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ON THE PROBABLE SUBDIVISION OF THE LAURENTIAN ROCKS OF CANADA.

BY SIR WILLIAM E. LOGAN, F. R. S.,
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Read before the American Association for the Advancement of Science, at Montreal, August 14th, 1857.

I have already indicated the probable separation of the Laurentian rocks of Canada into two great groups: that characterized by the presence of much lime and that without; but from recent investigation, the result of which has just been reported to the Canadian Government, it appears to me almost certain that the former of these two great groups will be capable of subdivision, and that some of its bands of limestone, with their associate strata, are of sufficient importance to be represented separately on the map. Having followed out one of these bands of limestone through all its windings, for a distance of eighty miles, the object of the present paper is to exhibit to the Section its geographical distribution, and the forms it presents in the physical structure of the region which it characterises. What at first appear to be two bands of these limestones, emerge from beneath the Lower Silurian series in the township of Grenville, on the Ottawa, and run into the interior parallel to one another, striking N. N. E. They are about two miles separated from one another, and both, with the gneiss between, dip in one direction, which is N.N.W., at angles varying from about 50 to 70 degrees. Attaining the rear of the township, a distance of about ten miles, the two bands unite, and are found really to constitute but one, the thickness of which, as far as I can make it out, is from 500 to 1,000 feet. It is plain from this distribution that the limestone is part of the out-crop of an undulating sheet, the ridges of which have been worn down. But in the horizontal section of an undulating surface, similar forms in the distribution of the rim, may be derived from the anticlinal or synclinal part of the undulation, and as the dips on the opposite sides are both one way, it is a question to which part the area belongs. Within a short distance of the eastern side of the limestone,—in fact touching it in one place,—an intrusive syenite makes its appearance belonging to a mass which occupies about thirty square miles in the townships of Grenville and Chatham, and runs to a point in Wentworth. The intrusion of such a mass of igneous rock can scarcely fail to have had a considerable effect in modifying the attitude of the strata which surround it. The crystalline condition of the syenite shews that it was slowly cooled under great pressure, and we cannot now say whether it was a deep-seated part of an outburst which reached the surface, as it was then constituted, or whether it was originally overlaid by masses of gneiss and limestone, which have since been worn away. In either case the probability is, that it would give to the strata, now surrounding it, an anticlinal form. It seems probable, therefore, that the western dip, belonging to the eastern band of limestone, where it approaches the syenite, is a true one, and that the form between the bands is synclinal. This appears to be corroborated by the fact that where transverse valleys occur between them, the wearing down of the intermediate gneiss widens the calcareous bands, particularly the east one, and narrows the interval.

The calcareous sheet having thus the form of a trough, the western dip of the western out-crop must be an over turn; and two spurs of the rock which point out to one another, the one turning south from the western belt, and the other north from the eastern, must constitute a subordinate anticlinal. Without reference to minor corrugations, the general form of the area would be that of two troughs joined together, each about a mile and a half wide, with an overturn dip on the west side, the one trough running north and south, and the other, as far as unconcealed by the superior fossiliferous strata, south-south-west and north-north-east. The opposite sides of this calcareous trough run into two valleys, which unite at its northern extremity. But though the limestone then crops out, the valley continues northward into Harrington, and after a short interval shows an isolated patch of limestone of about a mile and a half in length, by a mile in breadth, possessing, of course, a synclinal form. Beyond this, the valley splits into two, and while one branch runs rather north of N. E., the other turns N. of E. Each of these valleys is paved with limestone, the distribution of which shews a continuation of the synclinal form, with a bend more to the eastward than before.

The calcareous band on the western side has been traced to the north boundary of the township of Harrington, whence it crosses into Montcalm. It there appears to turn to the westward, but it has not yet been farther accurately examined. The eastern branch has been followed for between six and seven miles into Wentworth, when it appears to turn upon an anticlinal axis, and proceeding in a bearing S. S. W., for seven miles, it attains the southern boundary of the township, close upon the east side of the northern prolongation of the intrusive syenite. It runs in the same bearing for about three miles along this eastern side, into Chatham, and becomes deflected to the S. E. by the main body of the syenite, to which it runs parallel for about three miles. It then folds upon the axis of a synclinal, and running N. N. E. for upwards of five miles, returns into Wentworth, where it gradually bends round more to the eastward, and in about five miles reaches a position in the Gore of Chatham. It here folds over upon the axis of an anticlinal, and turning S. S. E. it maintains this course for about eight miles, in which it crosses into the Seigniory of Argenteuil and reaches the vicinity of Lachute, where it once more bends upon a synclinal axis, and proceeding eastward for about a mile, plunges under the Potsdam Sandstone and is lost.

In the winding course derived from the plications of the strata, the limestone usually presents a valley on the geographical surface; but to the west of all the folds that have been described, a bold ridge of gneiss runs from the front of Grenville to the rear of Harrington, the distance being about twenty miles and the bearing N. N. E. About midway, on the west side of this ridge, there are two areas about five miles long and broad, presenting the form of valleys, which are underlaid by limestone, so distributed as to render it probable that they are two outlying parallel troughs joined together, belonging to the same calcareous sheet as the one described. There would thus be four main synclinals and three main anticlinals, and the breadth they occupy altogether is about eighteen miles, giving about four and a-half miles for the breadth of each undulation.

Bands of dolomite sometimes accompany the limestone which is often interstratified with bands of quartzite. The quartzites appear to be heaviest near the junction of the limestone and gneiss, becoming thinner and less frequent as we recede from the calcareous rock. The greatest mass of quartzite met with, had a vertical measure of 400 feet, and it was in stratigraphical position beneath the limestone. The quartzite and the gneiss on each side of the limestone are often very thickly studded with garnets, and in some cases the aggregation of these is so close as to constitute a granular garnet rock. In the Gore of Chatham a band of limestone about three-fourths of a mile to the north-west of the one described, has been traced running parallel with it for seven miles. If the form which has been attributed to the first band be correct, the second would overlie it, with a great mass of gneiss between. A third band of limestone occurs about six miles north of the second; this has been traced for about four miles running east, which would be nearly parallel with the bearing of the second. In this bearing it has not yet been followed farther than to within a short distance from the line between the Seigniory of Argenteuil and the township of Abercrombie, towards the rear of both.

Continuous exposures of limestone have been met with on the west side of the Rivière du Nord, at St. Jerome. They have been followed for two miles with a north bearing, and the strike of the stratification between Saint Jerome and the rear of Abercrombie, is such as to make it probable that the St. Jerome rock will ultimately prove to be a part of the third band. A feature common to both localities is the occurrence immediately near the limestone, of immense masses of lime feldspar. North of the Argenteuil band, eight miles, examined across the stratification, consist almost entirely of it, in the form of labradorite, of which masses of the opalescent variety are in some parts enclosed in a paste of mineral without any play of colors. These feldspars are accompanied with hypersthene and ilmenite. This feldspar rock is abundant at St. Jerome, and its stratified character is conspicuously displayed, the beds running parallel with the limestone.

Mr. Hunt has traced a band of crystalline limestone for eleven miles, running diagonally across the township of Rawdon in a north bearing. On the west side of this, lime-feldspar forms the great bulk of the rock exposures for twelve miles across the measures, and shows a well-marked stratification. It appears probable that the Rawdon calcareous band is the same as the St. Jerome band, and that a synclinal axis exists between the two, the turn of the calcareous band on which is covered up by the fossiliferous rocks to the south.

In Chateau Richer below Quebec, a band of limestone occurs about a mile from the fossiliferous deposits, and to the north-west of it lime-feldspars present a breadth of eight miles. On an island near Parry's Sound on Lake Huron, Dr. Bigsby observed the occurrence *in situ* of the opalescent variety of labradorite, and the name of the mineral reminds us of the existence of the rock beyond the eastern end of the Province. It thus appears probable that a range of rock will be found winding irregularly from one end of the Province to the other, of sufficient importance to authorise its representation by a distinct color on the map, and a distinct designation in geological nomenclature.

ON DEDUCING THE MEAN TEMPERATURE OF A MONTH.

BY G. T. KINGSTON, M. A.
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Read before the Canadian Institute, December 12th, 1857.

The mean temperature of a day is commonly derived from the temperatures observed at three or more stated hours, by applying to their arithmetic mean a certain correction, the amount of which experiment has revealed: but as this method demands the personal attendance of the observer, at the stated hours—an inconvenience to which many people are unwilling to submit—it is very desirable that the maximum and minimum self-registering thermometers be made available for the same end.

It was the practice formerly to consider the arithmetic mean between the highest and lowest temperatures of a day as its *mean* temperature—an estimation in which no regard was paid to the time that the several component temperatures continued. This was obviously a very serious omission; for if the mean temperature of a day be regarded as an index of the total effect produced by heat during that day, the *duration* of the separate component temperatures ought certainly not to be left out of consideration.

The mean temperature of a *month*, when the mean temperatures of the several days that compose it are obtained by the inaccurate method referred to, will exceed the average daily minimum of the month by exactly half the average daily range; or, in other words, by a quantity derived from the average daily range, by multiplying it by the factor ½ or ·5. Now the *true* mean temperature of a month exceeds the average daily minimum by a quantity derived from the average daily range, by multiplying it by a factor which differs somewhat from ·5, and has different values in different months and in different localities. The values of these factors for each of the twelve months have been calculated for Toronto, and are given herewith. *A table is also furnished, shewing for each month and for* all ranges, from 1° to 30°, the quantities to be added to the average minimum temperatures of a month, in order to give the true mean temperature of the month.

The geographical limits within which these tables are applicable cannot be stated with precision until similar investigations have been entered into at one or more distant stations Probably, however, they may be used throughout Upper Canada as far east as Brockville and Ottawa. I regret that, owing to the manner of dividing the day, adopted in the observations on which the calculation of the tables was based, they can only be employed where the range is reckoned as the difference between the highest and lowest temperatures that occur during the period commencing and ending with 6 A.M. But as this mode is not convenient for observers in general, I propose to carry on observations with a view of forming similar tables adapted to a more convenient mode of reckoning the daily range.

TABLE I.

Giving the factors by which the average daily range of the month must be multiplied, in order to give the excess of the mean temperature of the month over the average daily minimum temperature:—

Months.	Factors.	Months.	Factors.
January..............	·5942	July.................	·4990
February.............	·5858	August...............	·5206
March................	·5772	September............	·5270
April................	·5460	October..............	·5456
May..................	·5366	November.............	·5852
June.................	·5254	December.............	·5712

TABLE II.

Shewing for each month, and for all ranges from 1° to 30°, the quantities to be added to the average daily minimum temperature of the month, in order to give the true mean temperature of the month. The nine upper rows will serve, also, as a table of proportional parts for tenths and hundredths of a degree in the range, by moving the point one or two places to the left:

Range.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.59	0.59	0.58	0.55	0.54	0.53	0.50	0.52	0.53	55	0.59	0.57
2	1.19	1.17	1.15	1.09	1.07	1.05	1.00	1.04	1.05	·9	1.17	1.14
3	1.78	1.76	1.73	1.64	1.61	1.58	1.50	1.56	1.58	64	1.76	1.71
4	2.38	2.34	2.31	2.18	2.15	2.10	2.00	2.08	2.11	..18	2.34	2.28
5	2.97	2.93	2.89	2.73	2.68	2.63	2.50	2.60	2.64	2.73	2.93	2.86
6	3.57	3.51	3.46	3.28	3.22	3.15	2.99	3.12	3.16	3.27	3.51	3.43
7	4.16	4.10	4.04	3.82	3.76	3.68	3.49	3.64	3.69	3.82	4.10	4.00
8	4.75	4.69	4.62	4.37	4.29	4.20	3.99	4.16	4.22	4.36	4.68	4.57
9	5.35	5.27	5.19	4.91	4.83	4.73	4.49	4.69	4.74	4.91	5.27	5.14
10	5.94	5.86	5.77	5.46	5.37	5.25	4.99	5.21	5.27	5.46	5.85	5.71
11	6.54	6.44	6.35	6.01	5.90	5.78	5.49	5.73	5.80	6.00	6.44	6.28
12	7.13	7.03	6.93	6.55	6.44	6.30	5.99	6.25	6.32	6.55	7.02	6.85
13	7.72	7.62	7.50	7.10	6.98	6.83	6.49	6.77	6.85	7.09	7.61	7.43
14	8.32	8.20	8.05	7.64	7.51	7.36	6.99	7.29	7.38	7.64	8.19	8.00
15	8.91	8.79	8.66	8.19	8.05	7.88	7.49	7.81	7.91	8.18	8.78	8.57
16	9.51	9.37	9.24	8.74	8.59	8.41	7.98	8.33	8.43	8.73	9.36	9.14
17	10.10	9.96	9.81	9.28	9.12	8.93	8.48	8.85	8.96	9.28	9.95	9.71
18	10.70	10.54	10.39	9.83	9.66	9.46	8.98	9.37	9.49	9.82	10.53	10.28
19	11.29	11.13	10.97	10.37	10.20	9.98	9.48	9.89	10.01	10.37	11.12	10.85
20	11.88	11.72	11.54	10.92	10.73	10.51	9.98	10.41	10.54	10.91	11.70	11.42
21	12.48	12.30	12.12	11.47	11.27	11.03	10.48	10.93	11.07	11.46	12.29	12.00
22	13.07	12.89	12.70	12.01	11.81	11.56	10.98	11.45	11.59	12.00	12.87	12.57
23	13.67	13.47	13.28	12.56	12.34	12.08	11.48	11.97	12.12	12.55	13.46	13.14
24	14.26	14.06	13.85	13.10	12.88	12.61	11.98	12.49	12.65	13.09	14.04	13.71
25	14.86	14.65	14.43	13.65	13.42	13.14	12.48	13.02	13.18	13.64	14.63	14.28
26	15.45	15.23	15.01	14.20	13.95	13.66	12.97	13.54	13.70	14.19	15.22	14.85
27	16.04	15.82	15.58	14.74	14.49	14.19	13.47	14.06	14.23	14.73	15.80	15.42
28	16.64	16.40	16.16	15.29	15.02	14.71	13.97	14.58	14.76	15.28	16.39	15.99
29	17.23	16.99	16.74	15.83	15.56	15.21	14.47	15.10	15.28	15.82	16.97	16.56
30	17.83	17.57	17.32	16.38	16.10	15.76	14.97	15.62	15.81	16.37	17.56	17.14

NOTES ON LATIN INSCRIPTIONS FOUND IN BRITAIN.

PART I.

BY THE REV. JOHN McCAUL, LL.D.,
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Read before the Canadian Institute, 12th December, 1857.

(1.) Of the Roman remains, which are scattered over different parts of Europe, there are probably none which presented so great difficulties to the antiquary as certain small greenish stones of a quadrilateral form, with intagliated inscriptions, in Latin, on their edges. Schmidt, in his work "Antiquitates Neomagenses" (the Antiquities of Nimiguen) seems to have been the first who directed attention to them, but he was himself unable to decipher them, or to determine their use. Since his time, however, the subject has been explained and illustrated by Spon, Chishull, Caylus, Saxe, Walche, Gough, Tochon, Sichet, Duchalais, Way, and Simpson,* so that there now remains no doubt that they were medicine stamps used by the Roman physicians or empirics for marking their drugs or preparations, especially for diseases of the eyes.

One of the most interesting of these stones, inasmuch as it presents very great difficulties in interpretation, is that which was found at Bath, in a cellar in the Abbey yard, in 1731. "It was shewn to the Society of Antiquaries in London, at that time and twice afterwards. Mr. Lethieullier gave them a cast of it in plaster, and in 1757, the stone itself was the property of Mr. Mitchell. It is square, of a greenish cast and perforated." Dr. J. Y. Simpson, (Edinburgh Medical Journal, March, 1851,) informs us that he "had attempted to trace out the present proprietor of the stamp, with a view of ascertaining, more correctly, the exact nature of the inscriptions; but that these efforts were quite unsuccessful." Fortunately, however, "some manuscript notices of this Bath stamp exist in the minute books of the Antiquarian Society, with an impression taken with ink from the inscriptions." From a comparison of these notices with the copies of the inscriptions given by Gough (Archæologia, vol. IX., p. 228,) Dr. Simpson has determined the reading and interpretation of two of the legends with certainty, and of the third with some probability, whilst he states that the fourth side "offers the most puzzling of all the inscriptions hitherto found upon the Roman medicine stamps discovered in Britain." It is to this inscription that I now desire to direct attention. Mr. Gough (Archæologia, vol. IX., p. 228,) reads it:

T· IVNIANI HOFSVMADρV
EC VMODELICTA A MEDICIS.

and Dr. Simpson offers the following explanatory remarks:

"This fourth legend on the Bath stone offers the most puzzling of all the inscriptions hitherto found upon the Roman medicine stamps discovered in Britain. As Mr. Gough gives it, the last words of the inscription (DELICTA A MEDICIS —esteemed by physicians,) are alone intelligible. The plaster cast of this side of the seal, contained in the Museum of the Antiquarian Society of London, contains an extremely imperfect copy of the second line, and not an over perfect one of the first; but we see enough of it to be quite aware of the great carelessness with which Mr. Gough had originally copied the whole inscription. The second last letter in the line is not the Greek ρ, but the Latin Q; and the name of the

* Dr. Simpson's articles in the Edinburgh Medical Journal, January and March, 1851, afford ample and satisfactory information, relative to the stamps found in the United Kingdom.

collyrium is not HOFSUM, as he gives it, but apparently PHOEBUM. At all events there is a P, which he has omitted, before the H; and the two medial letters, which he read FS, are seemingly EB. Such is the conclusion to which the examination of the lettering of the cast itself forces me; and what is much more important, because affording far stronger evidence than mine, Mr. Akerman reads this inscription in the same way. I may add that (as I am informed by the same gentleman,) the word is copied and written as PHOEBUM, in the several notices contained in the minute-books of the Antiquarian Society, and to which I have already referred; and Gough's *p* always given as Q.

Still, with all these emendations, I confess myself quite at a loss to decipher, satisfactorily, the inscription. The spelling of all the inscriptions on this stamp is executed very carelessly,—as in *crsomaelinum* for *crysomelinum; thalaser* for *thalasser;* and possibly the term QUECVMO may be a mis-spelling, by the engraver, for LEUCOMA. If so, the inscription would stand as

T JUNIANI PHOEBUM AD LU
ECOMA DELICTA A MEDICIS.

"*The Phoebum of T. Junianus for Leucoma, esteemed by physicians.*"

I am not aware that any of the old authors have described a collyrium under the name of PHOEBUM. But it looks like one of those high-sounding titles which the oculists were so fond of selecting and assuming, and we find described in their works collyria with such semi-astronomical appellations, as *Sol, Aster, Lumen, Phos, &c.*

I shall venture only one more remark, viz: the possibility of the term being PHORBIUM and not PHOEBUM. 'The Phorbium,' observes Galen, 'possesses attenuating, attractive, and discutient powers. They apply its seeds mixed with honey to Leucoma, and it is believed to have the power of extracting spicula of wood.'

The obvious objections to Dr. Simpson's interpretation are :—

1st. That we should have had *delictum* and not *delicta*.

2nd. That the participles *dilecta* or *delecta* are confused with *delicta*.

3rd. That his interpretation requires us to regard *quecumo* as a misspelling for *leucoma*.

As the circumstances seem to warrant a resort to conjecture, I would suggest PHOEDVM for PHOEBVM, and QVECVMQ for QVECVMO; and read the whole legend thus :—

T. IVNIANI PHOEDVM ADQV
ECVMQ DELICTA A MEDICIS.

i. e. T. IVNIANI PHOEDVM AD QVECVMQ DELICTA A MEDICIS.

It will be observed that the only conjectural variations are D for B and Q for O.

PHOEDVM, I regard as the Latinized form of ΦΟΙΔΟΝ or ΦΩΙΔΟΝ, derived from φώζω, whence φοῖδες or φῷδες, used by Aristotle, Probl. 38,7, Aristophanes, Plut. 535, and Hippocrates, Œcon. p. 404. Ed. Foes.

already cited by Liddell and Scott, and φῶδον, given by Suidas. QVECVMQ I regard as a contracted form of *quæcumque*, the E being used for AE, and the final Q for QVE, both of which uses are familiar to those conversant with Latin epigraphy. DELICTA is the participle of *delinquere;* or is used for *derelicta* from *derelinquere*, as in Ennius "delicto Coclite" (if that be the true reading) for "derelicto Coclite;" or it may be that the correct reading is RELICTA. The word thus admits of two interpretations, either "badly treated" or "given up." The meaning of the inscription, according to the reading which I propose, may be expressed thus: "The blistering (collyrium) of Titus Junianus for such (hopeless) cases as have been given up by the physicians."

If PHOEBVM be the true reading, I am inclined to regard the designation as selected with a view to the supposed superiority of Apollo to his son Æsculapius, and of course to the *medici* the sons of Æsculapius.

This universal specific was, perhaps, used on the principle of counter-irritation. Another panacea is noticed on the stamp found near Cirencester (the ancient Corinium) in 1818, and described by Buckman and Newmarch:

MINERVALIS MELINV [m]
AD OMNEM DOLOREM.

It may, I think, be safely inferred from the Bath inscription, if my interpretation be correct, that the stamp did not belong to a regular *medicus*, but to an empiric, possibly one of the *iatroliptæ*.

The difficulty in interpreting another legend on this stamp arises from the impossibility of determining the true reading of one of the words. In the books of the Society of Antiquaries the legend is given thus:

T. IVNIANI DIEXVM AD VETeRES CICATRICES.

Dr. Simpson conjectures DIAMYSVM (the name of a well known collyrium) for the inexplicable DIEXVM; but from the copy by Gough it appears that the letters between D and M are in a rude Britanno-Roman character, and that "the disputed word may perhaps be more correctly read DRYCVM or DRYXVM," which Dr. S. interprets as a preparation from the bark, acorn, or galls of the *Drys*, *i.e.* oak. Can it be that the word is formed from *Druidæ* or *Dryidæ*, and that both the appellation and the characters were adopted with a view to securing its sale amongst the native population?

(2.) In Nether Hall is preserved a Roman altar, found in the camp at Maryport, *(Olenacum,)* which bears the following inscription:

DEAE
SETLO
CENIAE
L. ABAR
EVS CE
V. S. L. M.

Dr. Bruce, in his very interesting and learned description of "the Roman Wall" (2nd Edit. London, 1853, p. 400,) has figured it, and offers the following remark relative to the interpretation:

"Nothing is known of the goddess Setlocenia, to whom the altar seems to have been dedicated by Lucius Abareus, a centurion."

Although I have not seen the stone, I have little doubt that *Setlocenia*, which has been regarded* as the name of an unknown goddess, is composed of significant parts, and should be expanded into SANCTAE ET LOCI GENIO.

It is impossible to determine, without examination of the original, the exact appropriation of the letters, but it seems to me plain that S is for *Sanctæ*, (as is frequently found,) and *et* unaltered, whilst it appears probable that LO is for *loci;* that C is a mistake for G, thus giving GEN for *genio;* that I is a mistake for L or T, the centurion's names being *Lucius* or *Titus Ælius Abareus;* or GENI for *genio*, without any prænomen. CE is of course for *Centurio*, and V.S.L.M the usual final formula.

Another reading, which might be suggested, of GENIAE as the feminine form of *genius*, is liable to the objection, that the word never occurs, so far as I am aware, in any ancient author or inscription. The only place in which I have seen it, is Heyne's note on Tibullus, IV. 6 1.

(3.) Some of the most interesting and abundant memorials of the military occupation of Britain by the Romans, are connected with the Tungrian auxiliaries, mentioned by Tacitus (Agric. 36,) in his description of the defeat of Galgacus by Agricola. Amongst the numerous altars erected by members of these cohorts are two, found at Birrens, (*Blatum Bulgium*,) in Annandale, Scotland, which present similar difficulties of interpretation. The inscriptions on them (as given in Stuart's "Caledonia Romana," Edinburgh, 1852, p. 128, 2nd edition, by Prof. Thomson, King's College, Aberdeen,) are:

* Vide Camden's Brit. Ed. Gough, III. p. 438.

(1.)	(2.)
DEAE VIRADES	DEAE RICAGM
THI PAGVS CON	BEDAE PAGVS
DRVSTIS MILI	VELLAVS MILIT
IN COH II TVN	COH II TVNG
GR. SVB SIVO	V. S. L. M.
AVSPICE PR	
AEFE.	

Stuart's observations on No. (1) are:

"With some few alterations—and considerable allowance made for the errors that may occur in deciphering those time-worn legends—the [inscription] may be translated somewhat as follows:—"*To the goddess (or deified)* – – – –, *Thiasus Pagus Condrustus, a soldier of the second Cohort of the Tungrian auxiliaries, commanded by Sivus Auspicius, Prefect, (dedicates this altar.)* We are at a loss to discover the meaning of the word VIRADES; perhaps it has been erroneously copied [by Pennant,] and ought to be read DRYADES or OREADES; in which case the difficulty vanishes, and we have the German soldier offering up his vows to a particular and perhaps tutelary class of the *Deæ Nymphæ*."

On the inscription No. (2) Prof. Thomson offers the following note:

"The altar appears to be dedicated to some provincial deity, possibly Ricagmena Beda by name, by a soldier of the Second Cohort of Tungrians, Pagus Vellaus, (vide Preh. Ann. p. 398,) or, to avoid imputing a serious grammatical error to the sculptor, by *two* soldiers, Vellaus and Pagus."

Subjoined is the passage in the "Prehistoric Annals of Scotland," to which reference is made in the note:

"It appears to be dedicated by Pagus Vellaus to one of those obscure local deities, apparently provincial names with Latin terminations, which are more familiar than intelligible to the antiquary. It belongs to a class of Romano-British relics which is peculiarly interesting, notwithstanding the obscurity of their dedications, as the transition-link between the Roman and British mythology. These altars of the adopted native deities are generally rude and inferior in design, as if indicative of their having their origin in the piety of some provincial legionary subaltern. In the obscure gods and goddesses, thus commemorated, we most probably recognise the names of favourite local divinities of the Romanised Britons, originating for the most part from the adoption into the tolerant Pantheon of Rome of the older objects of native superstitious reverence."

