1858.

Barometer ...... Highest, the 19th day, 30·461 inches.; Lowest, " 9th " 29·235 "; Monthly mean, 29·8430 inches.; Monthly range, 1·226 "

Thermometer. Highest on the 31st day, 53°0.; Lowest " 5th " —9°0.; Monthly mean, 26°03.; Monthly range, 62°00.

Greatest intensity of the sun's rays, 111°8, on the 29th day.
Warmest day was 17th; its mean temperature being 46°06.
Coldest day was 4th; " " 1·83.
It rained on 6 days during 29 hours; there fell *in toto* 1·70 inch.
It snowed on 10 days during 37 hours 15 minutes. There fell 9·9 inches, which, melted, yielded an equivalent to rain of 0·941 in's.
Conjoined melted snow and rain equivalent to 2·641 inches.

The most prevalent wind was the N.
The least " " were the E.S.E. and S.S.W.
No record of wind from the N.E., E.N.E., S.E., and S.S.E.
The most windy day was the 18th.
The most windy hour between 11 and 12 p. m. of 21st.
There was no calm day.
Cloudless days occurred on 4th, 20th, and 31st.
Ozone was in rather large proportion.
The Aurora was seen on 10 nights, with streamers brilliantly on 1. On 7 nights it was not present.
The Zodiacal Light was seen on one night.
The Solar Eclipse of the 15th was invisible here in consequence of the clouded condition of the atmosphere.
The Fringilla Melodia (Song Sparrow,) was first heard on 20th, and a butterfly "sporting in the sunbeam" was noticed on 28th.

N. B. The rain and snow guages are noted each morning at 10 a. m,

MONTHLY METEOROLOGICAL REGISTER, AT MONTREAL, (LATITUDE 45° 30′ N., LONGITUDE 73° 36′ W.) FOR THE MONTH OF APRIL, 1858.

HEIGHT ABOVE THE LEVEL OF THE SEA, 57·07 FEET.

BY A. HALL, M. D.

Day of Month.	Barometer, Corrected and reduced to Fah., 32°. 7 a. m.	2 p. m.	9 p. m.	Temperature of the Air. 7 a. m.	2 p. m.	9 p. m.	Tension of Aqueous Vapour. 7 a. m.	2 p. m.	9 p. m.	Humidity of the Atmosphere. 7 a. m.	2 p. m.	9 p. m.	Direction and Force of the Wind, from 0, Calm, to 10, Violent Hurricane. 7 a. m.	2 p. m.	9 p. m.	Amo'nt of Rain in Inches.	Amo'nt of Snow in Inches.	Clouds and their Proportion, in Numbers, from 0, Cloudless, to 10, perfectly Overcast. 7 a. m.	2 p. m.	9 p. m.	OBSERVATIONS.
1	30·201	30·078	30·013	31·8	50·5	41·0	·149	·186	·169	·84	·51	·65	N W 2	N W 1	N W 1	....	....	Cir. 3	Strat. 3	0 0	
2	050	29·942	29·866	41·8	56·7	44·2	·184	·194	·196	·70	·42	·68	S W 1	S W 1	S W 1	....	....	Cu. St. 10	0 0	0 0	Lunar Halo early A. M. of 3d.
3	29·862	866	937	46·0	52·6	41·0	·192	·146	·155	·62	·36	·58	N W 3	N E 1	N N E 1	....	....	Cu. St. 10	0 0	0 0	
4	998	790	743	33·0	50·0	46·0	149	234	215	71	65	69	N 1	N 1	N N W 1	....	....	Cu. St. 10	Cu. St. 10	0 0	Solar Halo, A. M.
5	807	672	668	44·5	54·0	49·0	204	194	258	68	48	71	S 1	S 3	S W 1	0·06	....	Nim. 10	Cu. St. 10	Nim 10	Rain.
6	811	851	30·037	36·0	43·0	27·0	149	142	093	71	51	63	W 2	W N W 1	W N W 1	0·04	....	Cu. St. 10	Cu. St. 7	Strat. 2	High wind.
7	30·189	30·109	181	19·5	34·5	29·6	065	136	111	62	65	67	N W 3	W N W 3	W N W 2	....	....	Cir. St. 5	0 0	0 0	Faint Auroral Light.
8	257	138	021	36·6	39·5	36·0	118	167	129	68	68	61	N 1	N 1	N W 1	....	....	0 0	Cir. St. 7	Cu. St. 9	
9	29·733	29·579	29·606	34·5	33·0	30·0	183	188	174	90	100	100	N E 1	N N E 1	N N E 1	0·12	....	Nim. 10	Nim. 10	Nim. 10	Rain. Slight Snow during night.
10	724	945	30·062	31·0	38·0	35·0	149	178	191	84	81	90	N 3	N 2	N W 1	0·37	Inap.	Cu. St. 10	Cu. St. 10	Cu. 4	Aurora, with streamers.
11	30·136	987	022	31·6	41·5	37·0	112	235	221	63	91	100	N W 1	N W 1	N 2	....	....	0 0	Cirr. 2	0 0	Bright Aurora, with streamers.
12	043	914	29·861	35·0	44·5	41·2	127	251	244	62	84	91	N E 1	N E 1	Calm.	....	....	0 0	Cir. Str. 4	Cu. St. 10	
13	29·729	584	527	36·5	43·0	40·8	199	248	235	90	88	91	E 1	E S E 1	S E 1	0·05	....	Nim. 10	Cu. St. 10	Cu. St. 10	Rain.
14	420	381	405	38·0	45·0	41·3	201	228	244	86	76	91	N E 1	N N E 1	N N E 1	0·55	....	Cu. St. 10	Cu. St. 10	Cu. St. 10	Hazy early A. M. Rain.
15	410	429	550	43·0	48·0	41·8	254	260	244	92	78	.91	N N W 1	N N W 1	N N W 1	0·01	....	Cu. St. 10	Cu. St. 10	Nim. 10	Rain.
16	624	674	706	43·0	52·0	41·8	193	173	177	71	46	66	W 4	W 2	W 1	0·08	....	Strat. 2	Cu. St. 6	0 0	
17	815	821	444	44·0	46·4	37·0	173	146	103	60	47	45	N N W 3	N N W 3	N W 2	....	....	0 0	Cu. 5	0 0	
18	30·070	30·124	30·198	41·8	49·0	41·0	173	099	177	73	29	66	N W 1	N N W 1	N W 1	....	....	0 0	Cu. 0·5	0 0	Lunar Corôna. Faint Auroral Light.
19	367	254	220	36·5	47·0	39·5	118	125	139	68	40	56	N N E 2	N N E 1	S 1	....	....	Cirr. 1	0 0	Cir. St. 3	
20	189	29·909	29·717	37·0	52·3	37·0	136	166	199	62	43	90	E 1	E S E 1	S E 1	....	....	Cum. 7	Cu. St. 10	Nim. 10	Rain, changing to snow during night.
21	29·438	492	716	34·5	40·6	37·0	190	167	178	95	68	81	E S E 1	E 1	N N E 1	0·70	Inap.	Nim. 10	Nim. 10	Cu. St. 10	*Hirundo Bicolor,* Common Swallow, seen this day. Lun. Halo. Rad. 23°.
22	831	815	634	42·2	54·0	50·5	222	263	283	83	64	78	W 1	S S E 1	S E 1	0·05	....	Strat. 4	Cu. St. 10	Strat. 3	
23	475	585	695	55·3	48·0	45·0	335	285	198	80	85	65	S 2	S W 4	S W 3	....	....	Cu. 3	Cu. St. 10	Cu. St. 10	Slight Snow. Lunar Corôna.
24	720	723	830	34·5	38·4	34·0	155	165	120	79	72	61	W N W 3	W 4	W 2	0·06	Inap.	Cu. St. 10	Cu. St. 10	Cir. St. 8	Hard Frost. Lunar Corona.
25	992	30·101	30·155	32·0	38·8	32·0	·100	131	113	54	55	60	W N W 2	W 3	W 2	....	Inap.	Cu. St. 10	Cu. St. 9	0 0	
26	30·136	100	119	36·4	43·0	36·6	127	177	136	62	66	62	N E 2	N N E 2	W 1	....	....	Cir. Cum. 9	Cu. St. 10	Cu. 5	
27	120	020	29·885	41·8	47·0	41·2	160	112	134	53	34	50	N E 2	N E 1	N E 1	....	....	0 0	Cu. St. 10	Cu. St. 10	
28	29·704	29·615	668	39·0	51·4	43·0	104	104	108	43	28	37	N N E 1	N 3	W 1	....	....	Cu. St. 10	Cu. St. 10	0 0	Lunar Corôna.
29	761	658	621	47·4	57·0	49·0	176	094	175	57	20	50	W 4	W N W 4	W N W 3	....	....	0 0	0 0	0 0	Wind squally.
30	419	393	636	47·0	48·0	46·5	202	212	251	62	63	84	S 1	N N E 3	N N E 3	Inap.	....	Cu. St. 10	Nim. 10	Nim. 10	Rain. First arrival from sea.

REPORT FOR THE MONTH OF MAY, 1858.