Henzen (in the 3rd vol. of Orelli's Inscrip. Lat. *Turici*, 1856) gives the first inscription from the 1st Edit. of Stuart's Caledonia Romana, and subjoins the brief notes:

"Nomina barbara fortasse etiam corrupta." "MILIT (*avit*)" "TVNGROR." "corr. PRAEF, cujus nomen male lectum est."

Having stated the opinions of others, I shall now proceed to offer my own views on the subject.

PAGVS, in both inscriptions, I regard, not as a proper name, but as the ordinary term, used by Cæsar and Tacitus, for "a district." Vide Cæsar, B.G. i. 37; iv. 1; and Tacitus, Germ. 39. CONDRVSTIS (or perhaps CONDRVSTVS—a form used in the middle ages) and VELLAVS are, in my judgment, ethnic adjectives, the former derived from CONDRUSI, the latter from VELLAI. The *Condrusi* and *Vellai* are both mentioned by Cæsar (B.G. ii. 4, and vii., 75.) The *Condrusi* were neighbours of the *Eburones*, who were succeeded by the *Tungri*. The *Vellai, Vellavi, Vellavii, Vellauni,* or *Velauni* were a people of Gallia Celtica, or Aquitania, as the latter term was extended in signification under Augustus.

They are noticed by Strabo, (iv. 2.) and Pliny, (iii. 20,) and their name is found in inscriptions: e. gr.

ETRVSCILLAE
AVG· CONIVGI
AVG· N̄
CIVITAS VELLAVOR
LIBERA.

The Etruscilla mentioned in this inscription is Herennia Cupressenia Etruscilla, the wife of the emperor Trajanus Decius, which fixes the date to the middle of the 3rd century after Christ.

Libera of course indicates the independence of the Vellavi, which they enjoyed, however, in the time of Strabo, although in that of Cæsar, (B.G. vii. 75,) they were in subjection to the Arverni.

For other inscriptions relative to this people, vide Mem. des antiquaires de France, iv., pp. 87 and 528.

MILI (or MILT) and MILIT are abbreviations of *militans*—not of *militavit*, as Henzen states, for the verb is in the omitted final formula—SIVO (or SIVOD, the ancient form of the dative and ablative, as given in the illustration,) is an erroneous reading of SILVIO, as appears from the following inscription also found at Birrens:

MARTI ET VICTO
RIAE· AVG· C· RAE
TI MILIT· IN COH
II TVNGR· CVI·
PRAEEST SILVIVS
AVSPEX PRAEF·
V S L M.

The names of the goddesses, as they appear in the inscriptions, I regard as VIRADESTHI, (or VIRADETHI, as it is given in the lithographic representation in the "Caledonia Romana,") and RICAGM-

BEDAE, or perhaps the latter is formed of two words. Nothing is known of these deities. They may possibly have been, connected with the towns Virodunum (*Verdun*) and Rigomagus (*Remagen*); and it appears to me more probable, that they were local deities of those who erected the altars, than that they were adopted from the Britons. If the reference to *Rigomagus* be correct, it may be inferred that the Vellavians, serving in a Tungrian cohort, adopted a Tungrian deity.

According to the views which I have stated above, I should translate the inscriptions thus:

(1.) "To the goddess Viradesthi (or Viradethi) the Condrusian district, (*i. e.* the men from that district) serving in the Second Cohort of the Tungrians, under the command of Silvius Auspex Præfect."

(2.) "To the goddess Ricagm*a*beda the Vellavian district, (*i. e.* the men from that district) serving in the Second Cohort of the Tungrians," &c., &c.

Since the foregoing remarks were written, I have seen the 3rd vol., Part iv. of the "Collectanea Antiqua" by Mr. C. Roach Smith, in which that learned and ingenious antiquary offers his views relative to the two altars which have been under consideration. From these I find that he has anticipated me as to the interpretation of *pagus*, the reference to *Rigomagus*, and the emendation of the præfect's name. After a careful consideration, however, of his interpretations, I see no reason for changing the opinions which I had previously expressed.

Subjoined are his remarks:

"I propose reading it (inscription 2,) thus: 'To the Goddess Ricamaga of the district (*Pagus*) of Beda, Vellaus, serving in the Second Cohort of the Tungri, in discharge of a vow, willingly dedicates.' The *Bedæ Pagus* was a tract on the line of the Roman road, from Treves to Cologne, some trace of the original name of which is retained in that of its modern representative Bitburg. In this region was a station or town, called *Rigomagus* or *Ricomagus;* and to this place, I suspect, may the Goddess of the Birrens altar be referred; especially as the dedicator was a Tungrian. The word *pagus* is not unfrequently found in the sense in which it here appears in similar inscriptions. Mr. Stuart gives one, copied by Pennant, and also found at Birrens, which was erected also by a Tungrian, to the goddess of the Viradesthian (?) Pagus. Mr. Stuart's reading of the first part is evidently erroneous; and equally so *Sivus Auspicius*, as we may be assured by fig. 2 of our plate" (giving the inscription already noticed,) "where we have the same prefect in the nominative case, *Silvius Auspex*."

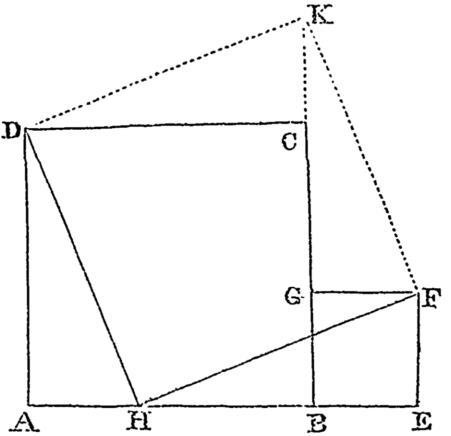
A decisive objection to Mr. Roach Smith's interpretations is that they are inconsistent with *pagus* in the nominative case. His reference to *Bedæ Pagus* seems to confirm the conjecture, that *Ricagmbedæ* was composed of two words, of which the latter *bedæ* was the name of the goddess. Hence *Beda vicus,* (now Bitburg), in the route *a Treviris Agrippinam,* as given in the Itinerary of Antoninus, derived its appellation; and from it came *Pagus Bedensis,* which is noticed in Wesseling's note. Vide Vet. Rom. Itiner. *Amstel.* 1735, p. 373.

NOTE ON THE PROPOSITIONS OF PYTHAGORAS AND PAPPUS.

Read before the Canadian Institute, Dec. 19th, 1857.

The following elegant construction is given by Prof. De Morgan in the Quarterly Mathematical Journal, (Vol. I. page 327,) as due to the Astronomer Royal.

Let A B C D, B E F G be two squares forming a gnomon; take A H equal to B E; join H F, H D. Translate without rotation each of the triangles A H D, H E F along the hypothenuse of the other (coming into the positions indicated by the dotted lines): a square H K is then formed equal to the original two together.

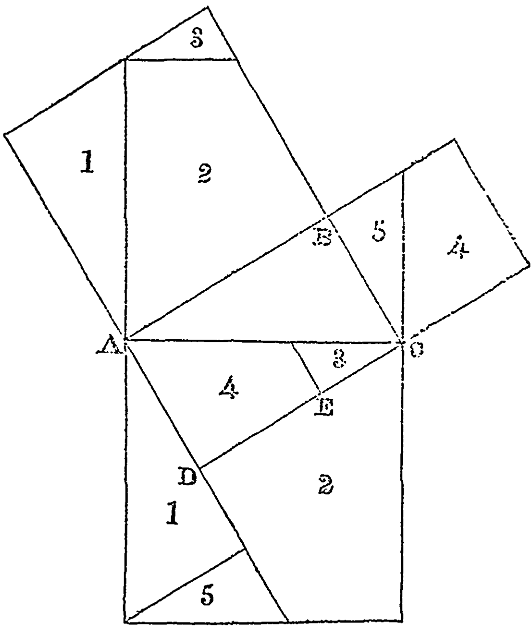


Professor De Morgan remarks that the proof thus obtained of the Pythagorean Proposition (Euclid I. 47) is the simplest that has yet been devised. The original squares are plainly those on the sides of the right-angled triangle H E F, and the new square that on the hypothenuse.

Precisely the same method may be employed when, instead of squares, we have two parallelograms forming a gnomon: in this case the resulting figure will also be a parallelogram, and, adopting the same letters as in the figure, its other side will be equal and parallel to

E C. This affords an easy proof of the well known theorem of Pappus, of which the Pythagorean is a particular case. For, referring to the triangle H E F, (E being not now a right-angle,) the parallelograms are those constructed on the sides H E, E F, and we can change them into any others on the same bases and between the same parallels without altering their areas, the point C remaining also fixed. Also, if the parallelograms be constructed on the outside, the point corresponding to C will be on E C produced backwards to an equal length. Hence we have the following proposition which is that of Pappus slightly extended, "If on the two sides of a triangle as bases any two parallelograms be constructed, (both on the inside, or both on the outside,) they will together be equal to a parallelogram constructed on the base of the triangle and having its other side equal and parallel to the line joining the vertical angle of the triangle with the point which is the intersection of the sides which, in each of the two parallelograms, are opposite to the respective bases."

The following mode of dissecting the square on the hypothenuse so



as to fill up the squares on the sides of a right-angled triangle is probably not new, though I have nowhere met with it. It is at once deducible from the preceding. In the figure, B is the right angle in the triangle A B C. The lines within the square on the hypothenuse are drawn parallel to the sides of the triangle and D E is taken equal to A D or B C. Precisely the same dissection serves for the proposition of Pappus, the parallelograms constructed on the two sides, and on the outside of the triangle, being first changed into two others (without altering their areas) having their sides coincident in direction with the sides of the triangle. D E is to be taken equal to that side of the parallelogram on whose production it lies, and the figure marked 5 in the parallelogram over the base is to be translated without rotation to its new position at the top of its parallelogram on the side, and not as represented in the figure which is correct only in the case of rectangles. J. B. C.

REVIEWS.

The St. Lawrence and the Saguenay, and other Poems. By Charles Sangster. Kingston, C. W.: John Creighton and John Duff, 1856.

Poems. By Alexander McLauchlan. Toronto: John C. Geikie, 1856.

Oscar and other Poems. By Carroll Ryan: Hamilton, Franklin Press, 1857.

A Song of Charity [*Canadian Edition.*] Toronto: Andrew H. Armour & Co., 1857.

Poetry is the natural progeny of a nation's youth. It is the eldest as well as the fairest, of the offspring of literature; if indeed it be not rather her parent, for songs were sung long before letters were invented. Our Province, however, occupies a singular position in this its Canadian youth. Our schooling has been too much alongside of the elder of Europe's nations, and our individual thoughts partake too largely of the experience which centuries have accumulated around the old Saxon hearth, to admit of the lyrical or epic muse inspiring for us the lay that is born of nature in the true poet's heart. We are past the first poetic birth-time, which pertains to the vigorous infancy of races; we have yet to attain to the era of refinement from which a high civilization educes new phazes of poetic inspiration. We cannot yet respond, amid these charred stumps and straggling snake-fences of our rough clearings, to Hiawatha's appeal to those:

Who love the haunts of nature,
Love the sunshine of the meadow,
Love the shadow of the forest,
Love the wind among the branches,
And the rain-shower and the snow-storm,
And the rushings of great rivers,
Through their palisades of pine-trees.

We want our pine-trees for lumber, and so long as they spare us a surplus for kindling wood, we ask no kindling inspiration from them. The rushing of our great rivers we estimate rejoicingly—for their water-privileges. The sunshine of the meadow is very welcome to us —in the hay-harvest; and the poetry of the snow-storm full of the music—of our sleigh-bells. As to our love for the shadow of the forest, that pertains to the romantic simplicity of our squatter stage of infancy, from whence we emerge as fast as possible into the clearing we hew out of it, rejoicing at the crash of falling pines, and keeping time with the music of the axe to the crackling of the logging-pile. We do not mean to say that a poet is an imposibility, amid the rugged realism of this vigorously practical Canada. The ungenial Ayrshire farm of Mosgiel gave no greater promise of a crop of poetry from its bleak and exposed heights before it gave birth to its "Mountain Daisy." But we wonder what would be the estimate of the emigrant settler who should apostrophise the giants of the Canadian back-woods, as they bowed beneath his sturdy stroke, after the fashion of the Ayrshire bard to the "wee, modest, crimson-tipped flower" over which he so reluctantly drove the ploughshare. We question much if our minister of agriculture could be induced to rescue from the rapidly dispersing ordnance reserves a Sabine farm for such a Canadian Virgil.

Such being the present prospects of the poet amongst us, it is not greatly to be wondered at that such poetry as we do produce is less redolent of "the odors of the forest" than of the essences of the drawing-room; and more frequently re-echoes the songs that are to be gathered amid the leaves of the library-shelf, than under those with which the wind sports among the branches whereon song-birds warble their nuptial lays. To the class of poetry which thus repeats the old-world music and song we must assign Mr. Sangster's "St. Lawrence and the Saguenay." It is a pleasant and tasteful depiction of the scenes and associations of our noble river, written in the same stanza as "Childe Harold," and with some echo of its mode of thought, though lacking the force and pathos of its passionate utterances. But, while we may easily cull from it many graceful versifications of such descriptions as the scenery naturally suggests, we have to search carefully through its hundred and ten stanzas to find any such as might be welcome to the jaded fancy of the old world because of their freshness of wild-wood imagery. Campbell has written, in the same stanza his "Gertrude of Wyoming," and sketched very pretty Indian pastorals, such as delighted the London drawing-rooms into the belief that "the mute Oneyda," and the savage Outallissi were the perfect embodyments of our American Aborigines. They do not, however, awaken any very familiar associations for us to whom the scenery, and even the Savage of the wild West, are not unfamiliar. But the poet of "the St. Lawrence and the Saguenay," sees the river as it is, and not as it was. To him, with all its beauty, it is only the great navigable highway from Ontario to the Sea, with its daily steamers, its wooding stations, its locks and canals. If the Indian lingers among its vanishing woods, it is as the old painted British Druid haunts Avebury or Stonehenge. Here, for example, is the picturing of the thousand Isles:—

> Many a tale of legendary lore
> Is told of these romantic Isles. The feet
> Of the Red Man have pressed each wave-zoned shore,
> And many an eye of beauty oft did greet
> The painted warriors and their birchen fleet,
> As they returned with trophies of the slain.
> That race has passed away; their fair retreat
> In its primeval loneness smiles again,
> Save where some vessel snaps the isle-inwoven chain:
>
> Save where the echo of the huntsman's gun
> Startles the wild duck from some shallow nook,
> Or the swift hounds' deep baying, as they run,
> Rouses the lounging student from his book;
> Or where, assembled by some sedgy brook,
> A pic-nic party, resting in the shade,
> Spring pleasedly to their feet to catch a look
> At the strong steamer, through the watery glade,
> Ploughing, like a huge serpent from its ambuscade.

Were we to transport the scene to the firth of Clyde, or any other islanded home river, and change only a single term; that of the *Red Man* for the *old Pict*, or even the *Red Gael*, there is nothing in the description that would betray its new-world parentage, At best it is no true Indian, but only the white man dressed in his attire; strip him of his paint and feathers, and it is our old-world familiar acquaintance. The lay of the Whip-poor-will, instead of some romantic Indian legend, is but a commonplace "Willie and Jeannie" love song, though thus heralded by one of the best stanzas in the poem:

> The Whip-poor-will, among the slumberous trees,
> Flingeth her solitary triple cry
> Upon the busy lips of every breeze,
> That wafts it in wild echoes up the sky,
> And through the answering woods, incessantly.
> Surely some pale Ophelia's spirit wails
> In this remorseless bird's impassioned sigh,
> That like a lost soul haunts the lonely dale!
> *Maiden sing me one of thy pleasing madrigals.*

However much taste and refinement may be displayed in such echoes of the old thought and fancy of Europe, the path to success lies not in this direction for the poet of the new world. To Tennyson this nineteenth century is as fresh an *el dorado* as America was to Cortes or Pizaro. To him it is a thing such as Spenser, or Dryden, or Pope, or Campbell, or Byron, had no knowledge of. Its politics, its geology, its philosophy, its utopian aspirations, its homely fashions and fancies, all yield to his poetic eye suggestive imagery rich with pregnant thought. And surely our new world is not less suggestive. It is not a "Hiawatha" song we demand. The Indian Savage is not the sole native product of the wilds, nor the only poetical thing that meets the eye in the clearings. Here is the Saxon doing once again, what Ælla and Cerdic did in old centuries in that historic isle of the Britons. Science and politics, and many a picturesque phaze of colonial life, all teem with inspiration such as might awake for a Canadian Tennyson another "Sleeping palace" like that from whence he led his happy princess:

> "When far across the hills they went;
> In that new world which is the old."

Poetry, however, is not the crop which it can at all be expected, or indeed desired, that Canadian farmers will cultivate at present. And if we can only reproduce exotic thoughts in verse, it is better on the whole that we should take the foreign originals at first hand. Having, however, stated our feeling in regard to the absence of that originality and individuality of character in "The St. Lawrence," which might have made of such a virgin theme a poetic gem of rarest beauty; we may nevertheless, refer with pleasure to some of its stanzas as grace-fully commemorating historical features. Here, for example, is a good subject not discreditably dealt with :—

> The inconstant moon has passed behind a cloud,
> Cape Diamond shows its sombre-colored bust,
> As if the mournful night had thrown a shroud
> Over this pillar to a hero's dust.
> Well may she weep ; hers is no trivial trust ;
> His cenotaph may crumble on the plain,
> Here stands a pile that dares the rebel's lust
> For spoliation : one that will remain—
> A granite seal—brave Wolfe ! set upon Victory's fane.
>
> Quebec ! how regally it crowns the height,
> Like a tanned giant on a solid throne !
> Unmindful of the sanguinary fight,
> The roar of cannon mingling with the moan
> Of mutilated soldiers years agone,
> That gave the place a glory and a name
> Among the nations. France was heard to groan ;
> England rejoiced, but checked the proud acclaim—
> A brave young chief had fallen to vindicate her fame.
>
> Wolfe and Montcalm ! two nobler names ne'er graced
> The page of history, or the hostile plain ;
> No braver souls the storm of battle faced,
> Regardless of the danger or the pain.
> They pass'd unto their rest without a stain
> Upon their nature or their generous hearts.
> One graceful column to the noble twain,
> Speaks of a nation's gratitude and starts
> The tear that valor claims, and feeling's self imparts.

The poem is manifestly designed as a companion, if not a guide-book, for the voyage to the Saguenay ; and though it has in it none of those magical passages which stir the heart like the sound of a trumpet, it will nevertheless make an agreeable return to the tourist for the small space it claims in his baggage.

Of the poems issued from the Hamilton Franklin Press, the principal one, entitled "*Oscar*," is a picture of the Crimean War, written by a young Canadian, who witnessed and bore a part in the scenes he describes. The plan of his poem, however, embraces a sketch of Canadian scenery, as noted by the imaginary hero, on his way to the seat of war, and so furnishes another view of the same picturesque and historic landscape which has been already drawn by the poetic pencil of Mr. Sangster. Here, for example, is Mr. Ryan's sketch of the Thousand Isles:—

Now Fairy Land is gained—the Thousand Isles—
Amid whose cedar shades sweet Nature smiles
In all the beauty of a scene unchanged,
As when the Indian warrior ranged
From isle to isle, long centuries ago,
And chased, with swift canoe, the nimble doe.
Those shady rocks the softest sound prolong,
As when they echoed to the Squaw's low song,
Who dipped her paddle in the dancing stream,
And watched the sun's last lingering beam,
As he, behind the forests of the west,
In dazzling glory slowly sank to rest.
Each isle an emerald, each rock a gem,
Which forms proud Nature's own bright diadem!
Those wilds again the Indian ne'er will know,
Nor will those waters, in their joyous flow
Bear savage forms unto the depths below.

Niagara is described, or rather soliloquised. Ontario, the St. Lawrence, its Rapids, and the scenes along its banks, all pass in review here, as in the former poem; and Canada itself is apostrophised in terms more loving than original, and with an occasional lameness in the prosody, here as elsewhere somewhat detrimental to the music of the verse:—

Hail! Canada, my own, my native land!
Land of a thousand floods sublimely grand!
Upon this world, on nation, land, or clime,
Has nature lavished gifts more wild, sublime;
Nor blest with brighter hopes her fertile vales,
Or wafted over hills more healthy gales.
Thy boundless wilds as yet untrod, unknown,
Industry soon will rear a joyous home;
Those fertile tracts where axe was never heard,
Where securely sings the native forest bird;
Where swiftly bounds the deer o'er leagues untold,
Wait but for man to yield their hidden gold.
Oh! glorious, happy West fore'er adieu!
Where'er I wander I will turn to you,
And, in mem'ry, thy beauties call to view.

The patriotism is here, certainly preferable to the poetry, even though the latter does recall lines not less patriotic, with which the sixth canto of the "lay of the last Ministrel" is preluded. But, passing onward down the St. Lawrence, here is the younger poet's picturing of the historic associations of the heights of Cape Diamond:—

See now Quebec with mighty grandeur rear
Its gloomy head—loom sternly in the air!
And from the awful height look proudly down
Upon St. Lawrence with a watchful frown;
Where 'neath its guarding shade securely ride
A thousand vessels on the heaving tide.
This Oscar saw, and stood to view the height
Where Fraser's clans had climbed that glorious night
Up the craggy steep to Abraham's plains,
And hid the verdant sod with bloody stains.
The chivalrous Montcalm, though hasty, brave,
Fought well, his noble post and cause to save;
To every deadly charge his men led on,
And nobly fought amid the clashing throng.
Proudly he died, though not in victory's arms,
Glorious he fell 'midst battle's wild alarms!
Nor did Death's terrors his manly bosom mock—
He died defeated nor survived the shock.

Peace to the warrior hero's shade—
Bright be his wreath, its glories never fade!
Wolfe the true, the noble, generous, brave,
Thou hast all earth can give—a hero's grave.
For this have kings and monarchs vainly sighed.
The tyrant's tomb by deeper stains was dyed:
A tear of joy, not grief, bedews his pall,
A prayer from earth thanks Heaven for his fall.
A lowly poet a chaplet fain would twine
Unto a name as bright and pure as thine.

* * * * * *

Proud Britain's standard, waving from the height
O'erlooks the glorious scene with conscious might;
Flag borne triumphant over sea and land,
And kiss'd the breeze on every foreign strand;
Serenely spread out to the sweeping gale,
Beholds the proud St. Lawrence' mighty vale.
Its wide-spread folds, high above all unfurl'd
Bids stern defiance to the envious world.
Here a true patriot justly would exclaim,
Let Liberty and Truth wash out the stain
That yet upon its mighty folds remain.
Long may true freedom 'neath its shade repose,
Twined round her brow, the shamrock, thistle, rose.
As once it was, may it ne'er again be grasp'd
To mark blood and ruin where'er it passed.

From off point Diamond's peak a booming gun,
With loud report, salutes the setting sun;
Through the ambient air mellow, clear and sweet,
The bugle's note, re-echoed, sounds retreat.

We would not willingly quarrel with a Canadian poet inspired by loyal and patriotic sentiments such as these; but we venture to think that a prose narrative of the Crimean Campaign, from one of ourselves who had borne a share in its sufferings and its triumphs, would have won the suffrages of a thousand Canadian readers for one who will be tempted to the perusal of "Oscar's" poetic experiences. Nor would such a narrative have been the less welcome for his enthusiastic apostrophe to the beauties of our noble St. Lawrence, though uttered only in eloquent prose. We may be permitted to say here once more, in the words of "Aurora Leigh":—

Young men
Too often sow their wild oats in tame verse,
Before they sit down under their own vine
And live for use. Alas, near all the birds
Will sing at dawn,—and yet we do not take
The chaffering swallow for the holy lark.

The poems of Alexander McLachlan are designated in the motto of their title page as "hamely rustic jingle," and as the former volumes are composed after the model of English poets of the beginning of the century, this is a faint echo of Allan Ramsay and Fergusson,—we can scarcely say of Burns: though some of the subjects are probably suggested by his choice of themes, *e.g.* "The Grieve; or the Lamentation of old Jawbaws," which thus begins:

I dinna ken what tempted me
To venture owre the raging sea;
To come awa' to to thir back wuds,
To live in poverty and dudds.
* * * * *

But here, e'en those wha rule the nation
Are driving on some speculation;
Aye, e'en the big parliamenter
Will trade and cheat, like a tramp tinker.
The biggest man thinks nocht degrading—

This it will be seen is a genuine, if not a very poetical Canadian glimpse of things as they are, and the curious reader may find more of the like kind in the same volume.

Craving as we do a native poetry, if we are to have Canadian poetry at all, The "Song of Charity" takes us by guile. The dedication of the tastefully executed volume "to kind friends in Orillia, Canada West," tells us that the poem was "composed in chief part, during a summer's holiday, on the waters and amidst the islets of little Lake Couchiching." Here accordingly is genuine native inspiration. We are gliding, with the author in his birch canoe, over the picturesque lake, and hailing the Indian as he silently paddles past us, under the lee of the wooded islands, from the prettily named Orillia—so called after a favorite native flower,—to his own scattered Indian lodges at Rama. We turn the page, and, as we expected, we are in the forest:

> The forest's faëry solitude,
> The violet's haunt be mine;
> Where call the free in merry mood
> From dawn till day's decline!
> All gentle creatures gather there
> From leafy nest and mossy lair;
> The little snakelet, golden and green,
> The pointed grass glides swift between;
> And there the quaint-eyed Lizards play
> Throughout the long bright summer-day—
> Under the leaves in the gold sun-rain,
> To and fro' they gleam and pass,
> As the soft wind stirs the grass
> A moment and then sleeps again.
> And there, the noontides, dream the deer
> Close couched, where with crests upcurled,
> The fragrant ferns a forest rear
> Within the outer forest-world.
> And many a petalled star peeps through
> The ferny brake, when breathe anew
> The soft wind-pantings. And there too,
> The hare and the tiny leveret
> Betake them, and their fears forget—
> Lazily watching with soft brown eye
> The laden bees go sailing by,
> With many a bright winged company
> Of glitering forms that come and go,
> Like twinkling waves in ceaseless flow,
> Across those dreamy depths below.
> And high above on the bending bough
> Its gush of song unloosens now
> Some forest-bird. Wild, clear, and free
> Upswells the joyous melody
> In proud, quick bursts; and then, anon,
> In the odorous silence, one by one

The thick notes drop, but do not die;
For through the bush the soul keeps on
With a music of its own—
So runs the forest minstrelsy!
One other sound there soundeth only
Out of the distance dim and lonely;
Out of the pine-depths, murmuring ever,
Floweth the voice of the flowing river.

And we too, wend our way out of these pine-depths, following the windings of the flowing river, until we at length emerge and—what see we? Not the rocky rapids of our Canadian Severn, or the woody solitudes of Chief's Island, or the fringing "bush" that still skirts the shores of Lake Simcoe,—but an ancient home:

Beneath the shade
Of those old trees so bent and sere;
And there, with its stonework tracery,
The quaint old house, as old as they,
Still stood, and kept from year to year,
With storm and frost and slow decay,
A struggle for the mastery,

We are not then in Canada at all? Unless we have slept a sounder and longer nap than Rip Van Winkle: it would seem not. While we were imagining ourselves in the bush, and deceiving ourselves even to the fancying these hares and tiny leverets, were some native variety that haunted the Georgian Bay, we were all the time amid the glades and the associations of Old Europe. We could even fancy ourselves once more under "the huge, broad-breasted old oak tree," beneath which we first made the acquaintance of "the lovely lady Christabel;" for the rythm, and even something of the mode of thought, recall to us that most beautiful fragment of the dreamy Coleridge's muse. But it is Canadian poetry we are in search of, and we therefore leave the "Song of Charity," and betake ourselves to the additional poems which accompany it. And here, at length, is one of truly native name and characteristics: "A Canadian Summer's Night." Now, at least, we are not deceived. We glide over the rippling waters of Lake Couchiching, and list to its forest voices:

Still callest thou—thou Whip-poor-will!
When dipped the moon behind the hill,
I heard thee and I hear the still.

But mingled with thy plaintive cry
A wilder sound comes ebbing by,
Out of the pine-woods, solemnly.

And hark, again! It comes anew—
Piercing the dark pine-forest through,
With its long too-hoo, too-hoo!
*   *   *   *   *   *   *

Shoreward again we glide—and go
Where the sumach shadows flow
Across the purple calm below.

There the far-winding creeks among,
The frogs keep up, the summer long,
The murmurs of their soft night-song.

A song most soft and musical—
Like the lulled voice of distant fall,
Or winds that through the pine-tops call.

And where the dusky swamp lies dreaming,
Shines the fire-flies' fitful gleaming—
Through the cedars—dancing, streaming!

Who is it hideth up in a tree
Where all but the bats asleep should be,
And with the whistling mocketh me?

Such quaint, quick pipings—two-and-two;
Half a whistle, half a coo—
Ah, Mister Tree-Frog! gare-à-vous!

The owls on noiseless wing gloom by,
Beware, lest one a glimpse espy
Of your grey coat and jewelled eye.

Now this is a genuine Canadian scene, such as no fire-side traveller or fancy-visioned poet of old world wanderings or library book-dust, could possibly call into being. The dark recesses of the pine-woods and the shadows of the lake-fringing sumach, the monotonous call of the Whip-poor-will, the soft and musical night-song of the frogs, the fitful gleaming of the fire-fly dancing in the cedar-swamp, the prowling night owl noiselessly listening to the mocking note—half a whistle and half a coo,—of the tree-frog: each one of these shows the touch of a Canadian pencil, such as the most labored study of the home poet would in vain attempt. In this direction alone lies the path in which poetic success is worth welcoming among us; unless indeed it be fancied that we can look for some great Canadian-born Miltonic epic, not local or exclusive, but for other ages and generations than our own, —of which consummation it can only be said there appears at present no very discernible prospect. D. W.

Climatology of the United States and of the temperate latitudes of the North American Continent, embracing a full comparison of these with the Climatology of the temperate latitudes of Europe and Asia, and especially in regard to agriculture, sanitary investigations, and engineering, with isothermal and rain charts for each season, the extreme months, and the year, including a summary of the statistics of meteorological observations in the United States, condensed from recent scientific and official publications: By LORIN BLODGET, Member of the National Institute, &c. Philadelphia, Lippincott & Co.; Trübner & Co., London, 1857.

In the prosecution of meteorological enquiries the United States deservedly hold a high rank. In the collection of meteorological data by fixed stations, as well as by surveying and exploring expeditions throughout the wide area of the union, an enlightened zeal has been ever manifested by the several public departments as well as by private individuals; and in contributions descriptive or explanatory of particular phenomena, the scientific literature of that country has been remarkably fertile. We are not, however, aware that prior to the publication of Mr. Blodget's book any attempt has been made to present to the world in a connected whole the large mass of materials which the industry of so many observers has called into being.

On this account if on no other Mr. Blodget, as pioneer in the work of compilation, merits the thanks of scientific men and of the world at large. His book bears marks of great acumen as well as of industry; it abounds in important facts and is highly suggestive, and as such well deserves to be recommended for a close and careful examination.

In saying this we do not engage to endorse every opinion entertained by the author. In a science so essentially progressive as meteorology many views must at best be held provisionally, subject that is, to be discarded or to be matured by extended observation. In Mr. Blodget's book we have a stem round which the fruits of future research may appropriately cluster, and glad shall we be if the work of grafting as well as that of pruning should fall to the lot of Mr. Blodget himself.

For the accomplishment of his task the author has brought experience of no common order: the aptness which he had exhibited for investigations of this kind procured for him some time ago the appointment of superintendent of the reduction of the meteorological observations made under the auspices of the Smithsonian Institution, in which capacity he was enabled to collect a large mass of data; and he has also apparently met with the utmost readiness on the part of the large body of observers throughout the continent to supply him with the results of their labors; so that as regards the temperate latitudes, to which his discussions are chiefly confined, there has been no dearth of materials.

The general arrangement of the book is clearly set forth in its ample title page:—it exhibits the geographical distribution of temperature and of the fall of rain and snow for the temperate regions of North America, it discusses the peculiarities of the two climatological areas into which the continent is divided by the Rocky Mountains, and draws a comparison between these and regions of analogous position in the old world. In conducting these comparisons regard is had to outline configuration, vertical elevation, and other physical features. The whole is illustrated by a series of neatly executed charts, consisting of an isothermal chart of North America for each of the four seasons, and one for the year, together with as many corresponding charts of rain and snow. There is also a temperature chart and a rain chart for the whole north temperate zone, with a profile of comparative altitudes for both hemispheres.

The book opens with an exhibition of the physical data upon which the author's subsequent discussions are based.

These data in the first place consist of the mean temperatures and the depths of rain at a large number of points both in the old and new world, arranged in tables for each month, the four seasons, and the year. In every case where it is practicable the latitudes and vertical elevations of the stations are given, together with the number of years from which the means are derived, and the actual dates at which the series commenced and terminated. For the old and new worlds the tables are arranged in separate groups. Besides the foregoing, for a few stations of importance in the United States at which observations have been continued during a long series of years, additional tables are given separately for each station, showing the monthly and annual mean temperatures, with the precipitation of rain and snow for each year that the period embraces.

Following the above mentioned and strictly meteorological details, which occupy the whole of the first chapter to the extent of about eighty pages, is a chapter on physical geography, which includes, in a tabular form, the vertical topography of the country east of the Rocky Mountains, arranged in belts perpendicular to the general direction of the Alleghanies. Another list for the regions west of the Rocky Mountains is also given, arranged in meridional belts 5° in width from the 100th meridian westward.

In instituting a comparison between the old and new worlds, with respect to their physical geography, the author considers that there are features now sufficienly apparent in North America which hitherto have been considered as peculiar to the older continents.

"The great point of interest lies in the new features of our physical geography, or in the views which differ so far from those previously held, as to require a change in all deductions based upon surface and vertical configuration, as all those of climatology must be to some extent. The most important of these recent determinations is that of a much greater altitude for the western interior than was before assigned to it, and that high and arid plateaus and basins exist in nearly as great a proportion to the general area of the continent as in Asia and Europe. There are conditions of surface and configuration similar to those which have been thought peculiar to Europe and Asia belonging to great regions here, and we are to look for correspondence in climate, and in vegetable and animal life, and if this last does not now exist, we ascertain such a correspondence to be possible, and may adapt our practical interests accordingly. Guyot, and other writers on physical geography, have contrasted the temperate latitudes here with those of Europe and Asia, in the view that this is wanting in the high desert plateaus of these, and assuming for this less altitude, a greater proportion of plains, and, consequently, the analogies of sea climates in contrast with the extreme continental peculiarities of Asia. Our recent surveys have shewn that lofty plateaus, lofty mountains, and extended districts of the most extreme continental character, exist here in nearly the same relation to the whole mass of the continent as in the old world, and the comparison of the two thus becomes much more direct and more necessary than before, as essential to a proper understanding of our climatology. In short, we may compare the two as mainly equal and similar in the physical features of surface and configuration, and we must do so to correctly estimate the consequences upon climatology, which are always most directly dependent on physical geography." pp. 84, 85.

The Alleghanies have been often considered as forming a line of demarcation between two very different climatological areas: it would seem, however, from more recent investigations, that the elevation of these mountains has but little influence in interrupting the uniformity of climate, excepting in the moderate degree produced by altitude alone, and that it is the Rocky Mountains that we must regard as the true barrier between two regions climatologically distinct.

"The great chain of the Rocky Mountains is next in the surface configuration, and from this point forward all the uniformity belonging to the Eastern United States disappears, and the greatest and most abrupt contrasts occur. As in the north of India and in other parts of Asia, everything here depends on configuration and surface; and not only on these directly, but also on the relation of any point or locality to an extreme of configuration in the vicinity. Thus the valleys of California are mainly controlled by the mountains near them, and if shut from the sea have arid climates, and, perhaps, a denuded, sandy, or alkaline surface; when if open to sea influences the reverse conditions prevail. These remarks apply more particularly to Oregon and the coasts north of the 35th parallel, than elsewhere, as the coast of Lower California is arid at all exposures." pp 88, 89.

This climatological division is again insisted on in the opening paragraph of the following chapter, descriptive of the general character of the Eastern United States.

"It is necessary to make a distinction of a very decided character between the parts of this continent separated by the Rocky Mountains, though the idea of this distinction has hardly yet entered into the received views of the North American climate. It is still described under the characteristics which belong only to the area east of the great plains, and the homogeneous character belonging to much of this great extent of surface is that recognized in Europe as the North American climate. Now that we have found this to differ so extremely from the interior and Pacific districts, it is necessary to describe it separately and to designate it as the eastern area of the United States.

So recently as the production of Guyot's able work on comparative physical Geography (Guyot's Earth and Man), the distinction made between the old world and the new was to assign to the new *oceanic*, and to the old world *continental* climates; the prevailing character of the Eastern States and the Mississippi Valley being taken as the type of the whole country. The great expanse of these plains gave reason for this distinction, in the then unknown condition of the interior and Pacific coast, but it is now clear that the proportion of arid and continental districts and climates is as great here as in the old world. The position of the plains exposed to oceanic influences is reversed, however, and instead of the extensive low areas belonging to the west of Europe our western coast is very narrow, and the Mississippi plain is, to some extent, the equivalent of the European plain.

But the climate of the Mississippi Valley or plain, and of the eastern side of the continent generally, is not oceanic strictly; and it differs radically from the oceanic climates of the west of Europe. It has its equivalent only in a similar continental position, or in China; which is, unfortunatly, too little known to aid the illustration much. As a whole, the North American continent differs little from the old world, except in the comparative areas embraced by the several divisions. Our oceanic districts on the west are very narrow and unimportant compared with the immense and fertile areas of like position and climate in Europe; our interior and extreme districts are differently placed from those of Asia, but in other respects they differ little; our eastern areas, which are properly neither interior nor oceanic, are comparatively larger and more important because of the existence here of a great interior plain opening southward to the tropical heat and moisture, and partaking to some extent of tropical peculiarities. . . . .

The early distinction between the Atlantic States and the Mississippi Valley has been quite dropped as the progress of observation has shewn them to be essentially the same, or to differ only in unimportant particulars. It is difficult to designate any important fact entitling them to separate classification; they are alike subject to great extremes and to the same extremes, they both have marked continental features at some seasons, and decidedly tropical features at others, and these influence the whole district similarly, without showing any line of separation." pp. 125, 126.

One of the principal features alleged as belonging to this area, as a whole, is its adaptation to a great range of vegetable and animal life; *another feature consists in this, that the whole area is in communication as regards its atmospheric changes*: any agency that affects one point producing a corresponding though not necessarily a simultaneous, or equal, or even similar change throughout the area. In the words of the writer:

"As an associated feature of the uniformity just alluded to, the changes of temperature, and the oscillations of every sort, strike over the Eastern United States as changes would over any plane surface; that is they are symmetrical and uniform, and knowing what they are at a few places we may easily infer what they have been at all. Thus, if a degree of cold occurs at St. Louis on one day, and at Philadelphia two days afterwards, or at any interval whatever, we may be certain that the whole intervening district has been similarly affected. So of a barometric depression or variation, or of a great storm, or of particularly severe winds. Though the changes occurring in one part may not be felt at an opposite point,—as, though it may be twenty degrees below the average temperature for any period at Charleston, it may be as much above that mean at Albany or Montreal—the conditions, whatever they are, affect the intervening districts symmetrically, and are participated in at all places according to the distance from the extreme points. This may be the case to some extent in other climates, or it may be so with some of the great changes, but here it is characteristic of all, and it contrasts extremely with the abrupt transitions, and the predominance of local changes in Southern and Central Europe, and on the west side of this continent as far as known." p. 129.

This chapter abounds in matter for reflection, but as somewhat copious extracts have been already made from it, we must commend it to the study of those specially interested in the subject, and content ourselves by quoting one more passage in which the general type of a storm is described. The description we leave to the experience, or to the future observation of our readers, to verify.

"Beginning at the northwest, or near Fort Snelling, the general succession of phenomena in the change from calm, average conditions, to the restoration of such conditions again, is something near the following: first, an increase of temperature with winds from the south, south-west or south east, of duration proportioned to the measure of the change that is to occur, or of from one to four or five days; a fall of barometer; a rain with east, north-east, or south east winds during the first half of its duration; a sudden change of wind to some westerly point with a rapid reduction of temperature, high winds and a rising barometer; and, in conclusion, a period of comparatively cold and clear weather. The nucleus or central area of this phenomenon, regarding it as a whole, or, as it may be done for illustration as a moving body, usually progresses eastward at the rate of three hundred miles in twenty four hours; and it is quite usually attended by a similar succession of changes until it reaches the Atlantic coast." p. 131.

Passing on to the west of the Rocky Mountains, we find one of the leading characteristics to be that of intense aridity. In illustration of this the temperature of evaporation, or that indicated by a wet bulb thermometer, will frequently remain for several days together 20° below the temperature of the air. At the driest part of the day this difference will sometimes amount even to 25° or 30°, and will continue for several months without falling short of 20°.

A remarkable effect of this dryness is the long resistance which animal substances offer to putrefaction, by which travellers are enabled to carry meat for almost an unlimited time without using salt or any preparative process.

Another remarkable feature in the Pacific climate is the extraordinary daily range of temperature, compared with that prevailing elsewhere, that sometimes takes place. Officers engaged in surveying have reported noon-day temperatures of 87° and 92°, followed at night by a depression below the freezing point, and in one locality a mean daily range during a fortnight of 55°. These extremes are doubtless chiefly due to the extreme clearness of the atmosphere, which its dryness produces, and which facilitates the absorption of heat by day and its loss by night.

The remarks on the Pacific climate are thus summed up:

"In review of the distinctions of a general character belonging to the interior and Pacific climates, they may be briefly stated to be *aridity* first; isolation of districts and conditions next; and periodicity of rains, winds, and some other leading phenomena in distinction from *equally distributed* rains, &c., as in the Eastern United States. The isolation of phenomena implies an interruption of the symmetry so characteristic of the East, and all the important differences which follow in this train. Extreme contrasts, diversities, and transitions belong here to *place* or *locality*, and in the East to *time*." p. 164.

Space will not admit of the introduction here of further extracts; we must be content, therefore, with indicating—as portions of the book peculiarly adapted to interest the general reader—the chapter on winter storms, and the succeeding chapters on climate considered in reference to vegetable productions, and in its sanitary relations. Compelled, however, to bring this notice to a conclusion, we would regret indeed were our intercourse with the volume itself to terminate with equal abruptness. We have found our estimation of it increase as we acquired a more familiar acquaintance with its contents, and with this commendation we now leave its further study to our readers. G. T. K.

The Canada Directory, for 1857–58. Montreal: John Lovell, 1857.

In all ordinary conditions of the studious mind, it must be confessed that a Directory or an Almanac, ranks along with Dictionaries, Concordances, Cookery books, University Calendars, Library Catalogues, Law Lists, Old Bailey Registers, and the like highly useful compilations: as a species of reading by no means too seductive or fascinating. Waylaid in a country inn on a rainy day, for lack of better, we have resorted to such reading, where choice was small; and the associations of the book seem to chime in very harmoniously with our recollections of the dreary drizzle, and dull monotonous plash from the dripping eaves. Here, however, comes before our editorial eye, a portly and well-conditioned volume, and—spite of all memories of such association with older members of the same worthy but prosaic family,—insists on its merits, claims to be permitted an audience, and asserts rights that will not be gainsayed.

And for a member of the aforesaid family, it must be owned that the Canadian Directory of 1857, has a wonderfully prepossessing manner and appearance. Nor, on closer acquaintance, does it prove by any means of so dull and commonplace a character as our enforced intercourse with some of the elder race of Directories had led us to anticipate; but on the contrary it is full of information of a highly varied and useful kind; and, albeit, like all its kith and kin, of an essentially practical turn in the main, it does not even refuse a little convenient by-play of sarcastic humour at a time.

The idea ordinarily attached to a Directory is one of those very convenient but ephemeral lists of names and addresses which lie on the desk of the Counting house for the year, and are then consigned to the waste-basket as worthless, except for the paper on which they are printed. Such, however, involves a very inadequate conception of this handsome and bulky imperial octavo. It does, indeed, embody such an index to places of business and private residences throughout the province; and, assuming the accuracy, which we find on testing these by a few known references, to be general throughout, this department alone must have involved an amount of labour and expense which it is difficult to perceive how the small price of so large a volume can repay. But besides this, and the Canadian and States advertisements,—which would almost require an appendix already, to intimate what effect the recent commercial crisis and American National bankruptcy have had upon them,—the statement in the preface is fully borne out, that, in addition to its value for the man of business, it is no exaggeration to say, it is "a Guide-book for the man of pleasure, an Index for the immigrant, and an Instructor for the settler; a Gazeteer for the student, and an Army-list for the militia officer; while for the statesman and others connected with official life, it is a Statistical Chronicle of the progress of the country in all departments of enterprise."

The Canada Directory is announced as a periodical intended to be continued each alternate year; and as the time approaches when this goodly octavo shall be deposed from its desk-throne, to make way for its successor, we can fancy the gathering doubts with which reference will be made to its already antiquated pages; until at length we witness the ungracious heartiness of its deposition: turned out of its responsible post of honor as unceremoniously as Paris's old citizen-king of 1848, was hustled into his hackney cab, and bundled out of the kingdom—kingdom no more—like so much shot rubbish.

But there are other things besides good wine which improve with the keeping, and develope undreamt of virtues in the sober maturity of their years. We have often conned over, in by-gone days, the thin little duodecimo Directories of the antiquated Edinburgh of the 18th century, compiled by the once famous Peter Williamson, who, after spending his earlier years among the Indians of our North American wilds, carried back some of the Yankee enterprise with him, and set up a house of entertainment for the legal hangers-on of the Scottish Parliament House, designating himself somewhat mysteriously "Peter Williamson, from the other world!" There he established the earliest "penny post," or receiving local letter box for the General Post Office; and there too he was the first to publish a street Directory for the Scottish Metropolis: which the curious still ransack—not in vain,—for evidence of the local habitation of Johnson's Bozzy, and many another local and world-famous celebrity of Auld Reekie. It is to this Scottish John Lovell of the eighteenth century, that the poet, Fergusson, thus alludes, in his "Rising of the Session;" *i.e.* the close of the Scottish legal term:—

This vacance is a heavy doom
On Indian Peter's coffee-room,

For a' his china pigs are toom ;
Nor do we see
In wine the soukar biskets soom
As light's a flee.

Old Directories are, in truth, a favorite and much valued resort for the topographer, the local antiquary, and the curious biographer. Professor Masson, for example,—sifting out the scattered fragments of incidents and surmises relative to the brief career of "the marvellous boy,"—remarks: "In what precise part of Shoreditch that house of Mr. Walmsley was where Chatterton lodged when he first came to London, and to which, on that memorable day, he returned through many dark and strange streets, we do not know. London Directories of the year 1770 are not things easy to be found." And Peter Cunningham—more successful in his search after, and into the old Directories of the "Fog Babel,"—fishes up many a hint from thence to give graphic individuality to the Sketches in his "Handbook of London." And Canada too has her men already, we trust, about whom future topographers and biographers may have something to inquire ; and has her elements of wider, and ever widening interest, about which the future historian will have many anxious questions to ask. The immediate use, and aparently all the value of Mr. Lovell's labours past, on the superseding of this Directory by its successor of '59–60 ; the obsolete columns of names and addresses, with business and banking records, local officialities, advertisements, and so forth, will seem stale and worthless, and, "dry, as the remainder biscuit after a voyage." Nevertheless, stored away on the shelves of public and private libraries, the time will come when—in the few antiquated survivors of the present large and plentiful edition,—all this classified miscellaneous matter about Clergy and religious denominations ; Universities, Colleges, and Schools ; Periodicals, and the Canadian press ; Banks, Customs, Crown Lands, and Railways ; Trade, Emigration, Population, and general statistics ; shall prove to be possessed of the very highest value. Some, indeed, of what seems most local and ephemeral in its character will, by and by, grow to be the most curious and widely interesting of its contents, and gather cobwebs of as eloquent antiquity as ever draperied ancient wine bin, or world-famous Heidelberg tun. The quaint gossip of Old Sam. Pepys is not quainter than much of this will yet be. We have only to fancy the possibility of getting hold or such a volume compiled by some enterprising Juan Lovell, Spanish hidalgo of the sixteenth century ; or by one of Raleigh's colonists of the Virgin Queen Bess's era ; or a prim and dumpy New England quarto, as well stocked with clerical and lay statistics, advertisements, and judicial details, in the time of Increase Mather and the New England witch trials. What a treasure would the volume prove to the Antiquary and Historian. How would the Historical Societies of Salem, New Haven, Boston, and Nantucket, contend for the honor of reprinting the precious document. What jealousies, and rivalries, and boastful eurekas would there be? Yet, doubt it not good reader the days of our own Queen Victoria will come to be as ancient, and quaint, and full of curious mystery to other generations, as ever were, or will be, those of a Castilian Isabella, or an English Queen Bess; and this portly volume has only to be kept long enough, to look as strange and antique to the men of another century, as ever a dumpy, brass-clasped quarto of the old puritan days of New England. When the Canada of Anno Domini 2058 looks back, with inquisitive wonder, on the Green-Youth of its nineteenth century, what a singular melange will these Directory advertisements then appear, which now present to our familiar eyes so business like an air. How will the antiquarian book-worm of that unborn century gloat over the mysteries of these so matter-of-fact trading manifestos and pictorial devices. And yet, there is also an aspect scarcely less strange and note-worthy, in the reproduction amid our new Canadian clearings of so much that pertains to an old-world civilization, and luxurious ingenuity of extravagance. Amusing it is, indeed, to find here just such another inventory, begot by the new-born energies of young Canada, as took the fancy of the poet of the "Task" in the Old England of the eighteenth century, with its broad-sheet wilderness of strange but gay confusion:

Roses for the cheeks,
And lilies for the brows of faded age;
Teeth for the toothless, ringlets for the bald,
Heaven, earth, and ocean, plundered of their sweets,
Nectareous essences, Olympian dews,
Sermons, and city feasts, and favorite airs,
Ethereal journeys, submarine exploits,
And Katerfelto, with his hair on end
At his own wonders, wondering for his bread.

Truly there is nothing new under the sun; and yet one might fall upon much duller and less novel reading than some of these same advertisements, set forth here in all the glories of fancy typography and illustration, to show our Great Grandfathers and Great Grandmothers how we lived in the reign of good Queen Victoria. Here for example, —set forth by a graphic and most moving picture of an unfortunate fair lady in the transitional stage of rejuvenescence, with her locks on one side white as snow, and on the other rivaling Milton's "raven down of darkness,"—is a manifesto of THE GREAT AMERICAN HAIR TONIC and HEBEAIONA, or *Balm of Cytheria*, which was proven at the late Boston Mechanics' Fair, on the authority of Dr. Hayes the eminent *State Assayer*, "over the choicest hair dyes of the Union, to be the best in the world. It permeates to the cellular tissue of the cuticle, and forces the Hair and Moustaches to grow. It cures"—but we have not space for its many virtues. It manifestly would be fatal to any lady's womanhood should it touch her chin; and a very small pot of it may be warranted quite equal to the largest quantum of Bear's Grease, for converting a common deal box into the most comfortable of hair trunks. Other equally gratifying evidences of the world's progress set forth "*Professor Wood's* Hair Restorative: To maiden beauty it is the finishing touch; to manhood it is the symbol and warrant of strength and nobility, to day, as in the days of the Patriarchs," &c. Or, if possible to reach a perukerian climax, we have the new *Comacantothermonigria*, or celebrated Bachelor's Hair Dye. "Its celebrity has reached the whole circumference of the globe; every country where civilization exists have patronised this surpassingly excellent hair dye. Its practical application upon over two hundred thousand persons, the Diplomas, &c., attest the fact that the superiority of this dye can never be lessened. Observe the hundreds of Dyes, so called, put forth to rival this grand original—note the ridiculous dilemmas they lead the unfortunates into who use them; The Rainbow Tints, the Blisters, the Fits, the . . . ," &c.! &c.!! &c.!!!