Day	Barometer 7 a. m.	2 p. m.	9 p. m.	Temperature 7 a. m.	2 p. m.	9 p. m.	Tension 7 a. m.	2 p. m.	9 p. m.	Humidity 7 a. m.	2 p. m.	9 p. m.	Wind 7 a. m.	2 p. m.	9 p. m.	Rain	Snow	Clouds 7 a. m.	2 p. m.	9 p. m.	Observations
1	29·917	29·936	30·165	47·5	55·0	44·5	·125	·194	·173	·39	·48	·60	N 3	N N W 2	N W 2	0·34	....	0 0	Cu. St. 7	Cu. St. 6	
2	30·400	30·410	430	42·0	48·0	41·5	·147	·156	·113	·57	·48	·42	N 1	N N W 2	N E 1	....	....	0 0	Cu. 2	0 0	
3	551	421	370	48·3	50·8	41·0	·120	·139	·155	·36	·39	·58	N 0·5	S W 1	S W 0·5	....	....	0 0	0 0	0 0	
4	275	120	037	45·8	62·0	50·5	202	216	245	71	40	65	Calm.	S 0·5	Calm.	....	....	0 0	0 0	0 0	*Cypselus Pelasgius* (Chimney Swallow) first seen this day. *Grystes Nigricans* (Black Bass) first caught at Lachine.
5	29·960	29·853	29·811	52·0	61·6	55·0	245	297	276	65	55	87	S 0·5	S 2	S 0·5	....	....	Cu. St. 10	Cu. St. 10	Cu. St. 10	Slight rain.
6	743	721	806	56·0	54·0	50·0	433	390	270	100	93	72	S S W 0·5	N N E 3	W 4	0·27	....	Nim. 10	Nim. 10	Cu. St. 5	Rain.
7	930	944	982	56·5	60·0	52·0	289	310	308	76	60	79	N E 3	N E 0·5	E 0·5	0·05	....	0 0	Cu. 2	0 0	Brilliant Aurora, with streamers.
8	30·032	916	858	60·5	69·0	59·0	309	306	283	64	48	54	Calm.	S S E 1	Calm.	....	....	Cirr. 5	Cir. St. 8	0 0	
9	29·761	645	629	59·0	69·0	58·0	358	411	439	73	60	88	S 3	S S W 2	W 2	Inap.	....	Cu. St. 10	Cu. St. 10	Nim. 10	Rain, thunder, and lightning.
10	916	952	30·007	47·0	52·3	44·5	208	208	160	66	53	53	W 2	N W 1	Calm.	0·13	....	Cu. St. 9	Cu. 5	Cu. St. 8	Rain.
11	30·070	880	29·596	40·0	55·0	45·0	132	181	251	52	43	84	N E 2	N E 2	E N E 2	....	....	Cu. St. 8	Nim. 10	Nim. 10	Rain.
12	29·511	475	565	46·0	52·0	42·2	280	361	204	88	93	68	E 1	W S W 2	W 4	0·44	....	Nim. 10	Nim. 10	Cu. 10	Faint Auroral Light seen through northern clouds.
13	820	30·020	30·172	49·0	51·0	42·0	258	149	142	71	40	51	W N W 3	W N W 3	W 1	0·43	....	Cir. St. 5	Strat. 3	0 0	Distant Thunder.
14	30·188	090	29·909	47·0	51·0	47·0	241	210	212	84	58	63	N N E 2	N E 0·5	Calm.	....	....	0 0	0 0	0 0	
15	29·821	29·673	777	46·0	63·7	48·2	238	373	247	77	62	71	Calm.	Calm.	N W 2	Inap.	....	Cu. St. 10	Cu. St. 8	Cu. St. 4	Rain. Wind squally.
16	30·014	30·054	30·144	46·4	51·2	42·0	238	142	121	77	37	43	N W 4	N W 2	Calm.	0·06	....	0 0	Cu. 3	0 0	Solar Halo. Rad. 23°.5. Faint Auroral Light.
17	086	009	29·939	44·8	58·0	46·0	173	160	215	60	34	69	W 3	W N W 1	W 4	....	....	Cu. St. 8	Cu. St. 10	Cu. St. 10	Rain.
18	29·871	29·873	912	44·7	47·0	46·2	251	278	273	84	85	45	E S E 3	S E 3	S 2	0·05	....	Cu. St. 10	Nim. 10	Nim. 10	Rain.
19	30·024	999	924	45·5	59·0	51·0	286	269	136	92	54	35	W 3	S S E 0·5	Calm.	0·17	....	Cu. 7	Cu. 9	Cu. St. 10	Rain.
20	29·799	734	957	48·8	52·0	49·0	303	341	322	89	89	92	S S E 1	Calm.	Calm.	0·03	....	Cu. St. 10	Cu. St. 10	Nim. 10	Rain.
21	751	811	893	46·0	50·0	46·0	262	234	286	84	65	92	N 1	N E 1	Calm.	0·28	....	Cu. St. 10	Nim. 10	Nim. 10	Rain.
22	982	30·092	30·105	44·3	57·0	49·0	251	295	258	84	63	71	N N E 4	N 1	W 0·5	0·09	....	Nim. 10	Cu. 7	0 0	Rain. *Hirundo Purpurea* first seen.
23	30·108	29·966	29·733	55·0	64·0	53·0	269	327	295	62	57	68	S W 2	S 2	S 3	Inap.	....	Cir. 5	Cu. St. 10	Cu. St. 10	Rain.
24	29·368	569	686	51·0	59·0	55·0	368	323	186	96	65	51	N 2	N N W 3	N N W 3	1·05	....	Nim. 10	Cu. St. 10	Cu. St. 10	Rain.
25	29·856	929	924	56·5	58·8	53·0	342	269	269	78	54	57	N 3	N 3	N E 3	0·01	....	Strat. 2	C. St. & Cu. 5	0 0	Swallows building.
26	928	891	900	54·0	69·0	56·0	321	329	308	80	46	69	N E 2	S 4	Calm.	....	....	Cir. St. 8	Cir. St. 5	Cu. St. 8	
27	981	978	30·080	51·6	69·0	59·0	315	353	285	83	48	49	S E 0·5	N E 0·5	N E 1	....	....	Cir. St. 9	Cum. 0	0 0	Shad-flies first noticed (*Ephemera vulgata*).
28	30·206	30·154	154	60·5	69·0	58·0	283	398	352	54	56	70	E 3	N E 3	Calm.	....	....	0 0	Strat. 3	0 0	Shad-fish (*Alosa Præstabilis*) in market.
29	204	101	051	60·2	72·8	59·0	338	339	323	65	41	65	N E 1	S 0·5	Calm.	....	....	0 0	0 0	0 0	
30	092	29·954	29·953	61·5	72·0	61·0	235	237	299	43	30	52	Calm.	S S E 3	Calm. 4	....	....	0 0	0 0	0 0	
31	29·973	973	758	67·4	77·0	68·0	450	469	373	48	67	54	S 4	S 6	S S W 5	....	....	Strat. 3	Cir. Cu. 5	Cir. Cu. 7	High wind, continuing most of day.

REMARKS FOR APRIL, 1858.

Barometer ...... Highest on the 19th day: 30·367 inches.
Lowest " 14th " 29·381 "
Monthly mean, 29·8371 inches.
Monthly range, 0·986 "

Thermometer.. Highest on the 23d day: 60°4.
Lowest " 7th " 17°5.
Monthly mean, 41°41.
Monthly range, 42°9.

Greatest intensity of the sun's rays, 117°6 on the 6th day.
Warmest day was the 29th, its mean temperature being 51°13.
Coldest " " 7th, " " " 27°86.
Mean of humidity for the month, ·664.

Rain fell on 10 days during 64 hours 10 minutes, amounting to 2·09 inches.
Snow fell on 4 days during 11 hours 50 minutes, the amount inappreciable, and estimated as rain.
The most prevalent wind was the N. W.
The least prevalent wind was the S. S. E.
No record of wind from the E.N.E., S.S.W., or W.S.W.
The most windy day was the 29th.
The most windy hour between 3 and 4 A. M. of same.
There was no calm day.
A cloudless day occurred on the 29th.
Ozone was in rather small ratio.

N.B. The rain and snow guages are noted each morning at 10 a. m.

REMARKS FOR MAY, 1858.

Barometer ...... Highest on the 3rd day: 30·551 inches.
Lowest " 24th " 29·368 "
Monthly mean, 29·9472 inches.
Monthly range, 1·183.

Thermometer. Highest on the 31st day, 79°0.
Lowest " 2d " 33°0.
Monthly mean, 53°70.
Monthly range, 46°00.

Greatest intensity of the sun's rays, 119°5, on the 29th day.
Warmest day was the 31st, its mean temperature being 70°80.
Coldest day was the 2nd, " " 43°83.
Mean of humidity for the month, ·634.

Rain fell on 14 days during 87 hours 28 minutes, amounting to 3·40 inches. No snow fell.
The most prevalent wind was the N.E.
The least " " were the E.N.E., E.S.E., and W.S.W.
A record of wind from each of the sixteen quarters, the division employed.
The most windy day was the 31st.
The most windy hour between 12 and 1 p. m. of 31st.
A calm day occurred on the 15th.
Cloudless days occurred on the 3d, 4th, 14th, 29th, and 30th.
Ozone was in rather large ratio, its mean average being 2·93.

N.B. The rain and snow guages are noted each morning at 10 a. m.

the Geological Survey of Canada there are now twenty-one species of Cystideans, about fifty Crinoids, and ten Star-fishes, or in all eighty-one species of Echinodermata from this formation instead of thirteen.

"In the Devonian formation several forms resembling Cystideæ have been referred to that group of organisms; but it remains still to be shewn that they are true Cystideans. The weight of the evidence tends to shew that the race was ushered in with the first living inhabitants of the deep—attained its greatest development in the latter portion of the Lower Silurian era, and died out about the time of the commencement of the Devonian. Of its associates in the Primordial Zone, the Brachiopoda, Pteropoda and Bryozoa remain to the present day. The trilobites held their possession of existence until the Carboniferous period, and the graptolites disappeared early in the Upper Silurian. With the exception then of the graptolites, the Cystideæ were the first race that became extinct."

In the remainder of the paper the scientific reader will find much curious investigation of the structures of the Crinoids and Cystideans of the silurian rocks, and the differences between them and their nearest modern relatives. These things are interesting in themselves, and raise curious questions as to the use of these perished creatures, and the conditions of life to which they were adapted. These questions we can answer only in part, but it is only by patient investigation of the minutest structures that we can hope to have even a general idea of the part they played in the works of the Supreme. Certain it is at least that they had an important share in gathering the materials of some of those limestone beds on which our country is based, and that the study of our numerous Canadian species is contributing largely to our knowledge of their mode of life. The investigations in this volume of the true nature of the orifices of Cystideans are of especial importance in this respect. No less than nineteen species are described in this decade, and many of them are illustrated by admirable figures, which equal, and we rather think far surpass anything hitherto done for American fossils. Another valuable paper by Mr. Billings, relates to the fossil Star-fishes of Canada.

Mr. Salter's contribution to the volume is a description of a singular new genus allied to Cystideans or Star-fishes if not connecting these groups.

Mr. Jones gives descriptions and figures of nine species of little bivalve Crustacea allied to the Cypoits and Cytheridea that now swarm in our ports and on our sea coasts, and which in the Silurian Seas, no doubt formed a part of the food of the Crinoids and Cystideans.

We are glad to learn that this work is to be offered on sale at a low price, and we hope that by this means it will find its way into the hands of numerous collectors, who may by the discovery of new species, and more complete specimens, assist in still farther extending our knowledge of the subjects of which it treats. This educational use alone will repay the publication of the work, and we trust that its practical importance will be duly appreciated when we state that a plate of one of these Cystideans no larger than a kernel of wheat, might enable any one to distinguish a silurian limestone from one belonging to the coal formation.

ROBERT BROWN.

The distinguished botanist died on Saturday last, at his house in Dean Street, Soho, in the eighty-fifth year of his age. Though less popularly known as a man of science than many of his contemporaries, those whose studies have enabled them to appreciate the labours of Brown rank him altogether as the foremost scientific man of this century. He takes this position not so much from his extensive observations on the structure and habits of plants, as from the philosophical insight and the power he displayed of applying the well-ascertained facts of one case to the explanation of doubtful phenomena in a large series. Till his time botany can scarcely be said to have had a scientific foundation. It consisted of a large number of ill-observed and badly-arranged facts. By the use of the microscope and the conviction of the necessity of studying the history of the developement of the plant in order to ascertain its true structure and relations, Brown changed the face of botany. He gave life and significance to that which had been dull and purposeless. His influence was felt in every direction:—the microscope became a necessary instrument in the hands of the philosophical botanist, and the history of developement was the basis on which all improvement in classification was carried on. This influence extended from the vegetable to the animal kingdoms. The researches of Schleiden on the vegetable cell, prompted by the observations of Brown, led to those of Schwam on the animal cell; and we may directly trace the present position of animal physiology to the wonderful influence that the researches of Brown have exerted upon the investigation of the laws of organization. Even in zoology the influence of Brown's researches may be traced in the interest attached to the history of development in all its recent systems of classification. Brown had, in fact, in the beginning of the present century, grasped the great ideas of growth and development, which are now the beacon lights of all research in biological science, whether in the plant or animal world.

But whilst his influence was thus great, his works are not calculated to attract popular attention. They are contained in the Transactions of our learned Societies, in the scientific appendices of quarto volumes of voyages and travels, or in Latin descriptions of the orders, genera, and species of plants. The interest taken in these works by his countrymen was never sufficient to secure for them republication, although a collected edition of his works, in five volumes, is well known in Germany. He was of a diffident and retiring disposition, shunning whatever partook of display, and anxious to avoid public observation. Thus it is that one of our greatest philosophers has passed away without notice, and many will have heard his name for the first time with the announcement of his decease. But for him an undying reputation remains, which must increase as long as the great science of life is studied and understood.

Robert Brown was the son of a Scottish Episcopalian clergyman, and was born at Montrose on the 21st of December, 1773 He was first entered a student at Marischal College, Aberdeen, and afterwards studied medicine at Edinburgh, where he completed his studies in 1793. In the same year he was appointed assistant-surgeon and subaltern in a Scotch Fencible Regiment, which he accompanied to Ireland, and stayed there till the end of 1800. Having through his love of botany made the acquaintance of Sir Joseph Banks, he was through his interest appointed naturalist to Capt. Flinders's Surveying Expedition to New Holland. During this voyage the whole continent of Australia was circumnavigated many parts of the coast were visited, and eventually the ship in which the Expedition sailed was condemned as unseaworthy at Port Jackson in 1803. Mr. Brown, remained in New Holland, visiting different parts of the colony of New South Wales and Van Diemen's Land, and eventually returned to England in 1805. Australia was then an unexplored mine of botanical wealth. Brown returned with nearly 4,000 species of plants. He was shortly appointed Librarian to the Linnean Society. Here he quietly examined his plants, and evolved with philosophic caution and patience those views which were destined to produce so extensive and lasting an impression on science. One of his earliest papers was published in the Transactions of the Wernerian Society of Edinburgh, and was devoted to the family of plants called by him "Asclepiadæ." In this paper the character of mind of the author is well seen. The microscope had been used, the process of the development had been watched, a new series of facts important to the laws of reproduction had been discovered, and a new order of plants established. Such was the nature of most of his future communications to the Linnean and Royal Societies. Such was the character of his great work on the plants of New Holland, which he published in the year 1810, with the title 'Prodromus Floræ Novæ Hollandiæ et Insulæ Van Diemen.' This work contained not only a description of the plants which he had himself collected in Australia, but also those collected by Sir Joseph Banks during Cook's first voyage. This book abounded in new facts and new orders. It was published as a first volume, but it was never succeeded by a second, as appeared to have been originally intended by the author. At the time this work was published, it was the practice of English botanists to arrange plants according to the artificial method of Linnæus, and Brown's 'Prodromus' was the first English work devoted to a scientific and rational classification of plants. Although the Linnean system of classification survived some time after the publication of this work, it eventually succumbed before those principles of arrangement which were carried out in so masterly a manner by Brown, and the importance which had been recognized by John Ray and Adamson, and even by Linnæus himself.

In 1814 Capt. Flinders published a narrative of his voyage, and to this was attached an appendix by Brown, entitled 'General remarks, Geographical and Systematical, on the Botany of Terra Australis.' In subsequent years several important papers appeared in the *Transactions of the Linnean Society*. Amongst others may be named, 'On the Natural Order of Plants called Proteacæ,'—'Observations on the Natural Family of Plants called Compositæ' (Vol. xii.),—'An account of a New Genus of Plants called Rafflesia' (Vol. xiii.) In 1828 he published in a separate form 'A Brief Account of Microscopical Observations on the Particles contained in the Pollen of Plants, and on the general existence of active Molecules in Organic and Inorganic Bodies.' These movements, the full import of which is at present not understood, he was the first to point out, and draw attention to their importance. On the Continent it is the custom to allude to this phenomenon as the "Brownonian movement." He is the author also of the botanical appendices attached to the accounts of the voyages of Ross and Parry to the Arctic Regions, of Tuckey's expedition to the Congo, and of Oudney, Denham, and Clapperton's explorations in Central Africa. Assisted by Mr. Bennett, he has also described the rarer plants collected by Dr. Horsfield during his residence in Java.

After the death of Dryander in 1810, Dr. Brown received the charge of the library and collections of Sir Joseph Banks, who bequeathed them to him for life. They were afterwards, by his permission, transferred to the British Museum in 1827, and he was appointed keeper of Botany in that Institution. In 1811 he became a Fellow of the Royal Society, and has several times been elected on the Council of that body. In 1832 he received the degree of D.C.L. from the University of Oxford. In 1833 he was elected one of the eight Foreign Associates of the French Academy of Science. In 1839 the Royal Society awarded him their Copley medal for his discoveries during a series of years 'On the subject of Vegetable Impregnation.' In 1849 he was elected president of the Linnean Society, a post from which he retired in 1853. During the administration of Sir Robert Peel he received a pension of £200 as a recognition of his scientific merits. He also received the decoration of the highest Prussian civil order "Pour le Mérite," of which his friend and survivor at the age of 88, the Baron von Humboldt, is Chancellor. Humboldt long since called him "Botanicorum facile princeps," a title to which all botanists readily admitted his undisputed claim.

He died surrounded by his collections in the room which had formerly been the library of Sir Joseph Banks. In private, Dr. Brown was greatly admired by a large circle of attached friends for the singular soundness of his judgment, the simplicity of his habits, and the kindness of his disposition. He was buried on the 15th inst. at the cemetery at Kensal Green, when his funeral was attended by a large body of his scientific and personal friends.—*Athenæum.*

BOTANY, &c.

The Natural History of British Meadow and Pastoral Grasses. By JAMES BUCKMAN. Messrs. Hamilton & Adams, London.—This little epitome is represented as adding a large amount to our knowledge of British Gramineæ. Every portion of the book gives evidence of the author's practical acquaintance with the subject on which he writes. The work is divided into three parts:—1. The Natural History of British Grasses; 2. Their Structure and Economy; 3. Their Agricultural Economy. To the Agriculturist desirous of improving the character of his pasture-lands, this book will be found a useful guide:—

The Practical Naturalist's Guide, containing Instructions for Collecting, Preparing and Preserving Specimens of all departments of Zoology. By J. B. DAVIES. Messrs. Simpkin & Marshall, London.—To those who know how to use specimens aright, this manual will be invaluable. It contains ample instructions for the preservation of all sorts of animals and their parts, from the huge Proboscidea and Cetacea down to the microscopic forms of the Protozoa. The means of taking animals, both on the land and the water, are detailed. There is a good chapter on dredging, and the taking of marine animals by the haul-net and towing-net; also, a series of receipts for making solutions and pastes in which to preserve animals:—

A Manual Flora of Madeira and the adjacent Islands of Porto Santo and the Dezertas. By R. T. LOWE, M.A. Van Voorst, London.—Tolerably accurate lists of the plants of these islands have been published before; but none of them can be compared, for extent and accuracy, with the present work. It is only a first part, embracing the Thalamifloral Exogens, and contains a very full and complete description of every species, with the character of the genera, orders and classes. Mr. Lowe has also added notes on the rarer or more interesting species, which will be found most valuable to those studying the botany of this part of the world.—*Athenæum.*

Illustrations from the genus Carex. By FRANCIS BOOTT, M.D. W. Pamplin, London.—In the preface, the author says: "My original design in this work was limited to the illustration of the Carices of N. America, which I had studied for several years under the advantage of frequent communication with my friend Mr. Carey, who had so ably described and grouped them in Dr.

Gray's "Manual of the Botany of the Northern States"; and the lithographed impressions were made in the prosecution of that design. The extensive and beautiful collection of specimens subsequently brought by Dr. Hooker from the East Indies, which were liberally placed in my hands by that eminent man, impelled me to extend my plan; and I have endeavored to illustrate the genus at large." Most of the species here figured are accordingly North American or East Indian. The ample list of North American will be found to comprise a very large share of the Carices of Gray's Manual, as well as of species of higher northern, more southern, and western regions. The figures of these fascinating plants are very truthful. The main object of the work is to give accurate representations of all the known Carices:—

A List of the Orchidaceous Plants collected in the East of Cuba, by Mr. C. Wright, with Characters of the New Species. by Prof. LINDLEY, (from *Ann. and Mag. Nat. Hist.*, May, 1838), —It appears that of the eighty species of Orchids gathered by Mr. Wright in his recent visit to Cuba, twenty-one are novelties (here characterised by Prof. Lindley), and several others have scarcely been seen since the time of Swartz;—showing "how rich in new species of the Order is the vegetation of that little-known island, and how much is still open to discovery by the diligent traveller.":—