The novelties of drinking advertisements again furnish a highly moral index of the Maine liquor law reform. One benevolent New York dealer has provided himself with a stock of wines of the most healing and medicinal character. Another, a Druggist of Boston, disposes of his fine old Whiskey "expressly for medicinal purposes;" and here again that useful public functionary the State Assayer, certifies the peculiar aptitude of the said Whiskey *for medicinal use*. It is accordingly put up in boxes, each containing one dozen quart bottles, for the convenience of delicate invalids.

Tobacco has its virtues set forth in all the eloquence of fancy type, and from one New York agency we learn the somewhat note-worthy information that he has "constantly on hand Tobaccos suited for the British provinces;" so that it would seem we have our own nicotian specialities, whatever these may be.

Literature again, plays—as becomes this highly enlightened age,—

a very prominent part. One eloquent bibliopole certifies of his publications, that "they cover every branch of human knowledge, from the child's A B C to the highest classical and scientific manual in Universities." But this is nothing to the Broadway Publisher who advertises a *Family Library* which would seem to be a new and infinitely more universal *Principia*. It treats of:

"The Divine Origin of Families, and of their relations to Christ and the Church; the noble and generous, as well as tender emotions associated with marriage; the sympathies of the home-circle; domestic happiness; the parental and particularly the maternal relation; family cares, trials, and vicissitudes; the principles of courtesy; family order and discipline; education of children; elegant accomplishments; fireside amusements and recreations; domestic virtues on Gospel principles; home made happy; housekeeping; cookery; carving; health, and the philosophy of living; sight and hearing, how preserved and lost; the use and beauty of the teeth; care of the sick; family bereavements; and Christian monuments to the memory of the deceased."

A Boston Publisher, who sets forth the virtues of his store, and advertises "The Moral Philosophy of Courtship and Marriage," and other "most valuable books for all ages, and both sexes," informs us of the following highly spiced product of Judicial literary recreation, penned in the cause of public morals among the descendants of the Puritan Pilgrims:

"The popular author, Judge Thompson, has just completed, for the public eye, the Great Work of his Life, entitled GAUT GURLEY, OR THE TRAPPERS OF LAKE UMBAGOG. This exciting tale is founded on a murder of unusual atrocity, that occurred about forty years ago. Gaut Gurley was supposed to be an actor in this and other flagitious crimes, and made his escape to the West Indies. Judge Thompson has built a Story upon these historic facts, which will probably be more read by New England people than any book which he has ever written. It is a work of thrilling interest and rare power."

So much for Literature. Nor is Science overlooked. There are indeed *cork legs* and *arms*, so scientifically perfect, that the wonder is any body continues to wear their natural ones: the Anglesey leg, for example, quite an aristocratic substitute for any common-place plebeian limb, and worthy to rank with the world-renowned one of Miss Kilmanseg. "The Marquis of Anglesey, (from which it derives its name,) found none equal to it, and wore it from the time he lost his *Leg* at the Battle of Waterloo till his death, in preference to all others. It has been tested in every possible way by all classes, male and female, and improvements added until it has attained its present perfection, and certificates can be shewn from numbers who are wearing pairs!" But to get from the feet to the head and crowning seat of Science; a tempting page allures to a wholesome self-examination, under the appropriate motto: "The proper study of Mankind is man." A cranium and physiognomy of Grecian perfection is pictorially mapped out as a phrenological chart. Towards the region of the lambdoidal suture we perceive a cerebral organ which produces on the retina the sensational idea of a gentleman making a graceful bow to a lady, and on referring to the corresponding number in the inventory below, we find that this spot is the seat of an intellectual organ, known, it would seem, as *Approbativeness.* Next, passing over a very touching representation of Friendship, we come to one marked (A) which, as it appears, is "*Conjugal Love,* or *the pairing instinct;*" while, in odd proximity, immediately alongside of it, a highly pugnacious scene of fisty-cuffs points out the region of *Combativeness.* The mental science has grown wonderfully since Lord Jeffery came into collision with Comb and Gall, and Spurzheim. Here we stumble over such psycological novelties as *Continuity, Vitativeness, Alimentativeness, Sublimity, Spirituality, Suavity,* and—oddest of all—*Human Nature:* whatever that may chance to mean as a mental faculty! We used to be of opinion that Phrenology had at least contributed some convenient terms for the use of the Mental Philosopher, whatever else might be set forth as its claims, but it would seem to have been indulging of late in transcendental flights, far beyond the reach of ordinary and uninitiated mortals.

Finally, we must by no means overlook the perfection to which the SCIENCE OF ADVERTISING has itself here attained. The glories of fancy typography; the æsthetics of pictorial hierography; the emphatic *Italics*; the lanky, dumpy, and excentric *Sand-letters*; the *Script,* the *Great Primer,* the *Pica,* the *Bourgeois,* the *Minion,* and *Nonpareil*; with all the thousand arts of the compositor, are the mere frame-work of this Science of puffery. Some of the specimens already quoted may serve as samples. But unfortunately, like all other good things in this wicked world, it is liable to abuse. One benevolent N. Y. Philantrophist, who has devoted "years of study and labor to the discovery and preparation of the *Gum-coated Forest Pill,* to meet the wants of suffering humanity," feelingly deplores the baseness of "unprincipled men who issue bogus spurious articles under the same name, to deceive the public." It is pleasant, however, to learn that "these vile attempts to impose on a discerning public seldom met with success; while such as innocently became the victims of Bogus imitations no sooner attempted to sell it than, to their disgrace, it was at once returned to them." Nevertheless, the benevolent advertiser, as a simple duty he owes to mankind, warns the public, if it would not be taken in with a Bogus Bolus, to "examine the label and purchase of men of integrity!" As will be observed in sundry examples quoted above, there is a pleasant indifference to the relations ordinarily supposed to subsist between grammatical nominatives and verbs, which frequently adds a novel and exceedingly striking effect to these highly seasoned specimens of our own nineteenth century commercial literature. Had we not indeed, already exhausted our available space, we could select specimens of "Canadian" and "American English," such as we can suppose some future Trench, or Latham, or Guest, puzzling his critical brains over, in the bewildering effort to invent the Grammatical rule which shall embrace an authority so high and indisputable. But we leave the further investigation of the subject to the enterprising reader, who will find a whole library of truth and fiction, fact and fancy, embraced within the ample boards of Lovell's Canadian Directory, and extending through one thousand five hundred and forty-four pages of as varied typography as his eye is ever likely to travel over.

To such glimpses of this New World of ours, in the year of Grace 1857, we can fancy the curious descendant of our Canadian generation, turning with no little wonder, in that coming century we have ventured to look forward to. If, however, any Map survives to tell him of the localities to which the various advertising sheets pertain, he will probably have penetration enough to perceive that the science of advertising in all its superlative magnificence, pertained to the Union Cities South of the Lakes; and that our Canadian enterprise confined its utterances, for the most part, to a much more homely and sober style in setting forth the virtues of its wares, being actuated possibly by the somewhat antiquated aim of—being believed.

D. W.

Annual Report of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures, and condition of the Institution, for the year 1856, *and the proceedings of the Board up to January 28th*, 1857. Washington: Cornelius Wandell, Printer. 1857. 34th Congress, 3rd Session. House of Representatives. Mis. Doc. No. 55.

The progress of the Smithsonian Institution at Washington cannot fail to be watched with jealous interest by Scientific men, and especially by the countrymen of the founder, to whom it might be permitted to regret that misunderstandings on one side and pique on the other had suffered so splendid an endowment to pass from its natural course into a foreign channel. The funds left by will of Mr. Smithson, (an Englishman, and an illegitimate son of the Duke of Northumberland,) who had quarrelled with the Royal Society after having offered the endowment to them, amounted to over five hundred thousand dollars, and were accepted by the Government of the United States, in trust, "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." Considering the fate which has befallen too many of the charitable bequests in the old world, it was an interesting question to find how such a trust would be executed in a case where no superior tribunal could exist to take cognisance of malversation, and where lack of specific definition in the wording of the bequest left plausible openings for misappropriation, the only protection against which, was the honor of a government whose citizens have not been uniformly notorious for the best of faith towards creditors. When the Act of Incorporation was before Congress, it was perhaps natural that such schemes as the following should be suggested: the diffusion of popular information among the people of the United States by the distribution of Tracts—the foundation of a National University—the establishment of a large library at Washington, or of a National Museum. Of these, the first is simply ridiculous, and against the rest it was urged by some who, fortunately, took a wider and juster view of their duties as trustees in the management of this endowment, that the object designed by the founder was specific as regards the "increase of knowledge," and cosmopolitan as regards its "diffusion among men;" that it was clearly never intended by him merely to educate the youth of the United States, nor to found monster establishments of books or specimens in a particular locality, which could only benefit citizens of the United States, and but few even of them. There was plain justice in this reasoning, for, however desirable and laudable these designs may be in themselves, they are only indirectly related to the design of the endowment; would have been in their effects chiefly and primarily beneficial to the country in which they existed; and ought, if their existence is desired, to be provided for by that country itself. If institutions which shall rival the British Museum, the National Gallery, and the Universities of Great Britain are to exist on this side the Atlantic, they should be raised by the people whose advantage and glory they concern, and not by the legacy of a stranger who desired to found (in the paraphrase of Professor Henry) "an institution to promote the discovery of new truths, and the diffusion of them to every part of the civilized world." Happily these views prevailed to some extent in Congress, and the result was a compromise whereby large discretion was left to the Board of Regents, although they were enjoined to establish museums of natural history, geology, and mineralogy; a chemical laboratory, a library, and a gallery of art; also, to have lectures delivered, and a suitable building for these purposes provided. In accordance with these instructions, the Regents at first determined to divide equally the annual income between the carrying out of the designs thus specified, and other plans which they considered more agreeable to the proper functions of the institution; they were also able, while complying with the letter of the Act of Congress in these respects, to render the accomplishment of the forenamed designs more in accordance with the spirit of the founder, and thus diminish the evils resulting from this imperfect legislation. The Library was made chiefly to consist of the transactions of the various learned societies; the collections for the Museum were made by the parties of the United States Survey; the Laboratory and Apparatus were furnished in a judicious spirit of practicalness, and made to include a Magnetic Observatory; and the Lectures (the most objectionable feature of the plan) have also been the least expensive. Still later the Regents repealed the system of equal division, and the funds are now appropriated as seems to them best from time to time; in this conduct, it is creditable to Congress that they have been sustained, though a strong agitation was raised against them. Of the justice of this course, we, as foreigners, can entertain no doubt, and still less when we find such passages as the following in the Secretary's report:—"The expense of this part, however, of the operations of the library is small in comparison with that which is in reality of little importance. I allude to the cost of keeping up a reading-room, in which the light publications of the day, obtained through the copy-right law, are perused principally by young persons. Although the law requiring a copy of each book for which a copy-right is granted, to be deposited in the library, was intended to benefit the Institution, and would do so were it designed to establish a general miscellaneous collection, yet as this is not the case, and as some of the principal publishers do not regard the law, the enactment has proved an injury rather than a benefit. The articles received are principally elementary school manuals and the ephemeral productions of the teeming press, including labels for patent medicines, perfumery, and sheets of popular music. The cost of postage, clerk hire, certificates, shelf-room, &c , of these, far exceeds the value of the good works received. Indeed, all the books published in the United States, which might be required for the Library, could have been purchased for one-tenth of what has been expended on those obtained by the copy-right law. . . . . . . Included in the additions to the museum during the last few years from Government exploring parties and private individuals, have been a number of living animals. Among these were two bald eagles, an antelope, monkeys, raccoons, two wild cats, a jaguar, and a large grizzly bear, the latter from the Rocky Mountains. . . . . It is neither compatible with the means of the Institution nor the duties of the Secretary and his assistants to take the custody of specimens of this character. While such presents evince kind feelings, and are complimentary to the management of the Institution, the expenses of transportation have been in some cases rather a heavy tax, and while we cannot very well refuse donations of this character, they would be much more acceptable were they received free of cost. . . . . The adverse effects of the early and consequently imperfect legislation ought as far as possible to be obviated, and this could readily be done if Congress would relieve the Institution from the care of a large collection of specimens, principally belonging to the Government, and purchase the building to be used as a depository of all the objects of natural history and the fine arts belonging to the nation. If this were done, a few rooms would be sufficient for transacting the business of the Institution, and a larger portion would be free to be applied to the more immediate objects of the bequest. Indeed, it would be a gain to science could the Institution give away the building for no other consideration than that of being relieved from the costly charge of the collections."

The remaining or extra-congressional part of the plan adopted by the Regents, and that to which we may assume the main efforts of the Institution will in future be devoted, consists of the following details, having in view (1) the increase of knowledge, (2) its diffusion among men.

For the first, it is designed to "stimulate men of talent to make original researches, by offering suitable rewards for memoirs containing new truths," and "to appropriate annually a portion of the income for particular researches, under the direction of suitable persons." When we reflect on the immense success which has attended similar measures in the French Academy, the Royal and other societies, and the British Association, we cannot doubt the wisdom and foresight displayed in these regulations, and may already congratulate the Institution on the prosperous results of the former part of their design, as evinced by the valuable memoirs which have appeared from time to time in the nine volumes known as the Smithsonian Contributions to Knowledge: the latter part will no doubt in due time be more fully carried out than seems yet to have been done, although the system of meteorological observation inaugurated by the Institution is no mean effort.

The second part of the design, for the diffusion of knowledge among men, it is intended to promote by "the publication of a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge not strictly professional," and, "by the publication of separate treatises on subjects of general interest." At present this portion of the plan has been very partially put into execution, yet we do not know of any want which is more pressingly felt than some such method of making accessible at once to the cultivators of science every where the discoveries which are now being so rapidly made in almost all departments. Much has been effected by the excellent reports issued from time to time by the British Association; but it would be an inestimable boon if the contributions to knowledge now scattered through isolated and often inaccessible periodicals, or lost in the crowded transactions of sparse societies, were year by year collected and arranged in a form which would enable each detached workman to see how far the building for which he may be hewing stones is rising by other hands. Nothing is more striking and distressing in the history of science than to see the waste of labor and intellect, and the disputes and heartburnings that have been caused simply by ignorance of what has been simultaneously doing in other places. It is true that to carry out this proposal efficiently would require a larger staff than seems to be contemplated in the Institution: but perhaps this very circumstance makes in its favor, as thus affording a provision (somewhat analagous to many examples in the old world, and in which the United States are lamentably deficient,) for maintaining a class of men who would make science their sole pursuit, and who would cultivate knowledge for its own sake and not as merely manure for the dollar tree. Certainly it would seem that the funds might be more properly devoted for such a staff than for that necessary to furnish the store clerks of Washington with rail-car iterature, or even than to illuminate the city belles by the light of popular lecturing. However, when we consider that the Institution is yet in its infancy, having barely existed for ten years, and contemplate what has already been effected by it, we are justified in hoping brightly for its future progress; and we would here record our grateful sense of the exertions of its noble Secretary, Professor Joseph Henry, to whom mainly all these results are due. He has fought the battle almost single-handed on behalf of science against narrow nationalism and political greed; he has met with obloquy and persecution, but may now look back with pride on the work he has done, and forward with hope on that which is before him, secure that he possesses the sympathy and gratitude of his brethren in science, whose interest he has so well served while at the same time saving the honor of his country.

We may briefly mention that the total amount of the bequest received into the Treasury of the United States was $515,169; of the interest that accumulated on this before the Institution went into operation, a portion amounting to $325,000 was devoted to building purposes, and the remainder of about $125,000 has been added to the principal, so that the annual revenue is now about $40,000, of which nearly the whole is expended in the manner above described.

The title at the head of this article is that of the Tenth Annual Report of the Regents to Congress, containing, in addition to the business matter of the Institution, an appendix, the contents of which are of a varied but generally useful character. Among these we may notice an abstract of lectures on architecture in connection with ventilation, &c., by Dr. Reid, whose disputes with the architect of the New Houses of Parliament will be familiar to all the readers of *Punch*. Professor Henry's very excellent article on "Acoustics applied to public buildings," (already given in this Journal, Vol. II. page 130,) and his report on the testing of building materials, are here: there is also by the same gentleman a syllabus of a course of lectures on Physics, which, starting from the ultimate properties of matter, carries us forward through the whole range of Natural Philosophy along a track which, although well laid out, seems to us less truly philosophical and less in accordance with the history of science than the one pursued by Comte. There is also a proposition for a work by the illustrious author of the ninth Bridgewater treatise, the magnitude of which is of startling dimensions: its suggested title is "The Constants of Nature and Art," and, in the words of the proposer, it "ought to contain all those facts which can be expressed by numbers, in the various sciences and arts." We are glad to observe a detailed account of the Observatory at St. Martin's, erected and maintained by our esteemed contributor, Dr. Smallwood, of whom Canada may be proud, and to whose zeal and services a graceful recognition is here awarded. The translation of Muller's "Report on recent progress in Physics," commenced in the last report, is here continued by a different hand and, we are glad to say, executed in a much better style; the paper itself is a most valuable one, and the Regents have done well in selecting it for publication. On the whole the present volume will not be found less valuable than the best of its predecessors, and we trust it may be followed by many which will rival it in usefulness.

J. B. C.

The Geography and History of British America, and of the other Colonies of the Empire; to which is added a sketch of the various Indian tribes of Canada, and brief biographical notices of eminent persons connected with the history of Canada. By J. George Hodgins. Toronto: Maclear & Co., 1857.

We welcome, with sincere satisfaction, this useful little product of the Canadian Educational Press, as an attempt—and in most respects a very successful one—to supply a grave defect in the materiel for juvenile school training. We have already* commented on the highly objectionable character of some of the most popular American Geographies and Historical Manuals as British or Canadian School Books. We have no desire that the rising generation should be taught, in American fashion, to decry every other nation, and esteem themselves the greatest, wisest, mightiest, and most superlatively progressive people that the universe can boast of. Nevertheless we do think it becomes us as members of the British Empire to know a little of its Geography and History; and as Canadians to acquire our information from some less partial source than "Morse's Geography," and the like products of the American press, which still hold their place in so many of our schools, and devote more space to setting forth the glories of some single States of the Union than they can spare for all Britain and the Canadas together.

Mr. Hodgins' Colonial History and Geography will meet, at once,

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* *Ante* Vol. I., page 465.

one of the most obvious wants of our Scholastic system; and issued, as we may presume it to be, under the authority, or at least with the approbation of the Chief Superintendent of Public Instruction, we may anticipate its general adoption throughout the Common Schools of the Province. Should such be the case a new edition must soon be required; and this will afford the author an opportunity, which we trust he will avail himself of, to make a careful revision of the text, and remove from it sundry evidences of haste in the original composition, as well as of carelessness in the press-reading.

In case of such a revision, other amendments may probably occur to the author. We very much question, for example, the fitness or good taste of introducing into a school-book biographical sketches of living celebrities,—political and ecclesiastical,—some of whose names are still bandied about in our daily press, and associated with sectarian or party cries. That is not a direction in which we have any reason to apprehend a want of instruction for the rising generation. We can scarcely anticipate satisfactory results from such "school exercises" as the following:—"Give a sketch of the career of Sir Allan MacNab," or "The Hon. M. S. Bidwell," or "Sketch the Career of the Hon. Francis Hincks." These and other names introduced here are still the shibboleths of party politics; and some of them, at least, are destined to be forgot as soon as they cease to be so. They must be as unacceptable to many parents' ears as they may be welcome to others. To sketch the career of living politicians is a new demand on the class form.

The sketch of the Indian tribes of Canada is concise, and, on the whole, comprehensive in its brevity. On one or two points, however, it would be benefitted by revision. In the matter of Indian names, especially, we think the affected purism, which aims at a return to the aboriginal etymon, peculiarly out of place in a school-book. Now that the name *Ottawa*, for example, is fixed in the termonology of our Canadian geography, it can only lead to confusion to perpetuate such terms as Utawas, Atawawas, Odahwas, &c. Again, we have *Odjibwas* and *Wyandots:* the least familiar forms of the names of tribes, one of which still embraces the most numerous of our Upper Canadian Aborigines, while the other has bequeathed its more familiar designation to Lake Huron. The accuracy which aims at including all the diverse terms, and every variation of such names, as the student may chance to meet with in minute research, is worse than useless when presented to the indiscriminating and unretentive memory of a child. Let him learn first to associate all his ideas on the subject with one definite, and if possible, simple and easily remembered name, and by and by all the rest will follow without labour or difficulty. To tell the child at starting that the Huron Indian is also the Wy-an-dot and the Qa-to-ghie; and that the Chippewa is the Od-jib-wa, the O-jib-way, the Chep-e-wy-an, and the Chip-pe-way, may possibly disgust him with the whole subject: it certainly can not render it any clearer to his mind. For nearly similar reasons we conceive that the space devoted to the derivation and significance of Indian topographical nomenclature might be much more usefully employed. Some of the interpretations are certainly wrong, others of them are open to grave doubts; while the important element, dependent on the essential differences of the Indian languages from which they are derived, is entirely overlooked. Such philological studies, even if correct, are premature, in such a rudimentary work as this. As we are suggesting amendments, we may also recommend the summary ejecting from the otherwise appropriate conclusion, that everlasting "Morning Drum" of the Honorable Daniel Webster, which, however "beautiful and impressive" when first heard, begins to grow somewhat wearysome from the hard duty it is made to do in Canadian oratory: "following the sun, and keeping company with the hours, with one continuous and unbroken strain" of trite grandiloquence.

We would not, however, wish to dwell on the partial blemishes of a book which we hope to see, not only re-issued in a form altogether satisfactory and acceptable as a most welcome addition to our school literature; but also made the model for a larger and more comprehensive work suited for advanced students, and designed to leave a more detailed and consequently a more permanent impression on the mind. In such a work, though Canada may still claim the largest share, it will not occupy it quite so much to the exclusion of other colonies and possessions of the British crown. Were geography the sole object in view, it would perhaps be legitimate enough to club Gibraltar with Heligoland, the Isle of Man, and the Channel Islands, in the minute segment of a concluding page here allotted to the whole; but for a work bearing on its title page "The Geography and History of the Empire," these themes are rich in historic associations demanding a much larger space. So also with British India, Ceylon, The Cape, St. Helena, and Malta, as well as other British dependencies, it would be difficult to conceive of subjects more suggestive of useful and attractive study for the beginner, just entering on the threshold of historical investigation. We deprecate, above all things, the infusion into the youthful minds of our provincial students of a disproportionate and untruthful estimation of Canada. Such a process of learning history has as much utility and beauty in it as the study of oneself in a convex mirror, where the nose swells to a size that rivals the remainder of the distorted features, and the face itself outbulks the whole dwindled and tapering figure. Canada is *not* the greatest corner of the universe, nor Toronto the concentration of all that is sublime and exclusively select and magnificent on our little planet. And as it is generally thought desirable that our young common-school pupils should have some idea that this Earth of ours is not quite so big as the Sun, and may even compare disparagingly with Jupiter or Saturn: we have an idea that there may be nothing unwise or unpatriotic in giving them equally truthful ideas of the political world at large; instead of merely substituting a Canadian "Morse" for the American one, which illustrates the Geography of Ireland by the picture of a "Peeler distraining for rent;" and after expending some forty pages on its own glorious "United States," generously spares a single page and a fraction for the whole of British North America. Regarding as we do such teaching as peculiarly injurious to the minds of the rising generation, we congratulate Mr. Hodgins on setting the example of a system of schooling more in accordance with wise discrimination and true patriotism; and if such ample knowledge should teach young Canada to think less of our Province in comparison with the rest of the world, we feel well assured that its final effect will be to make the world at large think more, and with better reason, of this the greatest of all the colonies of the Empire.

D. W.

SCIENTIFIC AND LITERARY NOTES.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

ON THE VARIATION IN THE QUANTITY OF RAIN DUE TO THE MOON'S POSITION IN REFERENCE TO THE PLANE OF THE EARTH'S ORBIT.—BY MR. C. FULBROOK.

The author called attention to an important difference in the amount of rain which falls in these latitudes at opposite parts of the moon's course with reference to the plane of the earth's orbit:—a result obtained by placing horizontally (from the daily register of Howard, in the vicinity of London) the amount of rain (when any) due to each day throughout a lunar course,—and so on for 100 courses in due order. The following table exhibits the result :—

Position of the Moon with reference to the Plane of the Earth's Orbit in its connexion with the Rain-fall of London and its vicinity, as deduced from a Register of the Weather during 100 courses of that Luminary.

Position of the Moon.	Days.	Amount of Rain.
In greatest South Latitude.	1	
	2	
	3	47·60 in. in 500 days. (days 3–7)
	4	
	5	
	6	
Ascending through the Plane of Earth's Orbit	7	
	8	
	9	
	10	
In	11	
	12	
North	13	
	14	
Latitude.	15	
	16	
	17	26·42 in. in 500 days. (days 17–21)
	18	
Descending through the Plane of Earth's Orbit	19	
	20	
	21	
	22	
In	23	
	24	
South	25	
	26	
Latitude.	27	

ON A LAW OF TEMPERATURE DEPENDING UPON LUNAR INFLUENCE—BY MR. J. P. HARRISON.

The author commenced by saying that, although the question of lunar influence on the atmosphere of our planet was very generally considered as set at rest by the investigations of M. Arago, yet he felt very confident that he was in a position to prove the law he was now about to announce without fear of contradiction. He had reduced and thrown into the form of tables and of curves 280 lunations, with the corresponding mean temperatures: and the laws at which he had arrived were:—First, between the first and second octant the temperature immediately after the first quarter, both on the average and also, with rare exceptions, in each individual lunation is higher than the temperature shortly before the first quarter; secondly, and more particularly: the mean temperature of the annual means of the second day after the first quarter (or the tenth day of the moon's age) is always higher than that of the third day before the first quarter (or the fifth day of the lunation.)

ON THE EFFECT OF WIND ON THE INTENSITY OF SOUND.—BY PROF. G. G. STOKES.