Salices Boreali-Americanæ: a Synopsis of North American Willows. By N. J. ANDERSON, Professor of Botany in the University of Stockholm, Sweden.—In the March number of this Journal (*Silliman's*) we stated that Professor Anderson had undertaken to elaborate the *Salicineæ* for DeCandolle's Prodromus, and that materials in the form of complete specimens of Willows were earnestly solicited from every part of this country, in order that he might attain to something like the same full acquaintance with our species which he possesses of the European forms. We are happy to announce that Prof. Anderson has already made a preliminary study of our Willows, from such materials as he has been able thus far to examine; and that he has embodied the results in a memoir upon the subject, which is just printed in the Proceedings of the American Academy of Arts and Sciences, vol. iv., where it occupies thirty-two pages. The introduction and the conclusion, embracing a critical comparison of our Salices with those of Europe, are written by Professor Anderson in the English language (which he uses with remarkable facility); the descriptive and critical matter is in Latin. To render it accessible to all who take an interest in the subject, a small separate edition has been printed, and is sold by Messrs. B. Westermann & Co., No. 290 Broadway, New York. On the receipt by the Messrs. Westermann, of postage stamps to the amount of 36 cents, a copy will be sent by mail, prepaid, to any applicant:—

Systematische Untersuchungen über die Vegetation der Karaiben, in besondere der Insel Guadeloupe; von A. GRISEBACH, (from Trans. Roy. Sci. Göttingen, vol. xvii, 1857), pp. 138, 4to.— This sketch of the Flora of Guadaloupe is very interesting and useful in itself, and of good promise for the *Flora of the British West Indies*, upon which Prof. Grisebach is now engaged, and which is so greatly needed:—

Essai d'une Exposition Systématique de la Famille des Characées; par feu J. WALLMAN, *Traduit du Suedois;* par M. le Dr. W. NYLANDER. Bordeaux, 1856, pp. 91, 8vo.—This monograph of the *Characeæ* appeared in the Transactions of the Royal Academy of Sciences of Stockholm for 1852, published in 1854, a year after the death of the author, who barely lived to complete the manuscript. To render the monograph more generally accessible, M. Durien de Maisonneuve engaged Dr. Nylander, the lichenologist, a compatriot of the author, to translate the memoir from Swedish into French, and caused it to be reproduced in this form in the Transactions of the Linnean Society of Bordeaux, in the first volume of the third series, 1856, also publishing a small extra impression in a pamphlet form. The author characterises no less than fifty species of *Nitella*, and sixty-six of *Chara*:—

Elogio di Filippo Barker Webb, scritto da FILIPPO PARLATORE. Ficenze, 1856, 4to., pp. 113.—The late Mr. Webb, a celebrated English botanist long resident in Paris, bequeathed his vast herbarium and excellent library to the Grand Duke of Tuscany, along with some funds for the care and augmentation of the collection. The immediate charge of the collection was of course entrusted to Prof. Parlatore, a near friend of the testator, and a most zealous botanist. After coming into possession of this noble bequest, upon the occasion of opening his course of lectures for the year 1855, Professor Parlatore pronounced the eulogy here published. It is illustrated by interesting explanatory notes, and followed by a catalogue of the works and opuscula published by

Mr. Webb, twenty-four in number; by an account of his library and herbaria; and by selections from his correspondence with various botanists. The lithographed portrait in the frontispiece is a truer likeness of Mr. Webb, than that which was published in his great work, the *Histoire Naturelle des Iles Canaries*:—

Agricultural Botany in the Western States.—In the fourth volume of the Transactions of the State Agricultural Society of Wisconsin for 1854–7, Mr. Lapham has given a good popular account of the forest trees indigenous to that State, illustrated by outline wood-cuts. To the Transactions of the Illinois Agricultural Society for 1856–7 the same indefatigable author has contributed, 1. A Catalogue of the Plants of Illinois, prefaced by some historical and statistical details; 2. An account of the Native, Naturalized and Cultivated Grasses of Illinois, illustrated by three plates or pages of wood-cuts. These do not equal the figures in Mr. Lapham's Grasses of Wisconsin. We are disposed to doubt the statement on p. 559 about the difference in the specific gravity of the pollen of Indian corn and of wild rice, unless the author can vouch for it from his own proper observations. Perhaps it rests upon no better basis of fact than the statement on the preceding page, that "had the wheat crop been at any time entirely destroyed, this invaluable grain would have been restored to us from seeds preserved for more than three thousand years in the folds of an Egyptian mummy!" We ought perhaps to say, that the asserted cases of such germination will not bear examination; and that those best qualified to judge utterly disbelieve, not only the asserted fact, but also the possibility of any such occurrence:—

How Plants Grow: A simple Introduction to Structural Botany; with a Popular Flora, or an arrangement and description of Common Plants, both wild and cultivated. By Asa Gray, M. D., Fisher Professor of Natural History in Harvard University. 2̃ 1 pp., 16mo., illustrated by 500 wood engravings. New-York, 1858. Ivison & Phinney.—Dr. Gray has prepared this little volume expressly for young beginners in botany, and for use in common schools, and has well carried out his purpose. The work is simple in style, and beautiful in its illustrations. While teaching with clearness the details of the subject, it is constantly bearing the mind, by simple explanations, above these details to higher thoughts and principles, and preparing it for the fuller survey of the science in the more extended works of the author's series. He considers in order—1st, How plants grow, and what their parts or organs are; 2nd, How plants are propagated or multiplied in number; 3rd, Why plants grow; what they are made for, and what they do; 4th, How plants are classified, named and studied. Then, in the second part, the work contains a "Popular Flora for Beginners," including descriptions of the common plants of the country, both those of the woods and fields, as well as those of our yards and gardens. It is arranged according to the natural system, and for the beginner in the science takes the place of the large Manual of Botany. The excellence of the volume consists in its being really "science made easy," not by culling out "interesting facts" to attract, and tying them artfully together, but by presenting the *system of fundamental truths* in a manner intelligible and attractive to the young mind.—*Silliman's Journal.*

REVIEWS AND NOTICES OF BOOKS.

How to Lay-out a Garden. Intended as a general guide in choosing, forming, or improving an estate (from a quarter of an acre to a hundred acres in extent), with reference to both design and execution. Second edition, greatly enlarged, and illustrated with numerous plans, sections and sketches of gardens and garden objects. By Edward Kemp, Landscape Gardener, Berkenhead Park. *London:* Bradbury & Evans. *Montreal:* B. Dawson & Son.

This book is of a thoroughly practical as well as scientific character. It gives directions as to the choice of a place for a country residence and the site and aspect for a house. It very clearly. sensibly, and fully informs proprietors what to avoid in laying-out or ornamenting their gardens or lawns. It states with appropriate illustrations the general principles of taste and style applicable to landscape gardening, with both the general and particular objects which by attention to these principles may be attained, as well in limited as in more extended grounds and gardens. It contains a chapter on special departments, such as the park with its trees and walks—the flower garden; its situation, design and contents—the rose garden—the pinetum—the kitchen garden, etc.; also a chapter of practical directions on a variety of points and matters pertaining to ornamental and useful gardening. The author has consulted with skill and judgment the well-known works of Price, Repton, and Loudon. The book is, however, essentially his own He writes with an evident enthusiasm, and an earnest love of his subject. The wood-cut illustrations are of a high order, and greatly heighten the interest of the volume. The style is clear, elegant, lively and forcible. We would cordially recommend this work to the attention of gentlemen who desire the grounds of their country residences to be a source of pleasure as well as profit to them. In this country, where wood is regarded as the enemy of the cultivator, and is cut down so frequently with a wanton disregard of good taste or even comfort, we need just such instructions as this book contains to direct us in the replanting and ornamenting of our waste places with leafy boscage and floral beauty.

THE FAMILY AQUARIUM, OR AQUA VIVARIUM; a "New Pleasure" for the domestic circle, being a familiar and complete instructor upon the subject of the construction, fitting-up, stocking and maintenance of the Fluvial and Marine Aquaria, or "River and Ocean Gardens." By H. D. BUTLER. *New York:* Dick & Fitzgerald. *Montreal:* B. Dawson & Son.

THIS is a little book of 121 pages, written in a popular and rather florid style, intended to instruct amateurs in the construction and maintenance of Aquaria. It contains much that has been described before in European works, along with remarks suggested by the author's own experience. Although written in America, and expressly for American use, it does not appear to us to contain anything that may not be found in English books. It directs special attention to the Vivaria in "Barnum's Museum," New York, and to the manufacture and preparation of Aquaria conducted under the direction of the proprietor, from whom it appears much curious and interesting materials for "stocking" may be obtained. The book is well got-up, written with no pretence of scientific precision, and is illustrated by several well-executed wood-cuts. It has also the merit of being cheap, and will prove an interesting addition to the young naturalist's library.

MISCELLANIES.

8. *Geological Survey of Canada.*—The following deserved commendation of the last Report of the Canadian Survey is extracted from the last number of Silliman :—

"*Report of Progress for the years* 1853-56; by Sir W. E. LOGAN, Provincial Geologist. Printed by order of the Legislative Assembly, 494 pp., 8vo., with maps and a quarto volume of plans of various lakes and rivers between Lake Huron and the River Ottawa. Toronto, 1857.—This Report covers four years of exploration. As in all the labors of the author, there is evidence of careful research and sure progress. The Special Report of Sir W. E. Logan covers the first 50 pages. It takes up especially the arrangement of the crystalline limestone among the other Laurentian (Azoic) rocks, and especially its condition in the vicinity of Grenville. The limestone occurs in bands that are nearly parallel, and which are so related as to leave no doubt that one or more strata of limestone are there folded up among the crystalline rocks. In Grenville there are two such bands about two miles apart, having a N.N.E. strike, and dipping, like the included gneiss, to the N.N.W. 50° to 70°. To the rear of the township the two unite andhave a thickness of 500 to 1000 feet. Other similar bands and patches occur to the northward and eastward of these, which have approximately the same strike, and confirm the view that the Azoic rock of the region, before its crystallization, contained one if not two or more thick strata of limestone. The author discusses the precise character of these folds and illustrates the subject by means of a map of the region on which the bands of limestone are represented in color.

"The Reports of A. Murray for the years 1853 to 1856 occupy pages 59 to 190, and contain details respecting the topography and geology of the region west of the Ottawa and north of Lake Huron. These are followed by Mr. James Richardson's Report on the *Island of Anticosti*, and the Mingan Islands in the Gulf of St. Lawrence, and the Palæontological Report of E. Billings, Esq. The island of Anticosti is covered by fossiliferous starta referred to a period uniting the Lower and Upper Silurian; the rock is an argillaceous limestone 2300 feet in thickness, throughout conformable and nearly horizontal. E. Billings, Esq., observes, p. 249, "All the facts tend to show that these strata were accumulated in a quiet sea, in uninterrupted succession during that period in which the upper part of the Hudson river group [Lower Silurian], and the Oneida conglomerate, the Medina sandstone, and the Clinton group [Upper Silurian], were in the course of being deposited in that part of the Palæozoic ocean now constituting the State of New York and some of the countries adjacent.' The fossils of the middle portion fill up the blank with the Upper and Lower Silurian, combining many of the Hudson river group with those of the Clinton, with the addition of other species unknown to both.

"In the two lower divisions (960 feet) the fossils that are of known species have been found in the Hudson or Trenton group, with three exceptions, the *Heliolites megastoma*, *Catenipora escharoides* and *Favosites favosa*, not before known to extend into the Lower Silurian. Singular tree-like fossils (*Beatricea*) occur 430 feet from the base. They are straight stems 1 to 14 inches in diameter, tubular, with the tube transversely septate, the structure in layers resembling in this respect an exogenous tree. 950 feet above the base there are three additional Upper Silurian fossils, *Leptæna subplana*, *Strophomena depressa* and *Atrypa naviformis*. In the upper 600 feet, 60 species of fossils were collected, and 20 out of the 24 hitherto described occur in the Clinton group, while 12 of the 24 are found also in the beds below. The following are the names of the 24 species; those in *italics* occur also in the lower beds of Anticosti, and those marked with an asterisk, are known as species of the Clinton group. *Chætetes lycoperdon*,* *Catenipora escharoides*,* *Favosites favosa*, Zaphrentis bilateralis,* *Orthis Lynx*,* O. elegantula,* O. flabellulum, *Leptæna subplana*,* L. transversalis, *L. profunda*, *Strophomena alternata*,* *S depressa*,* *Atrypa reticularis*,* *A. congesta*,* A. plicatula,* A. hemispherica,* *A. naviformis*,* Spirifer radiatus,* Pentamerus oblongus,* *Murchisonia subulata*,* Cyclonema cancellata,* Platyostoma hemispherica, *Calymene Blumenbachii*,* Bumastes Barriensis.*

"Mr. Billings describes a number of new Cystideæ and Asteriadæ from the Silurian of Canada, besides various Brachiopods and other molluscs. The genus *Huronia* he refers to Orthoceras (or *Ormoceras* if that genus be retained).

"Next follows the Report of T. Sterry Hunt, Chemist and Mineralogist to the Geological Survey. We have already quoted a few facts on minerals from this report; also at page 217 an article on Ophiolites, and page 361 a chapter on the Salines of Europe. We propose to cite farther on the subject of rocks at another time. There are also valuable chapters on the Metallurgy of Iron, Magnesian Mortars, the Purification of Plumbago, and Peat and its products, which we must pass by.

"The quarto volume of twenty maps of the various lakes and rivers between Lake Huron and the Ottawa, by Mr. Murray, show that the Canadian government is carrying forward the survey on the right plan—a union of geographical and geological investigations. The maps are of large size, nearly two feet by three, and contain particulars respecting the rocks of the regions, besides the usual map details, and in both respects a large amount of work has been ably performed."

Note on a Molar Tooth of the Horse in the Collection of the Natural History Society of Montreal.

In a collection of antiquities and fossils presented to the Society by Mr. Little of Newberry, C.W., is a specimen of a molar of an equine animal, labelled as having been found "on the margin of the River Sydenham, nine feet below the surface, near Hunt's Ferry, Township of Dawn. C.W." The question having arisen at the meeting whether this tooth is that of the common horse or of any of the fossil species whose remains have been found in American tertiary deposits, we have compared it with such specimens and figures as are within our reach. The specimen is a middle superior molar; 3·5 inches in length, 1·2 in its extreme anterio-posterior breadth and 1·1 inch nearly in its transverse measurement. It is not more curved than the molars of the domestic horse, but the folding of its enamel is more complex, especially in the isolated folds. In this last respect and in the dimensions of its crown, it corresponds much more closely with Leidy's figure of the tooth of the extinct species named by him *Equus Americanus*, than with that of the common horse. The specimen is in a good state of preservation. It is stained black on one side, and the cement has become brown and is somewhat cracked and broken externally, but it has not experienced any change giving evidence of great antiquity. It would not be safe to affirm on the evidence of this single specimen, the occurrence of the fossil horse in Canada; yet the form of the tooth and the circustances in which it is stated to have been found render this not improbable, and it would be interesting to know whether the ground in which the specimen occurred had certainly been undisturbed previously, what was the nature of the bed containing it, and what its other organic remains if any. To these questions we would invite the attention of any collectors or naturalists visiting the locality.

We may add that there would be nothing extraordinary in the occurrence of the remains of the extinct American horse in Western Canada, since these remains have been found not only in various parts of the United States, but by Sir J. Richardson as far north as Eschsbholtz Bay in Arctic America. Should any further equine remains be found in the locality in question, we should like to have an opportunity of submitting them to Dr. Leidy, the best authority at present on this subject, for comparison with his specimens. We would caution collectors, however, to be very careful in distinguishing remains taken from undisturbed beds, from those that may have been mixed with modern debris.

The following interesting articles were added to the Museum of the Natural History Society at its last monthly meeting. They were procured by Edward Little, Esq., of Newbury, C. W., from Alexander Bell, Esq., of Euphemia, and forwarded to the Society by J. T. Dutton, Esq. :—

1. A Wart, taken from the root of a soft maple tree (*Acer dasycarpum*), fully 26 feet from the living trunk, the root to which it was attached not exceeding one inch in diameter at its junction in either end. 1856.
2. An Arrow, nearly one yard in length, one of a full quiver of fifty, from Upper California, now in possession of a gentleman who after being pierced with two of them despatched the Indian and brought the bow and arrow home. The quiver is made of tanned deer-skin, with the hair on. The arrow is made of two different kinds of wood, and spliced very neatly. It is also barbed with three feathers. The stone head is remarkably sharp and neatly made.
3. An Oak Deer-bleat, given to the donor by the Indian Shawnabee in 1846, and stated by him to be his own manufacture.
4. A Stone Arrow-head, 1½ inches long, found ten feet under ground on Lot 21, Euphemia, C.W., shewing a striking analogy between the Californian and Canadian weapon.
5. An oval Stone Hatchet? about 4 inches long by 2½ broad and 1 thick, well polished and perforated across its breadth, the aperture ½ inch in width. The stone is a very hard jaspery slate, transversely marked with natural lines. This instrument was obtained in 1854 below the surface of the ground on the margin of the river Sydenham, Lot 12th, First Concession, Brooke, C. W.
6. The Molar Tooth of a Horse,—for description of which see page 318.
7. A piece of Fossiliferous Limestone, from Newbury, C. W.

Mr. Joseph T. Dutton lately presented to the Natural History Society a specimen of native loadstone or magnetic iron ore with polarity, from near Samakoff in Bulgaria, received from his brother, Samuel Dutton, Esq., of Constantinople, chief engineer to the Sultan. An analysis by Mr. Samuel Dutton accompanied the specimen, which has, according to him, a density of 4.223, and gives for 100 parts,—

Sesqui-oxyd of iron, ...	79.00
Titanic acid, ...	2.00
Red oxyd of manganese, ...	.50
Silica, ...	14.70
Alumina, ...	1.30
Volatile matters, water, sulphur, &c......	2.50
	100.00

To the Editors of the CANADIAN NATURALIST.

MESSRS. EDITORS,—I will send you by the Express to-morrow a specimen of the *Papilio philenor* (?) Butterfly, which was caught last month at West Flamboro'. These Butterflies appeared in countless numbers about the lilac trees as long as they continued in blossom, and then suddenly disappeared. They lasted from the 7th to the 18th of June, but very few appearing after that date.

I must apologize for not having ere this sent you a specimen; but I have only just brought them down from Flamboro', having caught but two in Toronto, though they were numerous there also. One specimen has a greenish tinge on the posterior wings, and not bluish as in the one I send you. The Caterpillar I have not yet met with.

I wrote to you from Toronto in the beginninng of last month, when I first caught a specimen of this butterfly. By informing me of your opinion respecting this insect, you will greatly oblige

Yours sincerely,

CHAS. J. BETHUNE.

Cobourg, 13th July, 1858.

[NOTE BY THE EDITORS.—The specimen sent with the above communication is evidently *Papilio philenor*, Fabr., a very beautiful butterfly common in the South, but not, in so far as we are aware, previously observed in Canada. It would be interesting to know if it is actually extending its range northward. It is due to our correspondent to state, that his information of the discovery reached us as early as June. To give collectors here an opportunity of inspecting the specimen, it has been left in the mean time with our publishers.]

MONTHLY METEOROLOGICAL REGISTER, SAINT MARTIN'S, ISLE JESUS, CANADA EAST, (NINE MILES WEST OF MONTREAL,) FOR THE MONTH OF JUNE, 1858.

Latitude, 45 degrees 32 minutes North. Longitude, 73 degrees 36 minutes West. Height above the level of the Sea, 118 feet.

BY CHARLES SMALLWOOD, M.D., LL.D.

Day of Month.	Barometer corrected and reduced to 32° F. (English inches.)			Temperature of the Air. F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.		
	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.
1	29'907	29'781	29'840	55'1	80'9	65'6	'400	'481	'389	'84	'46	'63
2	933	862	878	60'6	78'0	63'6	'391	'416	'416	'87	'44	'72
3	30'002	861	951	54'0	75'7	61'0	'288	'413	'390	'70	'48	'74
4	29'827	614	409	53'2	68'1	63'5	321	584	543	80	87	94
5	612	678	861	60'7	72'0	62'8	367	390	399	71	50	72
6	727	431	672	54'6	63'6	61'0	355	543	511	84	94	97
7	777	657	678	60'9	84'6	72'1	511	663	631	97	57	81
8	842	815	874	59'7	70'9	58'0	323	423	372	[illegible]	59	78
9	868	804	857	56'1	64'9	56'1	391	407	570	87	63	84
10	729	446	342	57'0	59'2	57'4	445	498	445	99	99	99
11	592	674	850	59'0	62'1	51'1	410	347	270	82	64	72
12	948	861	812	59'8	66'1	57'2	210	346	407	58	54	87
13	694	647	622	54'0	57'0	55'6	308	436	420	74	94	94
14	887	676	797	35'1	65'1	56'4	411	483	420	97	78	94
15	780	700	871	60'5	78'1	60'9	456	588	456	88	62	88
16	733	714	991	55'9	76'1	63'7	420	541	569	94	60	97
17	907	799	825	61'0	83'0	72'2	473	992	668	88	64	80
18	816	603	842	70'0	92'1	65'2	531	908	483	74	60	78
19	892	755	800	60'0	69'0	60'9	374	496	473	73	70	89
20	744	689	715	62'1	81'9	70'2	491	664	557	88	62	77
21	838	797	716	65'9	85'1	66'2	444	570	536	71	47	84
22	802	844	928	76'8	85'4	68'1	476	610	516	69	50	77
23	925	824	779	58'2	87'0	77'2	446	836	907	90	65	77
24	825	717	696	74'7	93'8	80'1	552	942	800	63	61	78
25	710	582	699	74'0	96'2	71'9	680	1'055	745	81	62	95
26	714	778	814	73'0	97'2	79'2	695	1'256	612	84	72	62
27	815	805	800	70'5	89'0	78'5	578	809	738	78	59	76
28	820	821	843	34'0	84'4	67'0	568	474	393	67	45	59
29	881	811	868	39'5	83'0	62'3	462	597	523	91	55	94
30	777	792	834	54'0	75'1	60'3	282	628	456	67	73	88