The remarkable diminution in the intensity of sound, which is produced when a strong wind blows in a direction from the observer towards the source of sound, is familiar to everybody, but has not hitherto been explained, so far as the author is aware. At first sight we might be disposed to attribute it merely to the increase in the radius of the sound-wave which reaches the observer. The whole mass of air being supposed to be carried uniformly along, the time which the sound would take to reach the observer, and consequently the radius of the sound-wave, would be increased by the wind in the ratio of the velocity of sound to the sum of the velocities of sound and of the wind, and the intensity would be diminished in the inverse duplicate ratio. But the effect is much too great to be attributable to this cause. It would be a strong wind whose velocity was a twenty-fourth part of that of sound; yet even in this case the intensity would be diminished by only about a twelfth part. The first volume of the "Annales de Chimie," (1816), contains a paper by M. Delaroche, giving the results of some experiments made on this subject. It appeared from the experiments,—First, that at small distances the wind has hardly any perceptible effect, the sound being propagated almost equally well in a direction contrary to the wind and in the direction of the wind; secondly, that the disparity between the intensity of the sound propagated in these two directions becomes proportionally greater and greater as the distance increases; thirdly, that sound is propagated rather better in a direction perpendicular to the wind than even in the direction of the wind. The explanation offered by the author of the present communication is as follows: If we imagine the whole mass of air in the neighbourhood of the source of disturbance divided into horizontal strata, these strata do not all move with the same velocity. The lower strata are retarded by friction against the earth, and by the various obstacles they meet with; the upper by friction against the lower, and so on. Hence the velocity increases from the ground upwards, conformably with observation. This difference of velocity disturbs the spherical form of the sound wave, tending to make it somewhat of the form of an ellipsoid, the section of which by a vertical diametral plane parallel to the direction of the wind is an ellipse meeting the ground at an obtuse angle on the side towards which the wind is blowing, and an acute angle on the opposite side. Now, sound tends to propagate itself in a direction perpendicular to the sound-wave; and if a portion of the wave is intercepted by an obstacle of large size, the space behind is left in a sort of sound shadow, and the only sound there heard is what diverges from the general wave after passing the obstacle. Hence, near the earth, in a direction contrary to the wind, the sound continually tends to be propagated upwards, and consequently there is a continual tendency for an observer in that direction to be left in a sort of sound-shadow. Hence, at a sufficient distance, the sound ought to be very much enfeebled; but near the source of disturbance this cause has not yet had time to operate, and therefore the wind produces no sensible effect, except what arises from the augmentation in the radius of the sound-wave, and this is too small to be perceptible. In the contrary direction—that is, in the direction towards which the wind is blowing,—the sound tends to propagate itself downwards, and to be reflected from the surface of the earth; and both the direct and reflected waves contribute to the effect perceived. The two waves assist each other so much the better as the angle between them is less, and this angle vanishes in a direction perpendicular to the wind. Hence, in the latter direction the sound ought to be propagated a little better than even in the direction of the wind, which agrees with the experiments of M. Delaroche. Thus the effect is referred to two known causes,—the increased velocity of the air in ascending, and the diffraction of sound.

REPORT ON THE DEVELOPMENT OF HEAT IN AGITATED WATER.—BY MR. G. RENNIE.

Mr. Rennie, in alluding to his former papers on the subject, read before the Section last year, at Cheltenham, stated that the subject of the mechanical or dynamic force required to raise a given quantity of water one degree of Farenheit had been the object of the research of philosophers, ever since Count Rumford, in his celebrated experiments on the evolution of heat in boring guns when surrounded by ice or water, proved the power required to raise one pound of water one degree, and which he valued at the dynamic equivalent of 1,034 lbs. M. Moya was the first who announced that heat . evolved from agitated water. The second was Mr. Joule, who announced that heat was evolved by water passing through narrow tubes, and by this method each degree of heat required for its evolution a mechanical force of 770 lbs. Subsequently in 1845 and 1847 he arrived at a dynamical equivalent of 772 lbs. These experiments had since been confirmed by other philosophers on the Continent. In the present paper Mr. Rennie stated his attention was called to the subject by observing the evolution of heat by the sea in a storm, and by the heat from water running in sluices. He, therefore, prepared an apparatus similar to a patent churn, somewhat resembling that adopted by Mr. Joule, but on a large scale. In the first case he experimented on fifty gallons, or 500 lbs. of water, inclosed in a cubical box, and driven by a steam engine instead of a weight falling from a given height, as in Mr. Joule's experiment; secondly, on a smaller scale, by 10 lbs. of water inclosed in a box. The large machine or churn was driven at a slow velocity of eighty-eight revolutions per minute, and the smaller machine at the rate of 232 revolutions per minute, so that the heat given off by the water in the large box was only at the rate of three and a half degrees per hour, including the heat lost by radiation; whereas the heat evolved by the ten gallons of water contained in the small box agitated at 232 evolutions was fifty-six degrees Fahrenheit per hour. Thus the temperature of the water in the large box was raised from sixty degrees to 144 degrees, and the temperature of the water in the small box to boiling point. As an illustration, an egg was boiled hard in six minutes. The mechanical equivalent in the first case was found to approximate nearly to that of Mr. Joule, but in the latter case it was considerably above his equivalent, arising, very probably, from the difficulty of measuring accurately the retarding forces.

ON SOME PHENOMENA IN CONNEXION WITH MOLTEN SUBSTANCES.—BY MR. J. NASMYTH.

The author stated, on introducing the above subject to the notice of the Section, that his object in so doing was to direct the attention of scientific men to a class of phenomena which, although their main features might be familiar to practical men, yet appeared to have escaped the attention of those who were more engaged in scientific research. The great fact which he desired to call attention to is comprised in the following general proposition,—namely, that all substances in a molten condition are specifically heavier than the same substances in an unmolten state. Hitherto water has been supposed to be a singular and special exception to the ordinary law,—namely, that as substances were elevated in temperature they became specifically lighter, that is to say, water at temperature 32° on being heated does on its progress towards temperature 40° become more dense and specifically heavier until it reaches 40°, after which, if we continue to elevate the temperature, its density progressively decreases. From the facts which Mr. Nasmyth brought, forward, it appears that water is not a special and singular exception in this respect, but that, on the contrary, the phenomena in relation to change of density (when near the point of solidification) is shared with every substance with which we are at all familiar in a molten state, so entirely so, that Mr. Nasmyth felt himself warranted in propounding, as a general law, the one before stated,—namely, that in every instance in which he has tested its existence, he finds that a molten substance is more dense, or specifically heavier, than the same substance in its unmolten state. It is on account of this if we throw a piece of solid lead into a pot of melted lead, the solid, or unmolten metal, will float in the fluid, or molten metal. Mr. Nasmyth stated, that he found that this fact of the floating of the unmolten substance in the molten holds true with every substance on which he has tested the existence of the phenomenon in question. As, for instance, in the case of lead, silver, copper, iron, zinc, tin, antimony, bismuth, glass, pitch, rosin, wax, tallow, &c.; and that the same is the case with respect to alloys of metals and mixtures of any of the above-named substances. Also, that the normal condition as to density is resumed in most substances a little on the molten side of solidification, and in a few cases the resumption of the normal condition occurs during the act of solidification. He also stated that, from experiments which he had made, he had reason to believe that by heating molten metals up to a temperature far beyond their melting point, the point of maximum density was, as in the case of water, at 40° about to be passed; and that at such very elevated temperatures the normal state, as regards reduction of density by increase of temperature, was also resumed, but that as yet he has not been able to test this point with such certainty as to warrant his alluding further to its existence.

A MATHEMATICAL INVESTIGATION OF THE PROPORTION BETWEEN THE LENGTH REQUIRED FOR AN ELECTRIC TELEGRAPH CABLE AND ITS SPECIFIC GRAVITY.—BY CAPTAIN BLAKELY.

The author showed, by the principles of the composition of motion, as a telegraph wire was payed out from a ship, the velocity which gravity would give it would soon become uniform by the resistance of the water as its parts descended; therefore, the descending part of the cable from the advancing ship to the part of the cable which had reached and was supported upon the bottom, as he showed, in very deep water, say two miles or more, might stretch back six or more miles from the ship. Now, unless a great strain was kept on the brake in the ship where the cable was paying out, a strain which in the case of the Atlantic cable had caused it to part, it was obvious from this demonstration that there must always be what the sailor termed "slack" in the cable when it reached and lay on the bottom, for the inclined length of the rope was always longer than the horizontal length of the bottom on which it was intended to lie. The author then proceeded to estimate, by mathematical formulæ, and numerically, the exact proportion of these in several supposed depths of soundings, rapidity of paying out, and specific gravity of the cable, and came to the conclusion, that the only way of lessening an evil, which must never be expected to be entirely got rid of, was by increasing the speed of the vessel paying out the cable, and diminishing the specific gravity of the cable itself, so that it should sink gently to its final position.

The *Athenæum* reporter, from whose notes we derive the above abstract, re-reports the following interesting discussion in the Section, to which it gave rise:—

Mr. James Thomson did not concur in the view taken by the author, as he conceived that in the method he proposed the cable would be apt to sink in festoons: a bend when once formed by its superior weight dragging down more rapidly than the parts on each side, yet horizontal, and thus the cable would have large folds, or even coils, when it reached the bottom.

During the conversation which arose in the Section after the reading of this communication, a new light seemed to break upon the members, as it seemed to be universally admitted that it was mathematically impossible, unless the speed of the vessel from which the cable was payed out could be almost infinitely increased, to lay out a cable in deep water (say two miles or more) in such a way as not to require a length much greater than that of the actual distance, as from the inclined direction of the yet sinking part of the cable, the successive portions payed out must, when they reached the bottom, arrange themselves in wavy folds; since the actual length is greater than the entire horizontal distance. The fact, therefore, which, when noticed, led to the increasing of the strain on the Atlantic cable until it broke, ought to have been anticipated, and must be provided for in the future progress of that great national undertaking.

ON THE AMOUNT AND FREQUENCY OF THE MAGNETIC DISTURBANCES, AND OF THE AURORA AT POINT BARROW, ON THE SHORES OF THE POLAR SEA.—BY MAJOR-GENERAL SABINE.

Point Barrow is the most northern cape of that part of the American continent which lies between Behring's Strait and the Mackenzie River. It was the station of H.M.S. Plover from the summer of 1852 to the summer of 1854, and to Captain Maguire, now in the Section, and the officers of that ship, they were indebted for the very valuable series of observations which he was now about to lay before the Section, and in part discuss. They were furnished with supplies of provisions, &c., for Sir John Franklin's ships, had they succeeded in making their way through the land-locked and ice-encumbered channel, through which they sought to effect a passage from the Atlantic to the Pacific. In this most dreary and otherwise uninteresting abode, Capt. Maguire and his officers happily found occupation during seventeen months, unremittingly, in observing and recording every hour the variations of the magnetic and concomitant natural phenomena, in a locality perhaps one of the most important on the globe for such investigations. Their observatory, placed on the sand of the shore, which for a long tract nowhere rose much above five feet above the sea, was constructed of slabs of ice, and lined with seal-skins throughout. The instruments had been supplied by the Woolwich establishment, with the requisite instructions for their use; and the observations were made and recorded precisely in the same manner as those of the Colonial magnetic observatories. These were sent by Captain Maguire to the Admiralty, and were in due course transmitted to General Sabine, by whom they were subjected to the same processes of reduction as those made in the Colonial observatories. The author then exhibited to the Section six long rolls, containing the results of this discussion, giving the reduced observations at each of the hours of the twenty-four. A sufficient body of the larger disturbances having been separated from the rest, it was found at Point Barrow as elsewhere, wherever similar investigations had been made, that in regard to the frequency of their occurrence, and the average amounts of easterly and westerly deflections, the disturbances followed systematic laws depending on the hours of solar time. The laws of the easterly and westerly were also found at Point Barrow, or elsewhere, to be distinct and dissimilar. The author explained how these observations, which manifestly related to those arising from what were called "storm," were separated from the rest; and when that separation was effected, the law of the true solar variation was shown distinctly to be observed. But upon instituting a comparison between the disturbance laws at Point Barrow and Toronto, it was found that the laws of the deflections of the same name at the two stations did not correspond; but, on the other hand, there existed a very striking and remarkable correspondence between the law observed by the easterly at Point Barrow and the westerly at Toronto, and between the law of the westerly at Point Barrow and easterly at Toronto; and this correspondence was shown to exist not in slight or occasional particulars only, but throughout all the hours in well-marked characteristics of both classes of phenomena; and it follows from the correspondence in the hours at which opposite disturbance deflections prevail, that the portion of the diurnal variation which depends upon the disturbances has opposite, or nearly opposite, characteristics at the two stations. The importance of eliminating these disturbances from the regular march of the solar variation was then pointed out in both: for when the diurnal variation is derived from the whole body of observations at Point Barrow, retaining the disturbances, the westerly extreme of the diurnal excursion, which, as is well known, occurs generally in the extra-tropical part of the northern hemisphere a little after 1 P.M., is found to take place at 11 P.M.; but when these larger disturbances are omitted, the westerly extreme falls at the same time as elsewhere—viz, 1 P.M.; and the author suggested the probability that the anomalies which have sometimes been supposed to exist in the turning hours of the solar diurnal variation in high latitudes may be susceptible of a similar explanation. It appears, then, by a comparison of the Point Barrow and Toronto observations, that in the regular solar diurnal variation the progression at the two stations is similar, the easterly and westerly extremes being each reached nearly at the same hours, whilst in the disturbance diurnal variation this progression is reversed. Another distinction exists in their magnitudes, which is found in the solar diurnal variation to be as nearly as may be in the inverse ratio of the values of the horizontal force at the two stations, (which is the antagonistic force opposing all magnetic variation,) whilst on the other hand the increase in the range of the disturbance variation is many times greater than it would be according to the same proportion. It would appear, therefore, that the absolute disturbing force must be much greater at Point Barrow than at Toronto. The author then proceeded to point out the concomitant occurrences of the auroral manifestations. The observers noted at each hour whether or not there was an auroral display: from 11 A.M, to 3 P.M. no auroral displays were ever observed; but the number of them was found progressively to increase from 3 P.M. to 1 A.M., and then again in regular progression to decrease to 0, at 11 A.M. The frequency of the occurrence of the aurora may be judged of, when it is said that during six months,—December, January and February of 1852–53, and the same of 1853–54,—the aurora was seen six days out of every seven. The hour of the day at which no auroral display is ever observed corresponds with the minimum of westerly disturbance, while the maximum of both is found at the same hour of westerly disturbance—viz., 1 A.M. The frequency of the aurora, also, and the amount of westerly deflection of the magnet also accord; whilst on the other hand the auroral hours appear to have little or nothing in common with the turning hours or the progression of the easterly deflections. When Sir John Franklin was going out on the expedition which deprived his country of the invaluable services of himself and his brave companions, he had been furnished by the Admiralty both with instruments carefully adjusted and compared with standard, and with full instructions for their use, and for the making and recording hourly observations of the utmost importance in the several stations he might occupy in these seas; and in the last letter which had ever been received from him, he had expressed his determination to put up those instruments at the several stations at which he should winter. Now when his ardour in these pursuits and that of Capt. Crozier, the second in command, and the other officers, were taken into account, there could remain no doubt that such observations had been made and recorded, and that these records still existed in some of the places he had last been in. When he (General Sabine) was with Capt. Parry, in 1818, they had made observations with the pendulum for determining the figure of the earth, and others of great scientific importance, on their way towards Behring's Straits. They had been exposed to considerable risk of the ships being lost, and were about to take to the boats and proceed overland, and in preparation for this they merely prepared to carry with them abstracts of the observations, leaving the original full records safely deposited in secure cases in the cabins of the ships, to be found by those who doubtless would be sent out to look for them. He had, therefore, no doubt that if the ships of Sir John Franklin were still in existence, in their cabins were to be found those scientific treasures; and this was one of the reasons why men of science were so anxious to have the ships carefully looked for, and it was a sacred duty even to the memories of those who had sacrificed their lives in procuring such results, to do them the justice and honour of having them recovered if possible.

ON CERTAIN PLANETARY PERTURBATIONS, AND ON A NEW PERTURBATION ON ENCKE'S COMET.—BY THE REV. W. E. PENNY.

It appears that there are in the motions of several of the planets inequalities arising from the product of the disturbing forces of two planets, which inequalities appear not to have been noticed hitherto, unless very lately, but which seem to be much larger than might have been expected, owing to the length of time during which they are accumulating. The most remarkable is one which exists in the motions of Mars and the Earth. Its period is about 1,800 years, or about twice that of the long inequality of Jupiter and Saturn. In the case of the Earth it appears to amount to about $7\frac{1}{4}$ seconds, and is owing to the product of the disturbing forces of Jupiter and Mars, and in the case of Mars it seems to amount to about $45\frac{1}{3}$ seconds, and is owing to the product of the disturbing forces of Jupiter and the Earth. It arises from the fact, that 4 times the mean motion of the Earth is very nearly equal to 8 times that of Mars *minus* 3 times that of Jupiter. Its value for the Earth is represented by the following equation:—$\delta\theta_2 = 7{\cdot}293'' \sin(8n_3 t - 4n_2 t - 3n_4 t + 8\epsilon_3 - 4\epsilon_2 - 3\epsilon_4 + 75^\circ{\cdot}14')$; and for Mars by the equation:—$\delta\theta_3 = -45{\cdot}684'' \sin(8n_3 t - 4n_2 t - 3n_4 t + 8\epsilon_3 - 4\epsilon_2 - 3\epsilon_4 + 73^\circ{\cdot}34')$: where n_2, n_3, n_4, are the mean motions of the Earth, Mars, and Jupiter. This inequality is remarkable as being, if the work is correct, larger, and in the case of Mars very considerably so, than any which arise from the simple perturbation of a single planet, —the largest hitherto known in the case of the Earth amounting to only 7·15", and in the case of Mars to 25·5". Also, there will be a corresponding inequality in the motion of the Moon, which I have not yet examined, but which may, perhaps, be sensible; for, according to the investigations of M. Hansen, the inequality in the motion of the Earth discovered by Prof. Airy, amounting to 2·04", with a period of 240 years, produces one of not less than 23" in the motion of the Moon, —so that, judging by analogy, there ought to be a sensible inequality in the present case also. Again, there seems to be an inequality in the motions of Jupiter, Saturn, and Uranus, with a period of somewhat more than 1,700 years, and amounting in the case of Jupiter to about 10"; and in the case of Saturn to about 40", and in that of Uranus to 43". It arises from the fact, that 6 times the mean motion of Saturn is nearly equal to twice that of Jupiter *plus* 3 times that of Uranus. There are several others besides these, of less importance, arising from the product of two disturbing forces; and there is even one which results from the product of three forces, and appears to amount to nearly 7". There are also several inequalities of the same kind in some of the asteroids, which are very much larger than any in the motions of the principal planets; but as the theory of the asteroids is considered to be of comparatively little interest, I have not communicated them.

But the most remarkable inequality of all of this kind is one which exists in the motion of the comet of Encke, and which is due to the product of the disturbing forces of Jupiter and Saturn. The mean motion of this comet is very nearly equal to 4 times that of Jupiter *minus* that of Saturn, or stated in other words, $\frac{n - 4n_4 + n_5}{n}$ is a very small quantity,—so that there will be a considerable inequality of the form P $\sin (nt - 4n_4 t + n_5 t + \theta)$, and also another of the form P' $\sin (2nt - 8n_4 t + 2n_5 t + \theta')$. This latter term, I find, appears to account for at least a very considerable part of the remarkable acceleration which has been observed in the mean motion of this comet; but owing to peculiar difficulties which beset the question, I am not able to say whether it accounts for the whole of it or not. There will also be a remarkable inequality, arising from a similar cause, in the motions of comets of short period.

ON THE ELECTRIC FISHES AS THE EARLIEST ELECTRIC MACHINES EMPLOYED BY MANKIND.—BY GEORGE WILSON, M.D., F.R.S.E., REGIUS PROFESSOR OF TECHNOLOGY, UNIVERSITY OF EDINBURGH.

Were the question put to a circle of scientific men, "With what form of electrical apparatus were mankind first acquainted?" we should be certain to hear much ingenious discussion concerning the date of Von Kleist's earliest Leyden jar (1745), Hauksbee's glass friction-machine (1709), and Otto Von Guericke's famous sulphur ball (1670). Few however, would go further back than this primitive instrument, unless the magnet were included among electrical apparatus, which in the form of the compass-needle it cannot be; and even if we dignified with the name of instruments the pieces of amber and precious stones which the predecessors of Guericke rendered attractive and luminous by friction, we should gain nothing by going beyond 1600, when Gilbert, the introducer of the word *electricity*, published his truly scientific treaties "De Magnete." The discussion would thus range at utmost over only two centuries and a half; and as the Magdeburgh sphere of sulphur is the earliest artificial arrangement which can be fairly called a machine, our oldest electrical instrument is apparently less than 200 years old.

Such, accordingly, has been the conclusion of our historians of Electricity; nor did it occur to me, whilst prosecuting researches into the early history of electrical instruments, to doubt its accuracy. Last summer however, I was directed towards a new channel of inquiry, by a paper read to the Archæological Institute at its meeting in Edinburgh by my colleague Professor Simpson, in which he drew attention to the application of the living torpedo as a remedial agent by the ancient Greek and Roman physicians, in demonstration of the antiquity of the practice of employing electricity therapeutically. I had not looked at the subject in this light before, but inquiry soon satisfied me that a living electric fish was the earliest, and is still the most familiar, electric instrument employed by mankind. Before entering into the proof of this it is worth while noticing, that although the historians of Electricity have not overlooked the fact that the ancients were aware of the electrical powers of the torpedo, they have passed unnoticed the early therapeutic employment of the fish, as a truth which, however interesting to the naturalist or the physician, had no significance for them. Priestley for example, in his "History and Present State of Electricity," 1775, refers to the gymnotus as "possessed of a kind of natural electricity, but different from the common electricity, in that persons who touch it in water are shocked and stunned by it, so as to be in danger of drowning" and quotes Muschenbroeck's query, "whether the sensation communicated by the torpedo does not depend upon a similar electricity?" But both references occur under "Miscellaneous Experiments," illustrating the then "present" state of electrical science, and no historical importance is attached to them. This is the more remarkable, that when Priestley wrote, the only electrical power known to characterize the fishes which he names was that of giving the "shock;" and so marvellous did this phenomenon appear to him, that he goes the extreme length of declaring, that "the electric shock itself, if it be considered attentively, will appear almost as surprising as any discovery that Sir Isaac Newton made; and the man who could have made that discovery by any reasoning *a priori* would have been reckoned a most extraordinary genius."

It seems strange, after these statements, that Priestley should have given no place in his history either to the ancient recognition of the shock-giving power of the torpedo, or to its application as a remedial agent; but the explanation of his silence probably lies in the fact, that he was not fully satisfied that the shock of the torpedo or gymnotus was electrical. "It is to be regretted," he says, "that none of the persons who have made experiments on these fishes should have endeavoured to ascertain whether they were capable of exhibiting the phenomena of attraction and repulsion, or the appearance of electric light, as experiments of this kind are of principal consequence, and must have been easy to make." Later historians of Electricity, especially those writing after the experiments thus referred to, had (in spite of difficulty, which Priestley quite undervalued) been successfully made, have not failed to quote the classical references to the torpedo, but have attached no importance to its medical use. and no Natural Philosopher, so far as I am aware, has even hinted the claim of the electric fishes to rank first in order of time among electrical instruments.

The subject is one of greater interest to physicists than to naturalists, but I bring it before the Natural History Section of this Association rather than before the sections devoted to Physics and Chemistry, in the hope of inducing naturalists placed in favourable localities to enquire how far uncivilized nations familiar with electric fishes employ their powers remedially.

The subject admits of a twofold division,—into, 1*st*, The antiquity of the practice of using the electrical fishes as remedial agents; 2*d*, The extent or generality of that practice.

So far as I have yet ascertained, the fishes which have been or are thus employed are limited to different species of the torpedo, the gymnotus, and the silurus or malapterurus; the first a widely distributed marine genus, the second abounding in many of the rivers of South America, and the third in certain of those of Africa. Of none of these fishes but the gymnotus can it with certainty be affirmed, that those who made use of them were aware that they were electrical instruments; and in the case of the gymnotus this remark applies only to its therapeutic use in very recent times. There is reason, indeed to believe that it had been employed for centuries by the South American savages as a mysterious heroic remedy; but in speaking of the zoo-electric machine as the earliest electric instrument, I must throughout be understood as looking at the living apparatus from a modern electrician's point of view.

The antiquity of the practice first concerns us, and must be rested chiefly on the torpedo, as employed by the civilized dwellers on the shores of the Mediterranean. From their writings we can trace the practice back for nearly two thousand years; certainly to before the Christian era.

On this point I shall mainly be content to quote the statements of the Rev. C. David Badham, M.D. In his learned and most amusing volume, "Prose Halieutics, or Ancient and Modern Fish Tattle," he thus writes of the torpedo under its Greek name Νάρκη;—"Besides those Sicarian Skate., there is one of much smaller dimensions, but of far more marvellous powers, which long before Leyden phials were invented, or the principles of electricity were understood, had pressed this redoubtable agent into its service, and was wont to give practical lessons in the science to all who did not object to the 'charge.' The peculiar powers of this fish are cursorily alluded to, or commemorated at length, by a whole host of ancient writers,—

> 'Quis non edomitam miræ torpedinis artem
> Audit et emeritas signatas nomine vires?'

asks Claudian; Plato compares Socrates to a Narké, from that sage's well-known capabilities of electrifying his auditory; and its achievements have been amply detailed by Aristotle, Cicero, Plutarch, Pliny, Oppian, Ælian, Athenæus, and Galen." So far as medical use is concerned, Dr. Badham observes, that "the electric properties of this enchantress of the sea suggested to ancient practitioners to try its efficacy in the cure of headache and painful nervous affections, by applying it epidermically; and Dr. Galen, who seems to have been a strong homœopathist, advises the numb-fish (which he erroneously supposed to retain some electrical virtue after death and stewing) as a dish to paralytic patients, with a view to cure their numbness: no doubt on the *similia similibus* principle."