Day of Month.	Direction of Wind.			Mean Velocity in Miles per hour.			Amo'nt of Rain in inches.	Amo'nt of Snow in inches.	Weather, Clouds, Remarks, &c., &c. [A cloudy sky is represented by 10, a cloudless one 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.
1	S. by W.	S. by W.	S. W.	8'12	1'62	3'22	....	....	Clear.	Clear.	Str. 2.
2	S. S. W.	S. S. W.	S. S. W.	0'20	4'47	4'65	....	....	C. Str. 6.	C. Str. 2.	Str. 2.
3	N. E. by E.	E. S. E.	S.	4'45	4'26	0'61	....	....	Clear.	Clear.	C. Str. 8.
4	E. S. E.	S. S. W.	S. S. W.	0'15	14'90	13'52	0'175	....	C. Str. 10.	Ni. 10.	Ni. 10. Thunder.
5	W. S. W.	W. S. W.	W. S. W.	16'05	15'12	7'07	....	....	Clear.	Clear.	Clear.
6	S. E. by S.	S. E.	S. W.	0'96	0'09	3'22	1'136	....	C. Str. 10.	Ni. 10.	Ni. 10. Thunder.
7	S. S. W.	W. S. W.	W. by N.	3'96	6'17	11'11	....	....	" 8.	C. Str. 6.	C. Str. 7.
8	N. N. W.	W. N. W.	S. S. W.	3'99	8'81	6'98	....	....	Clear.	Cirr. Cum. 2.	Str. 2.
9	S. S. W.	S. S. W.	S. S. E.	1'00	0'46	1'02	....	....	C. Str. 10.	C. Str. 10.	Ni. 10.
10	S. S. W.	N. E. by E.	N. E. by E.	0'71	3'81	2'22	5'775	....	Ni. 10.	Ni. 10.	Ni. 10. Distant Thunder.
11	W. N. W.	W. by N.	W. N. W.	6'70	8'95	7'60	0 400	....	C. Str. 9.	C. Str. 6.	Clear. Aurora Borealis.
12	N. E. by E.	E. S. E.	S. E.	6'96	4'05	0'12	....	....	Cirr. 4.	" 8.	C. Str. 9.
13	E. by S.	N. E. by E.	E. by S.	0'72	3'80	1'92	0'600	....	C. Str. 10.	Ni. 10.	" 8.
14	S. by W.	S. by W.	S. by E.	2'86	4'83	0'83	0'100	....	Ni. 10.	C. Str. 6.	Clear.
15	S. by W.	E. by S.	S. E. by S.	0'00	1'05	0'17	....	....	Clear.	Cirr. 6.	Str. 4.
16	S. E. by S.	S.	S. W. by S.	0'26	0'09	0'17	Inapp.	....	"	C. Str. 9.	Cum. Str. 6.
17	S. by W.	S. W.	S. S. W.	0'12	2'95	5'27	....	....	C. Str. 6.	" 9.	" 9.
18	S. W.	S. W.	N. E. by E.	5'31	6'70	7'00	Inapp.	....	Clear.	Clear.	C. Str. 10. Dist. Thunder.
19	N. E. by E.	E. S. E.	S. S. E.	3'61	2'62	0'76	....	....	C. Str. 8.	C. Str. 10.	Clear.
20	S. S. E.	S. by E.	W.	0'00	1'53	2'96	....	....	" 8.	" 4.	C. Str. 4.
21	S. by E.	S. E. by S.	S. E. by S.	0'88	0'02	0'16	....	....	Clear.	Clear.	Str. 2.
22	N. E. by E.	E. S. E.	S. E.	0'00	0'00	0'00	....	....	"	C. Str. 4.	C. Str. 4.
23	E. by S.	S. E.	S. S. E.	0'01	0'30	1'02	....	....	C. Str. 2.	C. C. Str. 9.	" 6.
24	S. E.	S. W.	E.	0'50	4'42	4'18	....	....	" 2.	C. Str. 6.	" 8.
25	S. S. W.	S. S. E.	S. W.	0'23	2'47	3'06	0'351	....	C. C. Str. 6.	" 6.	Ni. 10.
26	N. E. by E.	N. E. by E.	S. S. E.	0'16	0'22	0'75	0'119	....	C. Str. 2.	Clear.	C. Str. 2.
27	N. E. by E.	E. by N.	E. by N.	0'32	0'65	0'02	....	....	" 10.	C. C. Str. 8.	" 4.
28	N. N. E.	W. by N.	W. N. W.	0'10	8'05	8'73	....	....	" 3.	Clear.	Clear.
29	S. S. E.	E. S. E.	E. by S.	0'86	0'00	4'20	....	....	Clear.	C. C. Str. 8.	C. Str. 4.
30	N. N. W.	W.	N.	1'42	4'67	4'22			"	Clear.	Clear.

REPORT FOR THE MONTH OF JULY, 1858.

	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.
1	29'872	29'717	29'823	50'0	80'9	65'6	'258	'470	'552	'71	'52	'70
2	747	679	853	56'5	84'4	60'2	'308	'545	'536	'74	'47	'84
3	569	388	413	68'2	87'0	75'0	'543	'928	'826	'29	'72	'95
4	555	650	822	73'7	75'6	59'0	655	693	410	81	79	82
5	962	960	30'035	61'7	73'0	64'4	383	588	497	71	74	83
6	30'032	30'014	29'945	62'8	86'4	69'0	491	895	571	88	72	82
7	29'811	29'655	792	71'4	91'0	75'4	615	1'304	745	83	64	86
8	758	735	800	72'1	66'0	58'3	566	476	452	74	75	94
9	814	831	862	58'2	60'9	59'8	446	493	493	91	97	97
10	852	812	665	59'0	76'8	70'9	493	805	726	97	80	97
11	841	864	912	60'4	66'7	59'1	487	489	439	94	75	88
12	877	772	727	54'0	56'2	55'5	390	429	430	93	97	98
13	624	720	821	59'1	68'2	62'8	500	577	517	100	85	90
14	889	824	881	63'9	76'2	64'3	510	731	503	88	81	86
15	949	836	927	66'2	87'7	[illegible]	570	836	469	89	65	67
16	861	779	783	69'4	80'6	70'9	599	843	658	84	83	90
17	816	738	898	68'1	86'5	69'2	612	850	536	90	68	79
18	30'006	922	30'082	68'9	80'0	61'1	463	557	442	77	77	83
19	011	914	29'886	63'0	81'2	64'5	517	547	563	91	52	94
20	29'821	858	716	63'0	84'6	65'4	493	746	583	91	64	94
21	610	485	500	64'9	90'1	63'0	583	887	549	94	63	97
22	466	514	637	61'0	64'4	57'8	511	497	407	97	83	87
23	665	658	889	54'6	67'0	55'8	362	496	405	87	77	92
24	825	883	978	57'3	67'8	59'0	341	489	446	89	75	91
25	971	964	959	51'9	71'6	61'1	384	503	505	93	66	94
26	927	714	643	55'8	81'2	71'8	420	269	682	94	83	90
27	553	510	661	70'0	77'9	67'9	658	527	489	90	57	75
28	814	892	864	59'3	73'4	60'1	416	506	505	85	62	94
29	917	781	777	53'4	62'9	57'0	375	510	443	93	88	97
30	648	692	658	51'1	76'8	62'4	354	614	523	96	68	94
31	587	687	712	60'7	29'1	63'5	505	635	569	94	75	97

	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.
1	N. by W.	S.	S. W. by W.	4'32	4'00	6'96	....	....	Clear.	Clear.	Clear.
2	S. S. E.	E.	E.	3'30	0'51	0'32	....	....	"	"	Str. 3.
3	S. E.	S. S. E.	W.	1'27	3'37	5'50	1'206	....	C. Str. 10.	Ni. 10.	Ni. 10.
4	N. by E.	N. E.	W. N. W.	1'76	3'36	9'22	0'533	....	Clear.	C. Str. 8.	Clear.
5	W.	S.	S. S. E.	8'88	1'43	1'70	....	....	"	Clear.	"
6	S. by W.	S. by W.	S. by W.	1'32	1'01	4'25	....	....	"	"	"
7	S. W. by S.	S. by W.	S.	2'48	8'80	6'06	....	....	"	"	"
8	N. N. E.	N. N. E.	N. E.	7'15	1'40	16'08	0'800	....	Str. 4.	C. Str. 10.	Ni. 10.
9	N. E. by E.	N. E.	E. N. E.	17'83	0'37	9'02	0'746	....	Ni. 10.	" 10.	C. Str. 10.
10	N. E.	S. S. E.	S.	4'40	0'70	1'16	0'279	....	C. Str. 10.	Str. 8.	Ni. 10. Thunder.
11	N. E.	N.	E. N. E.	9'43	6'06	5'70	0'273	....	Ni. 10.	C. Str. 8.	Cum. Str. 9.
12	N. E. by E.	N. E. by E.	N. E. by E.	9'91	1'40	13'17	5'048	....	Ni. 10.	Ni. 10.	Ni. 10. Thunder.
13	N. E. by E.	S. W.	S. S. W.	13'50	6'60	7'92	1'326	....	Ni. 10.	C. Str. 10.	C. Str. 9.
14	S. S. W.	S. S. W.	W. N. W.	2'68	5'22	5'02	....	....	C. Str. 6.	Str. 2.	Str. 2.
15	S.	S.	S. S. E.	0'28	1'95	0'23	....	....	" 8.	Clear.	C. Str. 2.
16	S.	S. S. E.	S. S. E.	0'63	1'40	0'22	....	....	" 3.	C. C. Str. 10.	" 6.
17	S. W.	S. W.	N. by E.	0'53	4'20	4'77	....	....	Clear.	Clear.	Str. 4.
18	N. N. W.	N. N. W.	W. N. W.	2'77	1'60	1'05	....	....	"	"	Clear.
19	N. E.	S. by E.	S.	0'00	0'02	0'60	....	....	"	C. Str. 2.	Clear.
20	W. by S.	S.	E. by S.	0'00	0'00	1'62	0'060	....	C. Str. 10.	C. Cir. 6.	C. Str. 8. Thunder. Hail.
21	N. E. by E.	S.	E. S. E.	0'22	2'18	3'02	0'733	....	" 10.	C. Str. 8.	C. Str. 6. Thunder.
22	E. N. E.	W. by N.	W. by N.	0'11	6'31	12'61	1'030	....	" 10.	Ni. 10.	C. Str. 10.
23	S. W.	S. S. W.	S. by W.	4'51	2'08	13'02	....	....	" 10.	C. Str. 8.	" 8.
24	N. N. E.	N. E.	N. E. by E.	0'11	6'76	9'60	....	....	" 10.	Cumulus. 4.	" 9.
25	N. E. by E.	E. by S.	S. E. by S.	3'05	2'81	0'01	....	....	Str. 4.	C. C. Str. 6.	" 6.
26	S. E. by S.	S. E.	S. E.	0'02	1'13	6'15	....	....	Str. 2.	C. Str. 6.	" 9.
27	S. W.	W. S. W.	W.	0'00	0'08	16'12	....	....	C. Str. 4.	" 2.	Clear.
28	W. S. W.	W.	W. S. W.	16'81	15'82	4'05	....	....	Clear.	" 2.	Cum. Str. 4.
29	E. by S.	S. E. by S.	S. E.	0'12	0'26	0'56	Inapp.	....	C. Str. 10.	Ni. 10.	" 9.
30	E.	E. by N.	S.	0'28	0'37	0'22	....	....	C. C. Str. 6.	Clear.	" 2.
31	S. S. E.	S. S. W.	W.	0'00	1'05	0'08	0'180	....	" 6.	C. Str. 10.	" 6.