Whether Galen held the theory which Dr. Badham, half in jest, half in earnest, attributes to him, it is interesting to know that the term torpedo (happily translated numb-fish), implies that the Roman physicians were more struck by the ultimate paralyzing effect of the torpedo's discharge than by the earlier convulsing one. Galen, indeed, referred the powers of the fish to its exertion of "a torporific action peculiar to itself," so that we can scarcely say that he looked upon an electric fish as a shock-machine. We must not however, attach too much importance to the mere name of the one electric fish known to the classical naturalists and physicians. The sensations excited by what a modern physician would call the discharge of electricity, great in quantity, and moderately high in intensity, through the body, are in reality indescribable; but the ancient observers have depicted those sensations, to the extent that they had experienced them, as faithfully as any modern has done. We acknowledge, and escape the difficulty of precise description, by calling the sensations in question as a whole, "an electric shock." And as the ancients were familiar with the "shock," though they had no single term for it, I count it no anachronism to say that the torpedo was for them as for us, a living, electric shock-machine. The title, it will be observed, is a distinctive one, applicable only to a few creatures. The observations of Galvani, interpreted and greatly extended by Matteucci, Müller, Dubois Reymond, and others, have shown us that the higher animals, and probably all animals, are in a true sense electric machines, but not that they are shock-machines. They constantly develop electricity; but to the slight extent that it acts externally to their bodies, its quantity is too small, and its intensity too low, to confer upon it the slightest shock-giving power; the animal cannot, by an act of volition, influence the electrical currents which it unconsciously develops. On the other hand, a few creatures, all scaleless inhabitants of the waters, develop electricity, great in quantity, high in intensity, and admitting, as the creature wills, of being retained latent, or set free with killing force. These fishes thus correspond to our artificial therapeutic electric instruments, such as the coil-machine, in the quantity and quality of the electricity they furnish, but differ from them in this important particular, that we cannot compel them to give a shock any more than we can compel a leech to bite or to suck blood. So much are we at the mercy of their will in this matter, that in the case of the torpedo, Badham, speaking of himself, says, "We were not able, during a long sojourn at Naples, to obtain one shock in our own person; while many lazzaroni friends, who did not seek it, had frequently their arms 'astonished' (the word is Réaumur's) for a whole day after lugging a narké on board." How far the ancients realized this fact, of which to some extent they must have been cognisant, and what devices they followed to induce the torpedo to give its shock, does not appear very clearly from the Greek and Roman writings which have came down to us. Galen's ascription of similar properties to the dead as to the living torpedo, is not reconcilable with the belief that he was fully aware of the purely voluntary nature of the electric discharge. The same remark in all likelihood may be applied to the majority of the ancient practitioners who employed the torpedo in medicine. Nevertheless, it will be seen from their prescriptions, copied in the sequel, that they were generally strict in requiring that the fish should be alive, and whatever antiparalytic virtues Galen may have attributed to its cooked body, he denies that it has any narcotic effect as a medicine, unless when applied alive." A similar conviction probably led to the cruel practice of boiling the living torpedo in oil, with a view to produce an anodyne liniment. On this point, as on others connected with the subject before us, we may look for more precise information than at present we possess, when the great work on the Greek and Latin physicians, in course of publication at Paris, has made further progress. Meanwhile, the following references to the torpedo, will sufficiently illustrate the electro-practice of the ancient physicians. I quote them in chronological order, so far at least as centuries are concerned. Asclepiades who flourished in the first century, B.C., employed the torpedo in inflammation; but only fragments of his works have reached us.

Of the application of the torpedo as a stupefacient, we find mention in several writers anterior to Scribonius: Nicander alludes to it; and Asclepiades, who practised medicine in Rome a century before Scribonius, employed it in inflammation: and Anterus, a freedman of Tiberius, was successfully treated for gout through the application of a live torpedo, by advice of Charicles.

Pliny (first century) has many references to the torpedo. The following is one of the more general and speculative:—

"And then, besides, even if we had not this illustration by the agency of the echeneïs, would it not have been quite sufficient only to cite the instance of the torpedo, another inhabitant also of the sea, as a manifestation of the mighty powers of nature? From a considerable distance even, and if touched only with the end of a spear or staff, this fish has the property of benumbing even the most vigorous arm, and of riveting the feet of the runner, however swift he may be in the race. If, upon considering this fresh illustration, we find ourselves compelled to admit that there is in existence a certain power which, by the very exhalations, and as it were, emanations therefrom, is enabled to affect the members of the human body, what are we not to hope from the remedial influences which nature has centered in all animated beings?"

The succeeding quotations illustrate more precisely the mode of applying the torpedo:—

Scribonius Largus (first century) thus writes:—"Capitis dolorem quemvis veterem et intolerabilem protinus tollit, et in perpetuum remediat torpedo viva nigra, imposita eo loco qui in dolore est, donec desinat dolor, et obstupescat ea pars; quod quum primum senserit, removeatur remedium, ne sensus auferatur ejus partis. Plures autem parandæ sunt ejus generis torpedines, quia nonnunquam vix ad duas tresve respondet curatio, id est torpor; quod signum est remediationis."

Galen (second century) refers in similar terms to the treatment of headache: "Sed et torpedinem totam, dico autem animal marinum, capitus dolores sanare capiti admotam sedemque eversam coërcere à quibusdam est proditum. Verum ego quum utrumque essem expertus, neutrum verum comperi. Eam igitur cum cogitassem vivam esse applicandam, cui caput doleret, posse enim fieri ut hoc medicamentum anodynon esset, ac dolore liberaret similiter ut alia quæ sensum obstupefaciunt, ita habere comperi. Putoque eum, qui primus est usus tali quapiam motum ratione experiri aggressum."

Aëtius, who wrote in the end of the fifth century, does little more than abbreviate the prescriptions of his predecessors:—"Torpedo viva apposita diuturnum capitis dolore depellit, et prolabentem sedem intrò pellit mortua verò, aut omnino non, aut modice hæc facit."

Paulus Ægineta (end of the sixth or the beginning of the seventh century), who as his learned commentator, Dr. Francis Adams, tells us, "continued to be looked up to as one of the highest authorities in medicine and surgery during a long succession of ages," thus condenses the opinions of his predecessors:—"Torpedo; when applied to the head *while still alive*, in cases of headache, it procures relief, to the pain, probably by its peculiar property of producing torpor; and the oil in which the *living* animal has been boiled, when rubbed in, allays the most violent pains of the joints." The accomplished scholar, whose translation I have quoted, refers, in the relative commentary and elsewhere, to the general employment of the torpedo by the Greek, Roman, and Arabian physicians, adding the significant query—"Is not this an application of the principle of galvanism in medicine?"

Marcellus (whom I quote out of order) prescribes standing on a live black torpedo, on a moist shore which has been washed by the sea, till torpor is felt through the feet up to the knee, as a cure for gout.

From these accounts, and especially from that of Scribonius Largus, it appears that in the treatment of severe and obstinate headache, the torpedo was laid on the aching head, or aching part of the head, and left there till it had thoroughly benumbed it. The fish was probably wetted occasionally with sea-water (as Marcellus plainly intends), or immersed in it, otherwise it must soon have ceased to be "*torpedo viva;*" but whether dead or alive, its good effects must have frequently been owing as much to its acting as a cold poultice or wet bandage, as to its efficiency as an electric machine. It was faith, however, in its electrical powers that led to its therapeutic use; and this is all that concerns the present inquiry.

How early the torpedo was employed in medicine cannot be precisely determined. The labours of Daremberg and his colleagues will doubtless throw light on this point; but as Scribonius Largus, Pliny, and other writers of the first century, all describe the medical use of the torpedo, and Asclepiades and Nicander refer to it a century earlier, it at least dates from before the Christian era. It is probable, also, that the ancient physicians borrowed their torpedinal remedy from the Mediterranean fishermen long after they had acquired faith in it; and altogether we may safely say, in round numbers, that the electrical machine, as embodied in the torpedo, is at least 2000 years old. It is probably very much older, for barbaric nations love what the French call "heroic" remedies; and the shock of the provoked torpedo is likely to have been held medicinal by the earliest fishermen of the Mediterranean sea. It would be interesting to ascertain whether the Italian sailors of the present day have any traditional respect for the torpedo as a medicine. It is sold in the Neapolitan markets as an article of food; but I do not know if Galen's successors agree with him in imputing to it medicinal virtues after it is cooked. Apparently not; but the naturalists and electricians of Italy, a country prodigal of both, will enlighten us on this not unimportant matter.

Another electric fish besides the torpedo was known to the civilized nations of antiquity, and to nations whose civilization is of much earlier date than that of the Greeks and Romans. The Nile breeds one electrical fish, if not more; and when we remember what an inquisitive, intelligent people the ancient Egyptians were, and that both their medical skill and their practice of animal worship were likely to interest them in the singular endowments of the electric fish, we may well expect to find its powers chronicled, if not employed, by their priests and physicians. As yet, however, nothing has been extracted from either the hieroglyphics or the paintings on the tombs to fulfil this expectation. A very competent authority, indeed, adduces the *absence* of pictorial representations of the Nile fish from the Egyptian monuments as a proof of the special esteem with which it was regarded. "It might reasonably be expected," says Sir J. Gardner Wilkinson, "that the *raad*, or electric fish of the Nile, would be one of the most sacred, and forbidden for food; and it seems not to be represented among those caught in the ancient fishing scenes." He adds regarding the raad:—"It is a small fish, and the one I saw measured little more than a foot long by four inches in depth, but it had the power of giving a very strong shock. It is the *Melapterurus electricus*, and may have been the ancient *Latus*." Thus far Egyptian antiquity is silent as to the very existence of an electric fish; but the name by which the malapterurus is known to the modern Egyptians, has been referred to as proving that their predecessors had more or less precisely ascertained that the same force which is present in the thunder-cloud is present in the shock-giving fish. If this view is well founded, it is difficult to say how remote the period is to which we must carry back the commencement of electrical science, if not also of electrical art. Mr. Murray embodies the questionable view of this subject in the statement, "the silurus of which we have to speak is the *silurus* of the Nile (*Malapterurus electricus*), called raasch, or thunder-fish, by the Arabs."

Wilkinson, referring to the same subject, says, "the name *raad* 'thunder' is very remarkable, since the modern Egyptians are quite ignorant of its peculiar powers; and if it was borrowed by them, from their predecessors, the question naturally arises, were they acquainted with electricity?" The author probably intends here by "predecessors," the more ancient Egyptians, on whose customs and character he has thrown so much light. As the word *raad*, however, is Arabic, its origin, though ancient, may be much later than the latest of the Pharaohs. Assuming, apparently, this view, Alexander Von Humboldt asks, "did an ingenious and lively people, the Arabians, guess from remote antiquity that the same force which inflames the vault of heaven in storms is the living and invisible weapon of inhabitants of the waters? It is said that the electric fish of the Nile bears a name in Egypt that signifies thunder." It might be pleaded in behalf of this view that the sagacious Arabian physician Averrhoes explicitly affirmed of the torpedo, as Dr. Badham notices, that "the power which this fish possesses of affecting the skin, seems to be of a kind analogous to that by which the magnet acts upon steel," and would have extended this explanation to the silurus. To what extent, however, this ambiguous utterance is to be understood as implying the discovery by Averrhoes of the bond which modern science has shown to unite electricity and magnetism, and the expression by himself or his countrymen of this truth in the name given to the silurus, it is needless to inquire, till we have disposed of the philological question, does the word *raad* really signify thunder fish? The reply must be in the negative. Humboldt himself became satisfied of this, and states in a note to the passage already quoted, "It appears however that a distinction is to be made between *rahd*, thunder, and *rahadh*, the electrical fish; and that this latter word means simply 'that which causes trembling.'"

The question is one which only Arabic scholars can answer, and I have accordingly referred it to Mr. Edward Stanley Poole, a learned Orientalist, whose decisive reply I give in full:—"I fear the electric fish of the Nile will not sustain the credit of my ancient Egyptian friends for scientific knowledge. The Arabic appellation of the fish in question, namely *raa'ad*, is certainly given to it on account of its *causing trembling*. This is sufficiently plain, from a comparison of words from the same root; and is expressly asserted in an excellent Arabic work, 'Abdollatiphi Historiæ Ægypti Compendium.' The Arabic appellation of thunder is somewhat different (*raad*), and has evidently originated from the supposition that thunder is a trembling, or a state of agitation of the clouds; or from its being a cause of trembling. For the former of these two derivations we have the authority of El-Beydáwee, in his 'Commentary on the Kur-án. 'Raa'ád' is a generic noun, and 'Raa'ádeh' is a noun of unity, meaning a single fish of the kind called 'Raa'ád.' My reading of these words admits of no doubt, and is well known to Arabic scholars."

The modern Arabic name of the Nile electric fish thus does not justify the conclusion, that the Egyptians of past or present times believed that the shock of the fish was the same in nature as a lightning-shock. A name exactly equivalent in meaning is given, as Humboldt incidently informs us, to the gymnotus as well as the torpedo, by the South Americau Spaniards "who confound all electric fishes under the name of *tembladores*, literally "tremblers," or "producers of trembling."

At the present day the silurus of the Nile is sold in the markets of Cairo, and used as food.

The second point to be considered is the extent or generality of the practice of using electrical fishes as shock-machines. In this, however, as in other matters, it will be found that extension in space to a great degree corresponds to duration in time.

In ancient epochs the torpedo was probably employed medically on all the shores of the Roman empire, including our own, which it visited, and traces of its therapeutic use probably survive in some of them to the present day. I am unable, however, to indicate any such traces more precise than that the shock-giving powers implied in its vernacular titles, such as the Maltese name of *Haddayla*, a term which has reference to its benumbing powers; the French one, *La Tremble;* and the English, specially expressive names *cramp*-fish and *numb*-fish.

One modern people, however, makes use of the torpedo exactly as the ancients did, though whether as a tradition from the Mediterranean electro-physicians, or as an independent discovery, I have not the means of ascertaining. The Abyssinians, Dr. Bradly tells us, employ the torpedo (I presume from the Red Sea,) in the treatment of ferver. "The patient is first strapped to a table, and the numb-fish then applied successively over every organ of the body: the operation is reported to be both very painful and successful."

Next to the torpedo, the gymnotus is the most famous among electrical fishes, and it is by far the most powerful. The shock indeed, of a large gymnotus is so severe, that no lover of heroic remedies, having one at command, need long for a magneto-electric coil machine. Several species or varieties of the fish occur, as Humboldt tells us, in the large rivers of South America, the Orinoco, the Amazon and the Meta, besides frequenting their tributaries, and the smaller streams of an extensive bordering region. They have accordingly been familiar for centuries to the Indians, who are constantly reminded of their presence, even in rivers too deep to let them be caught or frequently seen, by the shocks which they feel when bathing or swimming in the river. The shallower streams, also, and basins of stagnant water, near the sources of the Orinoco and elsewhere are, in this writer's words, "filled with electrical eels," so that their shock-giving powers are forced upon the attention of all visiting those districts; and we cannot but feel curious to know whether any therapeutic use has ever been made of living machines so powerful.

At first sight it might appear that their very power had prevented their use. Humboldt mentions that "the dread of the shocks caused by the gymnoti is so great, and so exaggerated among the common people, that during three days we could not obtain one, though they are easily caught, and we had promised the Indians two piastres for every strong, vigorous fish." And that this fear, however exaggerated, is in the main well founded, is rendered certain by the unexceptionable testimony of Humboldt himself, not only in his famous account of the battle between the wild horses of the savannahs and the gymnoti, whose favourite pools they reluctantly invaded, but also in his description of the effect of a gymnotus-shock received in full force by himself.

"It would be temerity," says he, "to expose ourselves to the first shocks of a very large and strongly-irritated gymnotus. If by chance a stroke be received before the fish is wounded or wearied by long pursuit, the pain and numbness are so violent that it is impossible to describe the nature of the feeling they excite. I do not remember having ever received from the discharge of a large Leyden jar a more dreadful shock than that which I experienced by having imprudently placed both my feet on a gymnotus just taken out of the water. I was affected during the rest of the day with a violent pain in the knees and in almost every joint. To be aware of the difference that exists between the sensation produced by the voltaic battery and an electric fish, the latter should be touched when they are in a state of extreme weakness. The gymnoti and the torpedos then cause a twitching of the muscles, which is propagated from the part that rests on the electric organs, as far as the elbow. We seem to feel at every stroke an internal vibration, which lasts two or three seconds, and is followed by a painful numbness. Accordingly, the Tamanac Indians call the gymnotus, in their expressive language, *arimna*, which means, something that deprives of motion.'"

We cannot wonder, then, that the Indians who had experiences, such as Humboldt underwent, and who, unlike the philosopher, were unacquainted with the limits within which the shock-giving power of the gymnotus is restricted, should be unwilling to provoke its anger. This, however, has not kept them from employing it in medicine. All my information on this point is derived from Humboldt, and he does enter into details, but the following statement is sufficiently explicit:—

"In Dutch Guiana, at Demerara for instance, electric eels were formerly employed to cure paralytic affections. At a time when the physicians of Europe had great confidence in the effects of electricity, a surgeon of Essequibo, named Van der Lott, published in Holland a treatise on the Medical Properties of the Gymnotus. These electric remedies are practised among the savages of America, as they were among the Greeks."

I have not been able to obtain sight of Van der Lott's work, but Humboldt plainly records the Indian use of the gymnotus in medicine as a device of the Americans, not an imitation of European practice.

From a further statement it appears that the Spaniards had not taught this practice to the Indians, or borrowed it from them. "I did not," observes Humboldt, "hear of this mode of treatment in the *Spanish* colonies which I visited; and I can assert that, after having made experiments during four hours successively with gymnoti, M. Bonpland and myself felt till the next day a debility in the muscles, a pain in the joints, and a general uneasiness, the effect of a strong irritation of the nervous system."

On this point it remains to state, that even in Europe the gymnotus has been used as an electric machine in the end of last century. One sent from Surinam to Stockholm lived more than four months in a state of perfect health. "Persons afflicted with rheumatism came to touch it in hopes of being cured. They took it at once by the neck and tail: the shocks were in this case stronger than when touched with one hand only. It almost entirely lost its electrical power a short time before its death." In this case, the gymnotus was known to yield electricity by those who employed it; but the practice was probably borrowed from the aborigines of its native country. At all events, it is quite certain that, alike without knowledge of artificial electrical machines, or acquaintance with the therapeutic uses to which the Greeks and Romans put the torpedo, the wild Indian doctors had made trial of the healing electric virtues of the living gymnotus.

Within the last three years a new electric fish has become known to us, belonging to the same genus as the *silurus* or *malapterurus* of the Nile. It is found in the muddy brackish water of the River Old Calabar, near Creek Town, which lies about sixty miles up that river. This stream empties itself into the Bight of Benin, within a short distance from the delta of the Niger, in lat. 5½° north, and long. 8° east. The fish, accordingly, has been named the *Malapterurus Beninensis* by Mr. Andrew Murray, who has described and figured it in the *Edinburgh Philosophical Journal* for July 1855.

We are indebted to the zealous and intelligent missionaries of the United Presbyterian Church of Scotland, resident at different stations on the River Old Calabar, for our knowledge of the new species of electric fish. Quite recently they have sent home living specimens, some of which are now in Edinburgh: and through the kindness of Professor Goodsir and Mr. Murray, I, along with others interested in the electric energies of the animal, have had the opportunity of observing their shock giving powers. The shock is a sharp one, felt from the fingers to the wrist, the elbow, or the shoulder, according to the activity of the animal, and the position in regard to it of the hands of the experimenter. The fish varies in length from two to twelve inches, is sluggish in its general movements, but retentive of vitality and electrical energy even in unfavourable circumstances.

As soon as my attention was turned to the remedial employment of electric fishes, I proceeded to inquire whether the Africans along the Old Calabar river made any therapeutic use of its malapterurus. But before my inquiries were completed, I learned that the natives did make this use of the fish. In truth, the fact had been published by Mr. Murray two years ago, but I had overlooked the circumstance. The statement which is quoted below, is the more interesting, that it was not furnished in reply to queries, but was volunteered by Mr. W. C. Thomson, who was stationed for several years at the Creek Town Mission station on the River Old Calabar. Mr. Murray says:—"Mr. Thomson tells me that the electric properties of the fish are made use of by the natives as a cure for their sick children. The fish is put into a dish containing water, and the child made to play with it: or the child is put in a tub or other vessel with water, and one or more of the fish put in beside it. It is interesting to find that a remedy which has only of recent years come into favour among ourselves should have been already anticipated by the unlettered savage, who probably has had the remedy handed down to him by tradition from remote generations."

Unaware of this very precise announcement and inference, I applied to the Rev. W. Anderson, who brought from Old Calabar the living fishes at present in Edinburgh, and received the following answer:—

"In reply to your query, I have to state that I am not aware of any statement having been published in reference to the remedial properties of a shock from the fishes, neither have I ever seen them used in any way in sport; but Mrs. Anderson, to whom belongs all the credit of bringing the fishes home, testifies that the native mothers generally keep one of the fishes in a native-made basin, and that on washing their infants in the morning the practice is to dip either the hands or the feet of the infant, so as to cause it to receive a shock. This is done, they say, for the purpose of *strengthening* the child. The strong and the healthy have to undergo the operation as well as the weak and sickly." And that the fish is not an inactive agent in this singular process may be safely inferred from what follows—"So far as Mrs. Anderson's observation goes, there is no liking for the affair on the child's part; plenty of struggling and squalling. The natives use the fish as food."

A third and independent account of the native usages in reference to the malapterurus has been furnished by Mr. John R. Wylie, recently a teacher at Creek Town, Old Calabar, but at present in Edinburgh on sick leave. Mr. Wylie says: "The Calabar women use this fish in the following manner: They put one or two, according to size, in a tub of water, and then wash their children (infants) in the tub with the fish and all. They must have a strong sense of the benefit derived from this, as in general they dislike doing anything which makes their infants cry; and this process makes them do so most lustily. They also make the children drink a great quantity of the water in which these fish have been. I have been in yards, and seen, on several occasions, the process described."

The ascription of remedial virtues to the water in which the malapterurus has been kept, is a fact of interest when taken in connection with the similar opinion entertained by the Greeks, according to Ælian, in reference to the water in which a torpedo had lain.

After the triple testimony adduced, it will not be doubted that the employment of the malapterurus as a remedial electric machine is an established practice among the natives of Old Calabar; and few will question the justness of Mr. Murray's inference, that the practice is one of great antiquity among them.

It thus appears, that the nations bordering the Mediterranean, the Abyssinians, the Indians of South America, and the dwellers on the western rivers of Africa, have independently used the torpedo, the gymnotus, and the malapterurus as living shock-machines. The practice certainly dates from before the Christian era, so far as the first-named fish is concerned, and in all probability is of much earlier date for all the electric fishes.

Two conclusions, accordingly, seem unavoidable; namely, 1st. That the oldest electrical machine employed by mankind was the living electric fish; 2nd. That the electric machine most familiar to mankind is also the electric fish. The latter conclusion is of much less interest to myself than the former; and daily as galvanic batteries, and other electrical apparatus, are more widely known, it will become less significant. But as the present usages of uncivilized nations represent their past usages back even to a remote antiquity, the light in which a barbaric people still regards creatures so remarkable as the electric fishes is certain in most cases to illustrate the history of electrical science and electrical art. Writing as a physicist, I would remind naturalists, that it was the careful study of the powers of the torpedo that first enabled electricians to understand some of the most important laws of action of their artificial machines and batteries. I have elsewhere pointed out, that in Cavendish's "Account of some Attempts to Imitate the Effects of the Torpedo by Electricity" will be found the first enunciation of that distinction between *intensity* and *quantity* as affecting electrical phenomena, which has since proved so important a guide to the explication of electrical problems. Faraday dwells largely on this point, nor does it admit of the slightest doubt, that inorganic electricity, both as a science and an art, is very largely indebted to organic electricity in it for the explanation of the laws which it obeys, and for the contrivances by which it works.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

ON THE FORMATION OF CONTINENTS.—BY PROFESSOR BENJAMIN PEIRCE, OF CAMBRIDGE, MASS.

The interest which attaches to the comprehensive theory embraced in this important communication of Professor Peirce, tempts us to print the following unauthenticated abstract, in the absence of any more trustworthy report. In justice to the author, however, it must be borne in remembrance that it is derived from the reports of the Montreal press; and, at best, only serves to indicate the author's line of argument.

Prof. Peirce remarked that the principle lines of the continents are arcs of great circles tangent to the polar circles. Any globe will illustrate this. The eastern coast of South America and the western coast of Europe are in such a line. So also are the eastern coasts of Africa, Asia, and North America. The western side of Hindostan is tangent on the other side. So also are the lines of Sumatra, the western coast of America, and the longer line of New Zealand. The western coast of Africa, he said, was no doubt fully parallel. There were other lines tangent to the tropics—the northern line of South America and the range of islands of the Pacific. This seemed to indicate that the sun had some influence in forming the lines of continents. The difference of temperature caused by the sun's rays was very considerable; enough, as we saw, to keep portions of the earth in a state of fluidity while others were solid. For a large portion of the year the sun was near one or the other of the tropics, and it might be expected to exhibit its power in this way by producing lines of cleavage, strongly tending to form the outlines of continents, for the instant the earth should shrink so far that the crust should be too large for it, then the flexure must take place along the lines of natural cleavage. Then the phenomena of freezing showed that there was a tendency to lines perpendicular to these, which would give lines nearly tangent to the tropics. One or the other of these lines would be the bottom of the ocean, and a corresponding one the top of a continent. There would be no tendency to change, because the bottom of the ocean would keep cool from the superincumbent water, while the ridge of the continent would keep cool from its height, and the hottest places would be along the coast. We must expect these lines, therefore, to remain as a permanent condition, with only such modifications as would arise from currents and glacial action: a theory which geologists seemed inclined to adopt at present. He would draw attention to the effect which the trade winds produced by their friction upon the Pacific and Atlantic Oceans in gulf streams. The Gulf Streams, cotemporary with the first shaping of the American Continent, would throw warm water upon the European world and keep it in a fluid state for some time after the other continents were definitively formed. It was well known that the last portions of a fluid to freeze froze over most roughly; Europe, therefore, would be, as it was, the most broken up of the continents. Much criticism would arise from the known age-relations of different ranges of mountains. According to this view, we could hardly do otherwise than suppose that the first tendency to break should be along the line of the Pacific coast. Yet we know that this was one of the last to be upheaved. We must, however, remember that the first action was only a little flexure—just enough to give direction to a current which would afterwards throw the water over upon this side. This line, being the line of cleavage, would be the most subject to volcanic action, and would be the last as well as the first affected by it. The only ground of opposition to this was the theory of Elie de Beaumont, which traced long lines of wrinkling from very short lines of elevation in Europe. He thought that Elie de Beaumont had gone too far in making lines so short the bases of such extended generalization. It was very much like taking 600 or 700 miles of the Isthmus of Darien as a basis for determining the direction of the Andes and Rocky Mountains. We saw on examination that the lines of Elie de Beaumont were so close together, and so many of them were so nearly tangential to the polar circle, that we were led to believe that they might be only slight variations.

THE ZODIACAL LIGHT.—BY THE REV. GEORGE JONES, U.S.N.

The following brief notice conveys a very imperfect indication of the report submitted by the author, of his laborious and protracted observations.

Rev. Mr. Jones said, that after his former publication on the Zodiacal Light, he had felt the want of accurate and sufficient data, and determined to go to Quito, Ecuador, as the most eligible spot for his purpose. It was near the Equator and more free from clouds than most equatorial regions, and its elevation above the surface of the earth was productive of considerable transparency in the atmosphere. So great was this transparency that Humboldt had been able to see his friend, Bonnland, with the naked eye, at 17½ miles distance.

During June, July, and August, the sky at Quito was perfectly clear. But in June, Mr. Jones had been detained at Washington, and in July he and his assistant had the fever at Panama. His friend died on board the English steamer in Guayaguil River and two other persons also dying, he had been prevented from landing, and had to go to Payti, Peru. Thus he did not visit Quito till the end of August, when the sky had become less clear. During his eight months' stay he was only enabled to make 128 observations, but these were valuable. When clear the sky was surpassingly beautiful. The smaller stars were so visible that they seemed to crowd the firmament, while the milky way seemed to have descended quite near the spectator. There he had seen the Zodiacal light, not only at the horizon as before, but forming a complete arch across the sky, extending from the eastern to the western horizon, and this, too, at every hour of the night. It was sometimes so bright as to look like another milky way, stretching across the heavens. He had brought back with him, he might state, some 115 plates exhibiting this luminous arch, giving its boundaries as seen among the stars and also the central line lengthwise. The brightness of the central portion was always greatest, diminishing towards the edges. He would also state that he had made drawings of the relative brightness of the various parts, and taken observations of luminosity as compared with the Milky Way.

Mr. Jones made the following deductions from his observations:—

First, That the substance giving out the Zodiacal Light formed a complete circle. Several of his observations carried it round in a single night, so as to form a complete circle, with the exception of a portion apparently near the sun. On the 26th and 27th December for instance, he had taken five observations. The first of these traced the light to within 16 degrees of the setting sun, the last to within 18 degrees of the rising sun; thus forming a complete circle with the exception of 36 degrees.

Secondly. It is a *great* circle in the heavens, forming an angle of 3 deg. 20 min. with the ecliptic, the ascending node being at longitude 62 deg., and that descending at longitude 242 deg. As seen from the earth, it has a width of about 28 deg.

Thirdly. It is a geocentric circle; for if it were heliocentric one portion would be much nearer the earth than that opposite, and consequently appear of much less breadth, which was not in accordance with the facts of the case. And again, if heliocentric, the laws of the reflection of light would require that the portions next the sun should reflect less light than those near the zenith of the spectator, these appearances were not visible. Again, that portion of the light near the horizon showed an affinity to the spectator's motions as he approached towards, or receded from the ring. And this could only happen in case of a body not very far off.

NOTICE OF THE LONGITUDE OF FERNANDINA, FLORIDA, BY CHRONOMETER EXCHANGES, FROM SAVANNAH, GEORGIA.—BY A. D. BACHE, SUPERINTENDENT, AND CHARLES A. SCHOTT, ASSISTANT, U. S. COAST SURVEY.

(*Abstract for the Canadian Journal, communicated by the Author.*)

The longitude of Fernandina was required in order to know the direction of the line across the peninsula of Florida to the Cedar Keys, which was in a general way to be followed by the triangulation, to connect the Atlantic and Gulf Coast work. Reconaissance had shown a triangulation to be practicable, connecting the termini of the air line rail road. The longitude of Savannah had been obtained by telegraph, and easy means existed for the transportation of chronometers between the two points.

The paper contains an account of the operations, and incidentally a discussion of personal equation, and of the performance of chronometers under different circumstances. The final difference of longitude is given, which is of the greatest importance, as the two best authorities differ some nine miles. The diagrams which accompany it show the order of succession of the chronometer trips, the results of different trials with different observers for personal equation, and the comparison of the ratio of the observing chronometers with the changes of temperature.

From the observed changes of rate of all the chronometers compared with the changes of temperature, corrections were obtained by the method of least squares, and applied to the rate of each instrument so as to reduce them to a mean temperature rate.

The rates of the chronometers when stationary and travelling were deduced, the first by observations between the times of arrival and departure from the two stations, the second by considering the trips to and from Savannah and to and from Fernandina, and assuming equal travelling rates out and back. To these rates a correction was applied by the method of least squares, which, as was expected, turned out to be quite small. In determining this correction the hypothesis of equality of rates was dispensed with.

The two sets of chronometers each containing five instruments differing by nearly three-fourths of a second in the result for longitude, and consistently in the different trips, it was determined to transport them together so that they might be exposed to the same circumstances. This was done without any change of the results.

In deducing the final longitude weights were allowed according to the inverse ratios of the squares of the chronometer errors and also according to the duration of the trips.

The discussion gives 1 min. 29.76 for the difference of longitude of the stations at Savannah and at Fernandina, with a probable error of 0.06.

ON THE WINDS OF THE WESTERN COAST OF THE UNITED STATES, FROM OBSERVATIONS IN CONNECTION WITH THE COAST SURVEY.—BY A. D. BACHE, SUPERINTENDENT.

(*Abstract for the Canadian Journal, communicated by the Author.*)

The observations were made in connection with those of the tides in 1855 under supervision of Lieut., now Professor Trowbridge.

They are reduced by the methods stated in the paper on the winds of Cat Island in the Gulf of Mexico, and read before the Association in 1851.

The diagrams representing the winds for each month, for the half year and year, are plotted upon the compass rose, and show the quantities of wind. Others representing the hourly observations made each week are upon the ordinary rectangular system. They show better than any verbal descriptions, the whole of the phenomena of the winds at San Diego, San Francisco, and Astoria, during the year 1855.

The following simple generalizations are deduced:

1. The great prevalence of westerly winds representing a flow of air at the surface from the ocean in upon the land.

2. The general absence of easterly winds showing the absence of a return current at the surface. The proportion of westerly to easterly winds is as 8 to 1.

3. The increase of westerly winds in the summer, and their decrease in the winter.

4. When easterly winds blow at all, it is as a rule during the winter.

5. The N., N. E. and E. winds blow more frequently in the morning than in the evening hours.

6. The S. E. and S. W. winds are in general pretty equally distributed over the morning and evening hours.

7. The N. W. is the prevailing direction of the ordinary sea breeze at Astoria, and San Diego, and the W. at San Francisco.

Sometimes the W. wind has that character at the first named stations and sometimes the S. W. at the last named.

A close inspection of the same diagrams will lead to other interesting results.

Considering the quantities of wind at the three places for the whole year, (diagram No. 13,) San Diego and Astoria present remarkable similarities, there is more N. E., E and S wind at Astoria, and more N. W. wind at San Diego. At San Francisco the W. and S. W. winds give the character to the rose.

All show the same deficiency of easterly winds, and San Francisco is deficient also in southwardly ones.

The monthly curves grouped in two periods, from November to March, both included, and from April to October, show that the annual curve has the summer type impressed upon it.

The N. W. wind prevails in August at Astoria and San Diego, and the W. and S. W. at San Francisco.

There is scarcely any wind from points between North round by east and south. The form of the rose is exceedingly simple, and the generalization very obvious.

The N. E., E., S. and S. W. winds are considerable at Astoria, and the N. W. winds, give the prominent feature to the rose curve.

As the winter is not the windy season, so the months of March and September are not the windy months. The quantities in the several months and in the several directions are shown on Plate B. On the contrary, July is one of the windiest months of the year.

The further particulars deduced for each of the places of observation cannot be clearly followed without the diagrams.

ON THE HEIGHTS OF TIDES OF THE ATLANTIC COAST OF THE UNITED STATES, FROM OBSERVATIONS IN THE COAST SURVEY. BY A. D. BACHE, SUPERINTENDENT.

(*Abstract for the Canadian Journal, communicated by the Author.*)

The generalizations resulting from a study of the Coast Survey observations of the tides from Cape Florida to Portland are given in this paper, and are extended by the observations of Admiral Bayfield and Captain Shortland to the coasts of Nova Scotia and New Brunswick.

The coast is developed into a straight line, and the tidal stations plotted upon it with their actual distances from each other. At each station an ordinate is erected proportional to the height of the tide. The extremities of these ordinates are joined by a broken line, and a curve representing the general average of the change of heights is drawn across this line. A model in which vertical wires proportional to the rise and fall of the tides are inserted upon a map of the coast, at points corresponding to the tidal stations, shows clearly the law of change of heights.

In obtaining the curve of heights only the points corresponding to the tidal stations of the outer coast were joined; so, in the model, wires of different material represent the outer and inside tidal stations.

The least rise of tides is at Cape Florida, Cape Hatteras, and near the east end of Nantucket, the greatest at Tybee entrance, New York entrance, Boston and the Bay of Fundy stations.

The physical features of the coast clearly marked out are the great Southern Bay between Cape Florida and Cape Hatteras, the great Middle bay between Cape Hatteras and Nantucket, and the Eastern bay between Nantucket and Cape Sable, which itself may be part of the great Eastern bay between Nantucket and Newfoundland. This form of the coast, has, of course, not escaped the attention of geographers.

The tides are lowest at the entrance of these bays and rise as they pass into and up them.

Massachusetts bay is a dependency of the eastern bay, and so is Fundy. These interior bays, as also the sounds freely open to the sea along the, coast present the same features in their tides. Chesapeake bay, widening and changing direction from the entrance, is an exception to the rule. Nantucket and the Vinyard Sounds, Buzzard's bay, Narragansett bay, Long Island Sound, New York Bay, and Delaware Bay, come under the rule.

NOTES ON THE MEASUREMENT OF A BASE FOR THE PRIMARY TRIANGULATION OF THE EASTERN SECTION OF THE COAST OF THE UNITED STATES, ON EPPING PLAINS, MAINE. BY A. D. BACHE, SUPERINTENDENT OF THE U. S. COAST SURVEY.

(*Abstract for the Canadian Journal, communicated by the Author.*)

The reconnoissance for a base of verification at the eastern extremity of the primary triangulation in section I. of the coast was commenced by Chas. O'Boutelle, Esq., and Major Henry Prince, U. S. A., Assistants in the Coast Survey in 1853, and continued through 1854 and 55. The absence of long and straight beaches on this coast rendered it absolutely necessary to look for an interior site.

The reconnoissance resulted in the selection of Epping Plains, Penobscot Co., Me., as the most suitable site for the purpose, considering the character of the ground itself, and the facility of connecting the ends of the base with the primary triangulation.

In 1856 I examined the site and took steps to obtain the necessary estimate of the cost of preparing it for measurement. The profile of the road as graded gives a good general idea of the ground, as it varied but little from the natural profile.

The whole length of the line is about 8719 metres, or 5.4 miles. Its general direction is E 41° N (true bearing). From the eastern end for about 4 miles the plain is quite level, rising in the first mile pretty regularly about 15 feet, descending nearly as much in the second to rise by the same quantity in the third. It then runs along an elevated level for a fourth of a mile and descends gradually to the rougher part of the base which is included between the 3¾ miles from the east end and western end of the base.

This line was skilfully graded by Mr. Boutelle so as to follow the natural surface where the grades did not run above three degrees, and to give as long slopes as possible of the same grade for the convenience of measurement.

The graders partly consisted of the farmers and lumber men of the district, who served with great cheerfulness and skill in the use of the heavy implements for rough grading. One of the greatest difficulties was the removal of such boulders as were in the line, many of them being of such size as to require blasting to break them up, and some being actually removed to the required distance from the line by heavy blasts.

The base apparatus already described before the association and described and figured in my report for 1854, by Lieut. E. B. Hunt, of the Corps of Engineers, was used in this measurement.

The measurement was begun at the west end of the line on Saturday, the 18th of July, but the next week proved so rainy that it was only resumed in earnest on Monday, 27th.

The work of the first Saturday (24 tubes) was measured on the following Monday with precisely the same result as to length, the end measurement falling precisely on the marks which had been placed as terminating the first. The mark was placed and verified as all others of the same sort in one measurement by a transit placed at right angles to the line and at a moderate distance from it.

This was a descending slope of the strongest grade adopted, and there was a difference of temperature of some five degrees in the two measurements. On Tuesday a length of 18 tubes which had been measured on Monday was re-measured with an identical result. This was on an ascending slope.

On Monday the work was in part interrupted by the arrangements for photographing the apparatus, on Tuesday by a fog, and on Wednesday by showers in the morning; we made, however, half a mile each day.

On Wednesday began a series of four unbroken days, during the first of which we measured ¾ of a mile, and on the three others a mile or more than a mile each day, reaching the east end of the Base on Monday evening.

Whole length of Base 28,607 feet, or about 5.4 miles.

Mean level of Base above mean tide 257 feet.

Approximate correction for reduction to the level of the sea 4 inches nearly.

No. of tubes inclined 647

" " level 810

Correction for versed sine for whole base, 9.2 feet to be subtracted.

Maximum inclination 3°14'

Greatest day's work 281 tubes, 1.05 miles, in 11h. 10m. working time, averaging 1 tube in 2m. 27s.

DEPOSITION OF NATIVE METALS IN VEIN FISSURES, &c., BY ELECTRO-CHEMICAL AGENCY. BY PROF. E. J. CHAPMAN, OF UNIVERSITY COLLEGE, TORONTO.

From the known fact that solutions of various metallic salts may be decomposed by voltaic agency, and the metal obtained in the simple state, it has long been a favorite theory with many geologists, that depositions of native metals, in veins, &c., are due to a similar cause. That such may be a perfectly legitimate conclusion in many instances, I am quite ready to admit; but, in applying this view to any particular case, it is necessary, unless the explanation is to be regarded as a mere theory of convenience, that certain collateral circumstances be not altogether excluded from consideration. If these circumstances oppose themselves to our theory, and remain by it altogether unanswered; nay, if but a single well-proved fact withold its concurrence from the conditions demanded—surely it is more consistent with our obligations to scientific truth, that we abandon the theory at once —however plausible in itself, and however convenient in its application—rather than attempt to maintain it by keeping these opposing conditions out of sight, or by wilfully ignoring their value. Now, my object in the present brief communication, is simply to bring before the notice of the Section, certain facts, experimental and otherwise, which appear to me to prove most incontestibly, that, in nine cases out of ten, the so-called electro-chemical theory as explanatory of the origin of native metals in veins, is entirely fallacious.

We will take the case of native copper, under its known conditions of occurrence in the Lake Superior District and other parts of North America. The electro-chemical theory is constantly being brought forward in explanation of this particular case. As the copper is here, normally, in intimate association with vast masses of erupted trap, it might naturally be inferred that the presence of both trap and copper was equally due to igneous action;* or, where the copper occurs in small strings and arborescent masses apart from the trap, to a modification of this action, in volatilization and subsequent reduction of chloride of copper or some other volatile compound. But the upholders of the electro-theory, find these views apparently too simple for their approval. It is very possible that the copper may have originated by some other agency; but the following facts will, I think, shew that this unknown agency was not the electro-chemical principle, whatever else it may have been. The copper is very constantly found in the interior of zeolites or calc-spar, or surrounding crystals of the latter substance in such a manner as to shew that the calc-spar was solid before the solidification of copper—the copper often presenting the most sharply-cut impressions, even to the minutest striæ of the crystals of the calcareous spar. I mention this well known condition of occurrence first, because it is commonly referred to as affording a strong proof of the deposition of the copper according to the electro-chemical theory, although nothing can really be more fatal to the reception of this hypothesis.

The conditions of occurrence just alluded to, may, in the estimation of some, disprove the igneous origin of the copper; but equally do these conditions disprove its origin according to the other view. In the first place, it must be remembered that the zeolites, and carbonate of lime also, are *non-conducting bodies;* and hence that no deposition of metal can be made to take place upon them, by the electro-chemical process, unless their surfaces be first coated with graphite or some other conducting substance. This may be readily shown by the simple method of ascertaining the conductibility or non-conductibility of mineral bodies, employed by Von-Kobell. The substance under examination is to be placed in a solution of sulphate of copper, and touched by a slip of zinc, or a piece of zinc bent into a kind of tongs may be used to hold the mineral. A deposition of metallic copper will rapidly take place upon conducting bodies, such as pyrites, galena, graphite, anthracite, &c., &c.; but not upon non-conductors, as quartz, the feldspars, garnet, calc-spar, malachite, and other similar minerals.

This fact, when forced upon the attention of those who maintain the electro-chemical theory, has been allowed to be "an objection;" but that is not the proper term. It is an insuperable obstacle—nothing less—to the legitimate adoption

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*In support of this view, see Agassiz, "Lake Superior;" Dana, "Manual of Mineralogy;" Native Copper; Burat, "Geologie Appliquée;" Fournet, and other observers. It should also be remembered, in connection with this inquiry, that native copper occurs likewise in other truly erupted trap rocks of different ages and localities, as, for example, in Connecticut, New Jersey, Nova Scotia, Rhenish Prussia, the Faroe Isles, Barrhead in Scotland, and elsewhere. E. J. C.

of this theory; and until it can be satisfactorily explained away, to attempt to account for the origin of the copper by reference to the principle in question, is surely, to say the least, a mere waste of words. A few other objections to this electro-chemical hypothesis may be briefly touched upon.

This hypothesis exacts necessarily a solution of the copper in some form or another. Now, some of the minerals associated with these copper deposits—carbonate of lime, for instance,—are readily altered by immersion in cupreous solutions; whereas the crystals of carbonate of lime actually occurring with the copper, as well as those met with in its immediate neighbourhood, exhibit no appearance of alteration, but retain, on the contrary, their white color and original surface condition. By placing these same crystals for a short time in a solution of sulphate of copper, they become converted at the surface into malachite, or into a copper carbonate of similar aspect, more especially if the solution be kept at a moderately elevated temperature.† Again, if the enormous deposits of Lake Superior originated in this manner, might we not reasonably look for the presence of vast secondary products, the results of the chemical decompositions which must necessarily have taken place. It is asking almost too much to assume that these secondary products may, from their solubility, or from other causes, have entirely disappeared, without leaving behind them very manifest traces of their former presence. But, yet again, if we assume this origin for the copper, we must necessarily assume also that the cupreous solution came from above: that is to say, from an *overlying*, not from an *underlying* source; as otherwise, from the filling up of the fissures, the supply would quickly have been cut off. This involves manifold difficulties of an easily imagined character.

My object, in the present note, is not to propose theories in explanation of the origin of these copper deposits, but simply to shew that if one of the hypotheses already advanced with this view—that which attributes the larger copper masses (in intimate association with the trap) to direct igneous action; and the smaller, arborescent and more distinct masses to gaseous emanations as previously explained—be not free from difficulty; the other, or so-called electro-chemical theory, is, in the cases referred to, absolutely untenable; and, amongst other reasons, chiefly for this, namely: that the deposition of the copper on non conducting bodies is opposed to all known principles. It is to be hoped, therefore, that those who still feel inclined to adopt and maintain this theory of convenience, will not forget to enlighten us as to the cause of the peculiar departure from known laws exemplified in the cases under review.

THOUGHTS ON SPECIES.—BY JAMES D. DANA.

While direct investigation of individual objects in nature is the true method of ascertaining the laws and limits of species, we have another source of suggestion and authority in the comprehensive principles that pervade the universe. The source of doubt in this synthetic mode of reaching truth consists in our imperfect appreciation of universal law. But science has already searched deeply enough into the different departments of nature to harmonize many of the thoughts that are coming in from her wide limits; and it is well, as we go on in research, to compare the results of observations with these utterings of her universality.

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* Specimens of Carbonate of Lime coloured and altered by this process were exhibited to the Section.

I propose to present some thoughts on species from the latter point of view, reasoning from central principles to the circumferential, and, if I mistake not, we shall find the light from this direction sufficiently clear to illumine a subject which is yet involved in doubts and difficulties.

The questions before us at this time are—

1. What is a species?
2. Are species permanent?
3. What is the basis of variations in species?

1. *What is a species?*

It is common to define a species as a *group* comprising such individuals as are alike in *fundamental* qualities; and then by way of elucidation, to explain what is meant by fundamental qualities. But the idea of a group is not essential; and moreover it tends to confuse the mind by bringing before it, in the outset, the endless diversities in individuals, and suggesting numberless questions that vary in answer for each kingdom, class or subordinate group. It is better to approach the subject from a profounder point of view, search for the true idea of distinction among species, and then proceed onward to a consideration of the system of variables.

Let us look first to *inorganic* nature. From the study of the inorganic world, we learn that each element is represented by a specific amount or law of force; and we even set down in numbers the precise value of this force as regards one of the deepest of its qualities, chemical attraction. Taking the lightest element as a unit to measure others by, as to their weights in combination, oxygen stands in our books as 8; and it is precisely of this numerical value in its compounds: each molecule is an 8 in its chemical force or law, or some simple multiple of it. In the same way there is a specific number at the basis of other qualities. Whenever then the oxygen amount and kind of force was concentrated in a molecule, in the act of creation, the species oxygen commenced to exist. And the making of many such molecules instead of one, was only a repetition in each molecule, of the idea of oxygen.

In combination of the elements, as of oxygen and hydrogen, the resultant molecule is still equivalent to a fixed amount, condition, or law, of chemical force; and this law, which we express in numbers, is at the basis of our notion of the new species.

It is not necessarily a different amount of force; for it may be simply a different state of concentration or different rate or law of action. This should be kept in mind in connection with what follows.

The essential idea of a species, thence deduced is this: a *species* corresponds to *a specific amount or condition of concentered force, defined in the act or law of creation.*

Turn now to the organic world. The individual is involved in the germ-cell from which it proceeds. That cell possesses certain inherent qualities or powers, bearing a definite relation to external nature, so that, when having its appropriate nidus or surrounding conditions, it will grow and develope out each organ and member to the completed result, and this, both as to all chemical changes, and the evolution of the structure which belongs to it as a subordinate to some kingdom, class, order, genus and species in nature. The germ-cell of an organic being developes a specific result; and like the molecule of oxygen, it must correspond to a measured quota or specific law of force. We cannot apply the measure, as in the inorganic kingdom, for we have learned no method or unit of comparison. But it must nevertheless be true, that a specific predetermined amount, or condition, or law of force, is an equivalent of every germ-cell in the kingdoms of life. I do not mean to say that there is but one kind of force; but that whatever the kind or kinds, it has a numerical value or law, although human arithmetic may never give it expression.

A species among living beings, then, as well as inorganic, is based on *a specific amount or condition of concentered force defined in the act or law of creation.*

Any one species has its specific value, or law of force; another, its value; and so for all: and we perceive the fundamental notion of the distinction between species when we view them from this potential stand-point. The species, in any particular case, began its existence when the first germ-cell or individual was created; and if several germ-cells of equivalent force were created, or several individuals, each was but a repetition of the other; the species is in the potential nature of the individual, whether one or many individuals exist.

Now in organic beings,—unlike the inorganic,—there is a cycle of progress involving growth and decline. The oxygen molecule may be eternal as far as any thing in its nature goes. But the germ-cell is but an incipient state in a cycle of changes, and is not the same for two successive instants; and this cycle is such that it includes in its flow, a reproduction, after an interval, of a precise equivalent of the parent germ-cell. Thus an indefinite perpetuation of the germ-cell is in fact effected; yet it is not mere endless being, but like evolving like in an unlimited round. Hence, when individuals multiply from generation to generation, It is but a repetition of the primordial type-idea; and the true notion of the species is not in the resulting group but in the idea or potential element which is at the basis of every individual of the group; that is, the specific law of force, alike in all, upon which the power of each as an existence and agent in nature depends. Dr. Morton presented nearly the same idea when he described a species as a *primordial organic form.*

Having reached this idea as the starting point in our notion of a species, we must still, in order to complete and perfect our view, consider what is the true expression of this potentiality. For this purpose, we should have again in mind, that a living cell, unlike an organic molecule, has only an historical existence. The species is not the adult resultant of growth, nor the initial germ-cell, nor its condition at another point; it comprises the whole history of the developement. Each species has its own special mode of developement as well as ultimate form or result, its serial unfolding, inworking and outflowing; so that the precise nature of the potentiality in each is expressed by the line of historical progress from the germ to the full expansion of its powers, and the realization of the end of its being. We comprehend the type-idea only when we understand the cycle of evolution through all its laws of progress, both as regards the living structure under developement within, and its successive relations to the external world.

2. *Permanence of species.*

What now may we infer with regard to the permanence or fixedness of species from a general survey of nature?

Let us turn again to the inorganic world. Do we there find oxygen blending by indefinite shadings with hydrogen or with any other element? Is its combining number, its potential equivalent, a varying number,—usually 8, but at times 8 and a fraction, 9, and so on? Far from this the number is as fixed as the universe. There are no indefinite blendings of elements. There are combinations by multiples or sub-multiples but these prove the dominance and fixedness of the combining numbers.

But further than this, even numbers, definite in value and defiant of all destroying powers, are well known to characterize nature from its basement to its topstone. We find them in combinations by volume as well as weight, that is in all the relations of chemical attraction; in the mathematical forms of crystals and the simple ratios in their modifications,—evidence of a numerical basis to a cohesive attraction; in the laws of light heat, and sound. Indeed the whole constitution of inorganic nature, and of our minds with reference to nature, as Professor Peirce has well illustrated, involves fixed numbers; and the universe is not only based on mathematics, but on finite determinate numbers in the very natures of all its elemental forces. Thus the temple of nature is made, we may say, of hewn and measured stones, so that, although reaching to the heavens, we may measure and thus use the finite to rise toward the infinite.