REMARKS FOR JUNE, 1858.

Barometer ..... Highest, the 3rd day, 30'002 inches. Lowest, the 10th day, 29'342 ". Monthly Mean, 29'771 inches. Monthly Range, 0'660 ".

Thermometer... Highest, the 26th day, 97°4. Lowest, the 12th day, 44°4. Monthly Mean, 67°21. Monthly Range, 53°0.

Greatest intensity of the Sun's rays, 108°4.
Lowest point of terrestrial radiation, 43°2.
Amount of Evaporation in inches, 3'09.
Mean of humidity, '756.

Rain fell on 13 days, amounting to 8'656 inches; it was raining 49 hours 15 minutes, and was accompanied by thunder on 4 days. (From 5 to 6 p.m. on the 10th day there fell 0'933 inches.)
Most prevalent wind, S. E. Least prevalent wind, N.
Most windy day, the 5th day; mean miles per hour, 12'74.
Least windy day, the 23d day; mean miles per hour, 0'00.
Aurora Borealis visible on 1 night.
The Electrical state of the atmosphere has indicated high tension.
Ozone was in moderate quantity.
Fireflies first seen on the 18th day.

REMARKS FOR JULY, 1858.

Barometer. ...... Highest, the 18th day, 30'082 inches. Lowest, the 3rd day, 29'388 ". Monthly Mean, 29'750 inches. Monthly Range, 0'674 ".

Thermometer. Highest, the 7th day, 99°3. Lowest, the 1st day, 41°3. Monthly Mean, 66°50. Monthly Range, 58°0.

Greatest intensity of the Sun's rays, 108°1.
Lowest point of terrestrial radiation, 40°6.
Amount of Evaporation in inches, 3'14.
Mean of humidity, '818.

Rain fell on 13 days, amounting to 12'214 inches; it was raining 72 hours 44 minutes, and was accompanied by thunder on 4 days. (The rivers in this vicinity rose nearly 2 feet on the 13th day, owing to the heavy and continued rain.
Most prevalent wind, N. E. by E. Least prevalent wind, N.
Most windy day, the 28th day; mean miles per hour, 12'22.
Least windy day, the 19th day; mean miles per hour, 0'20.
The Electrical state of the atmosphere has indicated rather high tension.
Ozone was present in large quantity.

MONTHLY METEOROLOGICAL REGISTER, AT MONTREAL, (LATITUDE 45° 30′ N., LONGITUDE 73° 36′ W.,) FOR THE MONTH OF JUNE, 1858.

HEIGHT ABOVE THE LEVEL OF THE SEA, 57·07 FEET.

BY A. HALL, M. D.

Day of Month.	Barometer, Corrected and reduced to Fah., 32°.			Temperature of the Air.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction and Velocity of Wind at hour of observation.			Mean velocity of the wind in miles per hour.	Amo'nt of Rain in Inches.	Clouds and their Proportion, in Numbers, from 0, Cloudless, to 10, perfectly Overcast.			OBSERVATIONS.
	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.		10 a. m.	7 a. m.	2 p. m.	9 p. m.	
1	29·973	29·938	29·950	65·5	74·8	66·0	·389	·415	·330	·63	·48	·50	W S W 3·1	S 1·0	Calm.	0·59	0·02	Cu. 2	0 0	0 0	
2	30·093	30·060	30·086	67·6	75·0	67·0	·330	·382	·346	·50	·44	·54	W 2·0	W S W 2·00	N W 7·0	3·25	....	0 0	Cu. St. 6	Cu. St. 6	
3	181	133	088	60·0	69·2	64·6	·390	·300	·314	·74	·41	·53	N 8·0	E N E 4·00	Calm.	2·05	....	0 0	0 0	0 0	Clouded during night.
4	29·984	29·752	29·534	59·4	65·0	64·0	317	451	464	62	73	77	Calm.	S 2·00	S 6·00	7·58	....	Cu. St. 10	Nim. 10	Nim. 10	Rain. High wind.
5	680	818	865	63·4	71·0	62·0	464	403	523	77	54	94	W 6·0	W S W 4·00	Calm.	2·45	0·15	Cu. 6	Cu. St. 2	Cir. Cum. 2	Aurora, clouded afterwards.
6	895	611	881	58·5	63·6	60·0	296	569	649	59	97	90	Calm.	Calm.	Calm.	0·87	....	Cu. St. 9	Nim. 10	Cirr. 1	Rain, with thunder.
7	928	841	392	60·8	80·2	72·2	255	664	559	49	62	72	S W 3·0	S S W 6·00	W S W 3·00	3·37	1·02	0 0	Cir. St. 6	Cu. 9	Rain. Distant thunder.
8	30·040	30·066	30·096	67·2	70·5	61·0	438	371	325	68	49	61	W 1·0	W N W 3·00	W N W 1·00	1·41	0·02	Strat. 1	Cu. 8	Strat. 4	
9	104	023	29·986	56·3	63·2	57·8	343	373	394	72	61	82	Calm.	S W 3·00	Calm.	0·62	Inap.	Cu. St. 10	Cu. St. 10	Nim. 10	Rain.
10	29·761	29·561	248	56·5	62·0	57·0	413	536	466	90	100	100	Calm.	Calm.	N N E 1·00	0·37	0·26	Nim. 10	Nim. 10	Nim. 10	Rain. Thunder.
11	731	853	947	58·0	65·0	56·0	423	359	282	88	58	63	N 2·0	N N W 3·00	Calm.	1·33	1·82	Cu. St. 10	Cu. St. 10	0 0	Slight rain early A. M.
12	30·092	30·060	947	59·0	63·0	59·5	323	242	317	65	43	62	N E 2·0	Calm.	Calm.	0·62	....	Cir. St. 8	Cu. St. 10	0 0	Solar Halo A. M. Meteor 10.15 P. M. Clouded night.
13	29·844	29·778	801	55·3	57·0	56·5	360	452	439	68	94	88	Calm.	Calm.	Calm.	0·72	0·01	Cu. St. 10	Nim. 10	Cu. St. 10	Clouded. Rain.
14	839	829	896	56·8	64·5	58·4	439	537	442	88	71	83	S W 4·0	S W 2·00	Calm.	1·04	0·26	Cu. St. 10	Cu. St. 10	Strat. 3	
15	924	868	853	59·5	71·0	62·5	464	638	502	77	62	78	Calm.	Calm.	Calm.	0·37	....	0 0	Cu. St. 6	0 0	
16	938	936	958	61·0	68·0	64·0	483	591	556	78	68	84	S S W 0·16	S W 6·00	S W 4·00	3·00	Inap.	Strat. 1	Cu. St. 10	Strat. 3	Clouded during night. Slight rain.
17	30·065	980	898	64·0	79·0	71·0	543	943	678	79	58	73	W S W 5·33	W S W 8·33	W S W 3·00	2·79	Inap.	Cu. St. 10	Cir. Str. 8	0 0	
18	29·872	847	848	73 0	79·5	67·0	731	868	568	74	66	67	W S W 4·00	W S W 3·66	W S W 2·66	3·66	....	Strat. 3	Cu. St. 10	Nim. 10	Slight rain. Clouded night.
19	946	901	914	61·0	66·0	61·0	457	541	413	69	60	77	N N E 2·00	N N E 1·00	W S W 1·00	0·58	0·01	Cu. St. 10	Cu. St. 10	0 0	
20	914	812	832	62·0	77·0	70·4	370	717	579	66	77	78	W S W 1·00	Calm.	W N W 1·00	1·54	....	Cu. St. 8	Cu. St. 8	Cu. 7	Distant lightning in S. at 11 P. M.
21	895	807	900	67·5	77·6	69·0	418	422	398	62	46	56	Calm.	E 1·00	S W 1·00	0·04	....	Cu. 4	Cu. 3	Cir. Cu. 8	
22	30·016	995	30·060	66·6	80·0	67·5	463	449	333	71	61	50	Calm.	Calm.	Calm.	0·58	....	Cir. 2	Cirr. 6	Cu. St. 2	
23	018	982	29·880	68·0	80·5	75·7	476	638	577	69	62	64	Calm.	Calm.	S W 7·00	2·08	....	Cu. St. 10	Cu. St. 10	Cu. St. 9	
24	29·879	770	811	73·8	89·0	79·0	718	855	772	76	62	78	W 3·0	W S W 8·00	S W 1·00	4·66	....	Strat. 2	Cu. St. 7	Cir. 7	
25	827	811	804	77·5	89·0	76·0	799	997	772	86	73	86	W 2·0	W 6·00	W 3·00	2·09	....	Cu. St. 9	Cu. St. 8	Nim 10	Thunderstorm.
26	793	846	764	74·8	85·3	80·0	785	733	785	90	61	74	Calm.	Calm.	Calm.	1·08	0·15	Cu. St. 10	Cu. 3	0 0	
27	905	863	811	73·0	83·0	79·0	510	677	751	63	00	66	N N E 2·00	N N E 1·00	N W 1·00	0·62	....	Cu. St. 10	Cir. 4	Cu. St. 10	
28	862	859	882	75·5	85·0	74·0	666	531	396	77	44	48	N 3·00	N W 3·00	Calm.	0·58	....	Cu. 5	0 0	0 0	
29	946	835	866	72·0	76·0	63·6	595	470	433	76	52	73	Calm.	Calm.	N E 8·00	1·83	....	Cu. 4	Cu. St. 10	Cu. St. 10	Rain.
30	941	862	959	68·5	75·0	63·0	469	330	356	67	40	62	N 3	E N E 2·00	N 9·00	3·50	0·01	0 0	0 0	0 0	

REPORT FOR THE MONTH OF JULY, 1858.

	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.			7 a. m.	2 p. m.	9 p. m.	
1	30·049	29·890	29·835	65·2	72·0	68·0	·451	·358	·411	·73	·46	·60	W 3	W 3	W N W 1	1·33	....	0 0	Cu. St. 3	Strat. 1	Aurora, with streamers.
2	29·489	842	878	67·8	76·2	71·0	·319	·336	·469	·47	·37	·62	Calm.	S S E 1	Calm.	2·28	....	Cu. St. 8	Cir. 1	Cir. 1	
3	728	554	497	69·5	84·0	75·0	·516	·802	·785	·70	·72	·90	Calm.	S 9	N W 1	1·37	....	Cu. St. 9	Nim. 10	Cu. 8	
4	522	827	30·016	72·5	72·0	62·0	588	644	502	74	86	78	Calm.	N E 1	Calm.	1·62	0·96	Cu. St. 5	Cu. St. 10	0 0	Auroral Light.
5	30·191	30·204	182	60·0	68·7	63·8	310	398	373	60	56	62	Calm.	Calm.	N 3	0·91	....	0 0	0 0	0 0	" "
6	212	132	070	66·8	80·0	66·0	489	487	470	75	48	73	W S W 1	S W 5	S W 5	1·91	....	0 0	Strat. 3	0 0	" "
7	29·993	29·864	29·777	72·0	84·8	76·2	524	623	639	56	53	69	W 6	W S W 10	W S W 5	6·50	....	0 0	0 0	0 0	
8	815	893	978	71·0	67·0	61·5	604	425	413	73	64	77	N 10	N N E 18	N N E 6	8·70	....	Cu. St. 5	Cir. St. 9	Cu. St. 10	
9	30·004	30·018	30·024	58·0	66·0	60·0	423	438	283	88	68	54	N E 5	N E 5	N E 7	5·05	0·46	Nim. 10	Nim. 10	Cu. St. 10	
10	29·904	29·805	29·788	59·8	73·2	70·5	487	732	695	94	90	95	N E 9	Calm.	S W 3	1·62	0·02	Cu. St. 10	Nim. 10	Cu. St. 10	Thunderstorm.
11	966	30·076	30·144	59·0	64·7	59·8	469	389	426	94	63	82	N E 9	N E 8	Calm.	6·45	0·46	Nim. 10	Cu. St. 10	Cu. St. 10	
12	30·092	29·912	29·876	54·0	57·0	56·7	390	466	420	93	100	94	N E 5	N E 6	N N E 4	4·41	0·78	Nim. 10	Nim. 10	Nim. 10	
13	29·973	820	946	61·0	68·0	63·5	537	543	478	100	79	83	N E 6	W 6	W S W 3	1·75	1·40	Nim. 10	Cu. 6	Cu. St. 10	
14	30·057	30·034	30·040	62·0	74·4	67·2	491	532	523	88	63	79	W S W 1	W S W 6	Calm.	1·83	0·01	Cu. St. 9	Cu. St. 8	Cu. St. 5	Imperfect Solar Halo.
15	098	032	044	65·2	80·0	70·0	516	487	482	84	48	66	S W 2	S W 3	Calm.	1·33	....	Cu. St. 8	Cu. St. 8	0 0	Faint Auroral Light.
16	043	29·970	29·940	70·4	79·0	72·0	621	651	595	85	66	76	Calm.	Calm.	S W 3	0·79	....	Cir. St. 1	Cu. 6	Cu. 8	
17	29·948	30·021	993	78·2	82·0	70·0	744	650	416	78	59	57	Calm.	Calm.	W S W 4	4·54	....	Cir. St. 4	Cir. St. 4	Cir. St. 2	
18	30·148	086	30·133	66·6	76·0	67·0	438	314	333	68	53	50	Calm.	W S W 2	Calm.	1·70	....	0 0	0 0	0 0	
19	218	140	29·990	66·8	75·0	67·0	303	449	425	46	52	64	Calm.	S W 5	Calm.	2·25	....	0 0	Cu. St. 6	0 0	
20	29·988	29·862	823	63·8	72·0	65·0	403	559	540	67	72	89	Calm.	S W 2	S W 1	0·91	....	Cu. St. 8	Nim. 8	Cu. St. 10	Thunderstorm. Hail.
21	723	622	688	64·4	78·0	63·5	529	588	529	89	62	89	Calm.	S W 1	Calm.	0·87	0·43	Cu. St. 10	Nim. 10	Cu. 2	Thunderstorm.
22	607	600	755	61·8	68·0	60·0	523	543	426	94	79	82	Calm.	Calm.	S W 1	0·87	0·85	Cu. St. 10	Nim. 10	Cu. St. 5	Distant Thunder.
23	820	838	901	58·8	65·9	58·8	380	353	380	76	48	76	W N W 10	N W 8	Calm.	5·35	0·64	Cu. St. 10	Cu. St. 8	Cir. 3	
24	912	30·024	30·094	56·8	69·0	59·3	407	367	242	87	52	48	Calm.	N N E 1	N N E 8	0·45	....	Cu. St. 10	Cu. St. 8	Cu. St. 9	
25	30·154	115	099	64·0	67·0	61·0	373	393	442	62	59	83	Calm.	N E 2	N E 1	0·62	....	Cu. 4	Cu. St. 9	Cir. Cu. 8	
26	30·064	29·873	29·842	63·0	76·0	70·0	446	541	621	77	60	85	N E 1	Calm.	S W 9	1·70	....	0 0	Cu. 6	Cu. 5	
27	29·632	592	782	78·0	77·0	68·7	626	492	462	65	38	65	W S W 1	W S W 2	Calm.	2·95	....	0 0	Cu. St. 10	Cu. St. 5	
28	951	943	983	64·5	72·0	66·0	451	559	438	73	72	68	N W 1	N W 3	Calm.	0·66	Inap.	0 0	0 0	0 0	Lunar Halo. Rad. 30°.5.
29	958	859	796	59·4	62·0	59·0	380	429	439	76	77	88	Calm.	Calm.	Calm.	0·04	....	Cir. Cu. 9	Nim. 10	Nim. 10	Aurora, with streamers.
30	781	724	705	56·5	68·8	64·0	443	490	433	97	68	73	Calm.	Calm.	Calm.	0·00	0·08	Cu. St. 10	Cir. St. 7	Cu. St. 5	Dense Fog early A. M.
31	710	750	813	65·8	73·8	66·0	470	497	438	73	59	68	Calm.	Calm.	N N W 1	0·45		Cu. St. 10	Cir. St. 7	Cu. St. 4	

REMARKS FOR JUNE, 1858.

Barometer ...... Highest on the 3rd day: 30·181 inches.
Lowest " 10th " 29·248 "
Monthly mean, 29·8879 inches.
Monthly range, 0·933 "

Thermometer.. Highest on the 25th day, 90°2.
Lowest " 16th " 52°50.
Monthly mean, 68°10.
Monthly range, 37°70.

Warmest day was the 25th, its mean temperature being 80°83.
Coldest " " 13th, " " " 56°36.
Greatest intensity of the sun's rays, 126°, on the 26th day.
Mean of humidity for the month, ·675.
Rain fell on 13 days during 73 hours 15 minutes, amounting to 3·73 inches.
The most prevalent wind was the W. S. W.
The least prevalent wind was the E.

No record of wind from the N.N.W., E.S.E., S.E., or S.S.E.
Cloudless days occurred on the 3rd and 30th.
At observation hours it was calm on the 2nd, 6th, 13th, 15th, 22nd and 26th.
The most windy day was the 4th day, the mean velocity being 7·58 miles per hour.
The most windy hour between 2 and 3 p. m. of the 4th day; actual velocity being 20·66 miles per hour.
The Aurora was seen on 1 night. It was not visible on 17 nights, where, if existing, it must have been seen; and the remaining nights were cloudy.
Ozone was in moderate proportion.
Two thunderstorms occurred. Distant thunderstorm heard once, and distant lightning seen also once. A Solar Halo was seen on the 1st day. Lunar Corona on 2 nights. A Meteor is alleged to have been seen on the evening of the 12th.

N. B. The rain and snow guages are noted each morning at 10 a. m,

REMARKS FOR JULY, 1858.

Barometer ...... Highest on the 19th day. 30·218 inches.
Lowest " 2nd " 29·489 "
Monthly mean, 29·9197 inches.
Monthly range, 0·729 "

Thermometer.. Highest on the 7th day: 60°4.
Lowest " 1st " 17°5.
Monthly mean, 86°3.
Monthly range, 54°0.

Greatest intensity of the sun's rays, 128°8, on the 18th day.
Warmest day was the 7th, its mean temperature being 77°66.
Coldest day was the 12th, " " " 59°60.
Mean of humidity for the month, ·608.
Rain fell on 12 days during 69 hours 10 minutes, amounting to 6·09 inches. Hail fell on 1 day.
The most prevalent wind was the N. E.
The least " " were the S., S.S.E., and N.N.W.

No record of wind from E.N.E., E., E.S.E., S.E., and S.S.W.
The most windy day was the 8th, the mean velocity having been 8·70 miles per hour.
The most windy hour between 2 and 3 p. m. of same day, the velocity having been 19 miles per hour.
A calm day occurred on the 30th.
Cloudless days occurred on the 5th, 7th, 18th, and 28th.
Ozone was in moderate ratio.

N. B. The rain and snow guages are noted each morning at 10 a. m.