This being true for inorganic nature, it is necessarily the law for all nature, for the ideas that pervade the universe are not ideas of contrariety but of unity and universality beneath and through diversity.

The units of the inorganic world, are the weighed elements and their definite compounds or their molecules. The units of the organic are *species* which exhibit themselves in their simplest condition in their germ-cell state. The kingdoms of life in all their magnificent proportions are made from these units. Were these units capable of blending with one another indefinitely, they would no longer be units, and species could not be recognized. The system of life would be a maze of complexities; and whatever its grandeur to a being that could comprehend the infinite, it would be unintelligible chaos to man. The very beauties that might charm the soul would tend to engender hopeless despair in the thoughtful mind instead of supplying his aspirations with eternal and ever-expanding truth. It would be to man the temple of nature fused over its whole surface and through its structure, without a line the mind could measure or comprehend.

Looking to facts in nature, we see accordingly every where, that the purity of species has been guarded with great precision. It strikes us naturally with wonder, that even in senseless plants, without the emotional repugnance of instinct, and with reproductive organs that are all outside, the free winds being often the means of transmission, there should be rigid law sustained against intermixture. The supposed cases of perpetuated fertile hybridity are so exceedingly few as almost to condemn themselves, as no true examples of an abnormity so abhorrent to the system. They violate a principle so essential to integrity of the plant-kingdom, and so opposed to nature's whole plan, that we rightly demand long and careful study before admitting the exception.

A few words will explain what is meant by perpetuated fertile hybridity. The following are the supposeable grades of results from intermixture between two species:—

1. No issue whatever—the usual case in nature.

2. Mules (naming thus the issue) that are wholly infertile whether among themselves or in case of connection with the pure or original stock.

3. Mules that are wholly infertile among themselves, but may have issue for a generation or two by connection with one of the original stock.

4. Mules that are wholly infertile among themselves, but may have issue through indefinite generations by connection for each with an individual of the original stock.

5. Mules that are fertile among themselves through one or two generations.

6. Mules that are fertile among themselves through an indefinite number of generations.

The cases 1 to 5 are known to be established facts in nature; and each bears its testimony to the grand law of purity and permanence. The examples under the heads 2 to 5 become severally less and less numerous, and art must generally use an unnatural play of forces or arrangements to bring them about.

Again, in the animal kingdom, there is the same aversion in nature to intermixture, and it is emotional as well as physical. The supposed cases of fertile hybridity are fewer than among plants.

Moreover, in both kingdoms, if hybridity be begun, nature commences at once to purify herself, as of an ulcer on the system. It is treated like a disease, and the energies of the species combine to throw it off. The short run of hybridity between the horse and the ass, species very closely related, reaching its end *in one single generation*, instead of favoring the idea that perpetuated fertile hybridity is possible, is a speaking protest against a principle that would ruin the system if allowed free scope.

The finiteness of nature in all her proportions, and in the necessity of finiteness and fixedness for the very existence of a kingdom of life, or of human science its impress on finite mind, are hence strong arguments for the belief that hybridity cannot seriously trifle with the true units of nature, and at the best can only make temporary variations.

It is fair to make the supposition that in case of a very close proximity of species, there might be a degree of fertile hybridity allowed; and that a closer and a closer affinity *might* give a longer and a longer range of fertility. But the case just now alluded to seems to cut the hypothesis short; and moreover it is not reasonable to attribute such indefiniteness to nature's outlines, for it is at variance with the spirit of her system.

Were such a case demonstrated by well established facts, it would necessarily be admitted; and I would add, that investigations directed to this point are the most important that modern science can undertake. But until proved by arguments better than those drawn from domesticated animals, we may plead the general principle against the *possibilities* on the other side. If there is a law to be discovered, it is a wide and comprehensive law, for such are all nature's principles. Nature will teach it not in one corner of her system only, but more or less in every part. We have therefore a right to ask for well defined facts, taken from the study of successive generations of the interbreeding of species known to be distinct.

Least of all should we expect that a law, which is so rigid among plants and the lower animals, should have its main exceptions in the highest class of the animal kingdom, and its most extravagant violations in the genus Homo; for if there are more than one species of Man, they have become in the main indefinite by intermixture. The very crown of the kingdom has been despoiled; for a kingdom in nature is perfect only as it retains all its original parts in their full symmetry, undefaced and unblurred. Man, by receiving a plastic body, in accordance with a law that species most capable of domestication should necessarily be most pliant, was fitted to take the whole earth as his dominion, and live under every zone. And surely it would have been a very clumsy method of accomplishing the same result, to have made him of many species, all admitting of indefinite or nearly indefinite hybridization, in direct opposition to a grand principle elsewhere recognized in the organic kingdoms. It would have been using a process that produces impotence or nothing among animals, for the perpetuation and progress of the human race.

There are other ways of accounting for the limited productiveness of the mulatto, without appealing to a distinction of species. There are causes, independent of mixture, which are making the Indian to melt away before the white man, the Sandwich Islander and all savage people to sink into the ground before the power and energy of higher intelligence. They disappear like plants beneath those of stronger root and growth, being depressed morally, intellectually and physically, contaminated by new vices, tainted variously by foreign disease, and dwindled in all their hopes, and aims, and means of progress, through an overshadowing race.

We have therefore reason to believe from man's fertile intermixture, that he is one in species; and that all organic species are divine appointments which cannot be obliterated, unless by annihilating the individuals representing the species.

It may be said, that different species in the inorganic world combine so as to form new units, and why may they not in the organic? It is true they combine, but not by indefinite blendings. There is a definite law of multiples, and this is the central idea in the system of inorganic nature. In organic nature, such a law of multiples, if existing, would be general, as in the inorganic; it would be an essential part of the system, and should be easily verified, while, in fact, observation lends it no support, not even enough to have suggested the hypothesis.

In one kingdom, the *inorganic*, there is multiplication of kinds of units by combination, according to the law of multiples, and no reproduction; while in the *organic*, there is reproduction of like from like and no multiplication of kinds by combination. And thus the two departments of living and dead nature widely diverge.

Neither does the possibitity of mere mixture among inorganic substances afford any analogy to sustain the idea of possible hybrid mixture indefinitely perpetuated among living beings. The mechanical aggregation of units that make up ordinary mixture, is one thing; and the combination that would alter a germ, one of the units in organic species, even to its fundamental nature, is quite another. This last is not aggregation. It is as different from mere mixture as is chemical combination, and stands somewhat in the same relation, so that the analogy has no bearing on the question.

3. *Variations of species.*

But there are variations in species, and this is our next topic. The principles already considered teach, as we believe, that each species has its specific value as a unit, which is essentially permanent or indestructible by any natural source of change; and we have, therefore, to admit in the outset, if these principles are true, that variarions have their limits, and cannot extend to the obliteration of the fundamental characteristics of a species.

To understand these variations, we may again appeal to general truths.

Variation is a characteristic of all things finite; and is involved in the very conditions of existence. No substance or body can be wholly independent of every or any other body in the universe. The most comprehensive and influential law in nature, most fundamental in all change, composition or decomposition, growth or decay, is the law of mutual sympathy, or tendency to equilibrium in force through universal action and reaction.

The planets have their orbits modified by other bodies in space through their changing relation to those bodies. A substance, as oxygen or iron, varies in temperature and state of expansion from the presence of a body of different temperature; in chemical tendencies from the presence of a luminous body like the sun; in magnetic or electrical attraction from surrounding magnetic or electrical influences. There is thus unceasing flow and unceasing change through the universe. All the natural forces are closely related as if a common family or group, and are in constant mutual interplay.

The degree or kind of variation has its specific law for each element; and in this law the specific nature of the element is in a degree expressed. There is to each body or species the normal or fundamental force in which its very nature consists; and in addition, the relation of this force to other bodies, or kinds, amounts or conditions of force, upon which its variations depend. One great end of inorganic science is to study out the law of variables for each element or species. For this law is as much a part of an idea of the species as the fundamental potentiality; indeed the one is a measure of the other.

So again, a species in the *organic* kingdoms is subject to variations, and upon the same principle. Its very development depends on the appropriation of material around it, and on attending physical forces or conditions, all of which are variable through the whole of its history. Every chemical or molecular law in the universe is concerned in the growth,—the laws of heat, light, electricity, cohesion, &c.; and the progress of the developing germ, whatever its primal potentiality, is unavoidably subject to variation, from the diversified influences to which it may be exposed. The new germ, moreover, takes peculiarities from the parent, or from the circumstances to which its ancestry had been exposed during one or more preceding generations.

There is then a fixed normal condition or value, and around it librations take place. There is a central or intrinsic law which prevents a species being drawn off to its destruction by any external agency, while subject to greater or less variations under extrinsic forces.

Liability to variation is hence part of the law of a species; and we cannot be said to comprehend in any case the complete idea of the type until the relations to external forces are also known. The law of variables is as much an expression of the fundamental equalities of the species in organic as in inorganic nature; and it should be the great aim of science to investigate it for every species. It is a source of knowledge which will yet give us a deep insight into the fundamental laws of life. Variations are not to be arranged under the head of *accidents:* for there is nothing accidental in nature; what we so call, are expressions really of profound law, and often betray truth and law which we should otherwise never suspect,

This process of variation is the external revealing the internal, through their sympathetic relations; it is the law of universal nature reacting on the law of a special nature, and compelling the latter to exhibit its qualities; it is a centre of force manifesting its potentiality, not in its own inner working, but in its outgoings among the equibrating forces around, and thus offering us, through the known and physical, some measure of the vital within the germ. It is therefore one of the richest sources of truth open to our search.

The limits of variation it may be difficult to define among species that have close relations. But being sure that there are limits—that science, in looking for law and order written out in legible characters, is not in fruitless search, we need not despair of discovering them. The zoologist, gathering shells or mollusks from the coast of eastern America and that of Japan, after careful study, makes out his lists of identical species, with the full assurance that species are definite and stable existences; and he is even surprised with the identity of characters between the individuals of a species gathered from so remote localities. And as he sees zoological geography rising into one of the grandest of the sciences, his faith in species becomes identified with his faith in nature and all physical truth.

If then we may trust this argument from general truths to special,—general *truths* I say, for general principles as far as established are truths—we should conceive of a species from the potential point of view, and regard it as—

a. A concentrated unit of force, an ineffaceable component of the system of nature; but

b. Subject to greater or less librations, according to the universal law of mutual reaction or sympathy among forces.

And, in addition, in the *organic* kingdom,

c. Exhibiting its potentiality not simply or wholly in any existing condition or action, but through a cycle of growth from the primal germ to maturity, when the new germ comes forth as a repetition of the first to go another round in the cycle and perpetuate the original unit; and, therefore, as follows from a necessary perpetuity of the cycle—

d. Exhibiting identity of species among individuals by perpetuated fertile intermixture in all normal conditions, and nonidentity by the impossibility of such intermixture, the rare cases of continuations for one or two generations, attesting to the stability of the law, by proving the effort of nature to rid herself of the abnormity, and her success in the effort.

e. The many like individuals that are conspecific do not properly constitute the species, but each is an expression of the species in its potentiality under some one phase of its variables; and to understand a species, we must know its law through all its cycle of growth, and its complete series of librations.

We should therefore conceive of the system of nature as involving, in its idea, a system of units, finite constituents at the basis of all things, each fixed in law; these units in organic nature as adding to their kinds by combinations in definite propositions; and those in organic nature adding to their numbers of representative individuals, but *not* kinds, by self-reproduction; and all adding to their varieties by mutual reaction or sympathy. Thus from the law within and the law without, under the Being above as the Author and sustainer of all law, the world has its diversity, the Cosmos its fullness of beauty.

I would remark again that we must consider this mode of reaching truth, by reasoning from the general to the special, as requiring also its complement, direct observation to give unwavering confidence to the mind; and we should therefore encourage research with a willingness to receive whatever results come from nature. We should give a high place in our estimate to all investigation tending to elucidate the variation or permanence of species, their mutability or immutability; and at the same time, in order that appearances may not deceive us, we should glance towards other departments of nature, remembering that all truth is harmonious, and comprehensive law the end of science.

A word further upon our conception of species as realities. In acquiring the first idea of species, we pass, by induction, as in other cases of generalization, from the special details displayed among individuals to a general notion of a unity of type; and this general notion, when written out in words, we may take as an approximate formula of the species. One system of philosophy thence argues that this result of induction is nothing but a notion of the mind, and that species are but an imaginary product of logic; or at least, that since, as they say, (we do not now discuss this point), genera are groupings without definite limits which may be laid off variously by different minds, so species are undefined, and individuals are the only realities—the supposed limits to species being regarded as proof of partial study, or a consequence of a partial development of the kingdoms of nature. Another system infers, on the contrary, that species are realities, and the general or type idea has, in some sense, a real existence. A third admits that species are essentially realities in nature, but claims that the general idea exists only as a result of logical induction.

The discussion in the preceding pages sustains most nearly the last view, that species are realities in the system of nature while manifest to us only in individuals; that is, they are so far real, that the idea for each is definite, even of mathematical strictness, (although not thus precise in our limited view,) it proceeding from the mathematical and infinite basis of nature. They are the units fixed in the plan of creation; and individuals are the material expressions of those ideal units.

At the same time we learn, that while species are realities in a most important and fundamental sense, no comprehensive type-idea of a species can be represented in any material or immaterial existence. For while a species has its constants, it has also its variables, each variable becoming a constant so far only as its law and limits of variation are fixed; and in the organic kingdoms, moreover, each individual has its historic phases, from the germ through the cycle of growth. The general idea sought out by induction, therefore, is not made up of invariables. Limited to these, it represents no object, class of objects, or law, in nature. The variables are a necessary complement to the invariables; and the complete species idea is present to the mind, only when the image in view is seen to be ever changing along the lines of variables and developement. Whatever indidualized conception is entertained, it is evidently a conception of the species in one of its phases,—that is, under some one specific conditon as to size, form, color, constitution, &c., as regards each part in the structure, from among the many variations in all these respects that are possible: mind can picture to itself individuals only and not species, and one phase at a time in the life of an organic individual, not the whole cycle.

We may attempt to reach what is called the typical form of a species, in order to make this the subject of a conception. But even within the closest range of what may be taken as typical characters, there are still variables; and moreover, we repeat it, no one form, typical though we consider it, can be a full expression of the species, as long as variables are such an essential part of its idea as constants

The advantage of fixing upon some one variety as the typical form of a species is this,—that the mind may have an initial term for the laws embraced under the idea of the species, or an assumed centre of radiation for its variant series, so as more easily to comprehend those laws.

Again, abrupt transitions and not indefinite shadings have been shown to be the law of nature. In proceeding from special characters to a general species-idea, nature gives us help through her stepping stones and barriers. In former times, man looked at iron and other metals from the outside only, and searching out their differences of sensible characters, gradually eliminated the general notion of each, by the ordinary logical method of generalization. But science now brings the element to the line and plummet, and reaches a fixed *number* for iron and other elements as to chemical combination, etc. By this means, the studying out of the idea of a species seems almost to have escaped from the domain of logic into that *of direct trial by weights and measures. It is no longer the undefined progress of* simple reason, with a mere notion at the end, but an appeal to definite measurable values, with stable numbers at bottom, fixed in the very foundations of the universe. So, in the organic kingdoms, where there is, to our limited minds, still greater indefiniteness in most characters, the barrier against hybridity appears to stand as a physical test of species. We are thus enabled in searching into the nature of a species, to strike from the outside detail to the foundation law.

The type-idea, as it presents itself to the mind, is no more a subject of defined conception than any mathematical expression. Could we put in mathematical terms the precise law, in all its comprehensiveness, which is at the basis of the species iron, as we can for one of its qualities, that of chemical attraction, this mathematical expression would stand as a representative of the species; and we might use it in calculations, precisely as we can use any mathematical term. So also, if we could write out in numbers the potential nature of an organic species, or of its germ, including the laws of its variables, this expression would be like any other term in the hands of a mathematician; the mind would receive the formula as an expression for the species, and might compare it with the formulas of other species. But, after all, we have here a mere mathemathical abstraction, a symbol for amount or law of force, which can be turned into conceptions, only by imagining (supposing this possible) the force in the course of its evolution of concrete realities, according to the law of development and laws of variations embraced within it.

NEWER PLIOCENE FOSSILS OF THE ST. LAWRENCE VALLEY.—BY PROFESSOR DAWSON.

The object of this paper was in the first place to notice several fossil shells recently found by the author and others in these deposits, and which did not appear to have been previously observed. The species mentioned were:

Natica Heros, Say.................................Beauport.
Natica Grœnlandica, Beck.......................... do.
Fusus tornatus, Gould. ....Montreal.
Fusus harpularius, Couthoy......................
Rissoa minuta...................................Montreal.
Turritella, (like *crosa*)................... ....Beauport.

Bulla oryza, Tott ....Montreal.
Spirorbis sinistrorsu, Montague........................ do.
Univalve, (perhaps *Menestho albula*)..................

Most of these are shells now living on the Atlantic coast of America, north of Cape Cod, and some of them ranging very far north. The paper then referred to the distribution of the various kinds of drift in the vicinity of Montreal, and to the conditions of the sea areas, in which the shells and other marine animals of the Newer Pliocene period existed in the St. Lawrence Valley. Good evidence exists of a sea beach on Montreal Mountain, at an elevation of 470 feet above the sea. The sea area corresponding to this beach must have extended to the Laurentide hills and the escarpment of Niagara, and communicated freely with the ocean on the east. On the other hand there are lower shores of the same period only 100 feet above the St. Lawrence. These must have belonged to a very narrow prolongation of the present Gulf of St. Lawrence.

The conditions of climate, ice, drift, &c., corresponding to these different shores must have been very diverse.

Again, in the stratified drift, it is possible to recognise, within a few inches of each other, a bed containing deep-sea shells, and another containing species that are littoral; these sea bottoms corresponding to different levels of the land. It is evident that any conclusions with reference to the climate indicated by the marine fauna of these successive beds of marine detritus, must take into account these fluctuations of the sea level, and the changes in animal life consequent on them. Taking these into account, positive and reliable results may be attained; and the study of such districts as the St. Lawrence valley may be made to contribute toward the elucidation of the conditions of life in older formations.

NORTH AMERICAN LAKES.—BY MR. CHARLES WHITTLESEY.

The fluctuations of level of the American lakes, have repeatedly formed a subject of inquiry, and have been brought under the notice of the Canadian Institute, by Major Lachlan, in former years. These fluctuations present three distinct features. There was first the general rise and fall, extending through a long period of time; then the annual rise and fall occurring regularly within a certain period of each year, which Mr. Whittlesey styled the annual fluctuation; then there was the third, a local, fitful, and irregular oscillation, lasting sometimes from three to five minutes, and varying in duration from one to twenty-four hours. He had no difficulty in explaining the general rise and fall of the lakes, as they were merely the reservoirs for the drainage of the country of the surplus water, which passes thence by the St. Lawrence as a general opening to the sea. Mr. Whittlesey read a variety of statistics in reference to the range and extent of the two first named fluctuations, and said he was unable to find in these, or in the examinations he had made, any confirmation of the popular belief that there is a seven years rise and fall of waterin the Lakes. He then directed attention to the cause of the third phenomenon—the irregular fluctuations which occur without any particular known cause. Although these pulsations, as they might be termed, were the first to attract notice, they were the last to have received any explanation. They occur in all conditions of the atmosphere, but whether produced by electro-magnetic influence or not he could not say, although he thought it not unphilosophic to look in that direction for their cause.

DIRECTION OF THE CURRENTS OF DEPOSITION AND SOURCE OF THE MATERIALS OF THE OLDER PALÆOZOIC ROCKS.—BY PROF. JAMES HALL.

In treating of the elevation of mountains, the author remarked, sufficient consideration had not been given to the distribution of the material forming these mountain chains, in its unaltered condition. All the materials they knew of were stratified, and had been metamorphosed more or less. He proposed to occupy a few moments in following the direction of the ancient currents, and to show their parallelism with the mountain chains in the Laurentian Mountains, north-east of them, which are nearly parallel to the Appalachian chain. The Geological Survey would show whether these sediments were thicker to the eastward than to the westward; but he thought the direction of the currents which deposited the materials forming the Appalachian chain, was from the north-east. They had certainly good evidence, from the fact that the strata are of the same age, and are much thicker from the north-easterly direction then from the south-west. They gradually thin in that direction, and as he believed they were deposited by water, the further from the source they would be the thinner. They had reason to believe that in the south-west these strata were much thinner than in the north. Taking the Hudson River group which consists of sediments stretching to the south-west, with a thickness of 1000 feet to the north-east of us, it thins down to 600 feet in Pennsylvania, and finally in the Mississippi valley the thickness is not more than 100 feet. Passing from the Hudson river group and over a lapse of time, to the Oriskany Sandstone we find the deposits from the north-east.

At Gaspé the thickness is 7000 feet, in New York it is reduced to a few hundred feet, and the strata thin out in a westerly direction. The conclusion he had arrived at was that along these lines of deposit where the greatest accumulation of sediment has been made, is where we have the greatest elevation of mountain chains. This merely coincides with the direction of the ancient currents, and the Appalachian mountain range has not been more uplifted than the other portions of the country, or than the plain between these and the Atlantic. In New York and Pennsylvania we get to the Potsdam Sandstone, and, therefore, *there was no uplifting of any previously existing rocks before the Appalachian chain*. The folding and plication had commenced at an early period—at a period before the upper Silurian Rocks were formed, and we find these strata plicated, and uplifted and metamorphosed in a considerable degree. We get no lower than the Potsdam Sandstone in any part of the Appalachian chain, and we can demonstrate that no lower mass has had anything to do in giving us the elevation of this mountain chain. The Professor then referred to his examination into other formations in confirmation of his hypothesis that elevating forces had not caused the uplifting of these mountain chains. On the contrary, if there had been no folding and plication, this range of mountains, he thought, would have been twice as high as they now are.

CLASSIFICATION OF THE HUMAN RACE.—BY THE REV. PROF. ANDERSON, OF ROCHESTER.

This subject was introduced to the notice of the Section with a view of shewing the importance of some comprehensible classification of the varieties of the human race, in order to the correct observation of those facts upon which one school of ethnologists founded their opinion that mankind consisted of several species, or of one species planted in several centres of creation. To illustrate the difficulties in the way of classification, Prof. Anderson mentioned that Virêy divided the race into two species—the white and the yellow; the black and the brown. But many difficulties interfere with the classification. Take, for instance, the Arabians—the purest of the Semitic races—and he found the Arab in one place with light hair and blue eyes, while in the hot regions of the desert the Arab very nearly approached the Negro. The same changes occurred in the Hindoos and great Iranian races, as they descended from the mountains to the hot deltas of the rivers and to the sea coast. This was also to be remarked in Africa; so that the distinction into white and yellow, black and brown, formed no really useful classification. Jacquenot spoke of three species of men; Dumoulin of eleven, of which the first was the Celto-Scyth Arab, the meaning of which he could not divine. Colonel St. Vincent made eleven species; and Luke Burke, the editor of the *Ethnologist*, made sixty-three; while Dr. Morton's posthumous works made twenty families, each of which he plainly looked on as a distinct species. These could not all be right. Again, Agassiz considered that there were at least eight, and perhaps a thousand centres of creation, though there was but one species; but there were many difficulties about that theory, as it would require a new miracle of creation for each supposed centre; and it was a good rule in physics not to allow new creations except where they were absolutely required. He concluded by saying that he thought the proper attitude for Ethnologists at present was to hold all theories as provisional, keeping themselves ready to give an unprejudiced consideration to new facts whenever they appeared.

ON THE BREAKS IN THE SUCCESSION OF LIFE IN THE BRITISH ROCKS.—BY PROF. A. C. RAMSAY.

Professor Ramsay, of the Geological Survey of Great Britain, who attended the meeting as the representative of the London Geological Society, described the physical breaks, and the breaks in the succession of life, which appear to be established by the palæontological study of the British rocks. In illustration he exhibited a chart to show the fossiliferous strata of Great Britain in their chronological order, and the number of genera and species of fossils found in each, as well as the number which pass from one series to the next above. He then discussed the probable causes at work to produce the phenomena under consideration, and expressed his belief that the extinction of the animal and vegetable species of fossils was owing to physical changes similar to those which are constantly in operation at the present time.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—OCTOBER, 1857.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp of the Air.				Mean Temp. + or — of the Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN	6 A.M	2 P.M	10 P.M	ME'N		6 A.M	2 P.M	10 P.M	M'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M	2 P.M	10 P.M	Result.	ME'N		
					°	°	°	°	°												°							
1	29.671	29.591	29.677	29.6500	41.6	49.8	46.7	46.47	— 3.95	.216	.314	.284	.273	.83	.89	.90	.87	W N W	N E b E	N E b N	N 42 E	2.0	4.2	5.3	3.93	5.04	0.080	...
2	.804	.832	.914	.8563	40.0	50.7	42.9	43.98	— 5.95	.181	.191	166	.175	.74	.52	.61	.62	N E	E b S	N E b N	N 49 E	6.3	6.2	7.5	5.77	6.28	......	...
3	949	.941	.946	.9472	38.9	50.5	50.9	47.17	— 2.33	.203	.278	.320	.266	.87	.78	.87	.82	N E b N	N E b E	N E N	N 64 E	4.2	4.5	3.0	2.97	3.09	......	...
4	.949	.888	—	—	51.4	55.2	—	—	—	.334	.368	—	—	.89	.86	—	—	N E b E	Calm.	Calm.	N 81 E	1.2	0.0	0.0	1.32	1.38	......	...
5	.907	.864	.802	.8548	51.8	59.6	49.8	53.03	+ 4.42	.354	.408	.312	.349	.93	.82	.89	.87	Calm.	S b E	Calm.	S 25 E	0.0	5.2	0.0	0.79	0.99	......	...
6	.767	.726	.738	.7405	50.1	63.5	48.7	54.20	+ 5.98	.320	.397	.289	.340	.90	.70	.86	.83	Calm.	N W b N	N N W	N 29 W	0.0	12.3	0.8	6.49	6.53	......	...
7	.769	.766	.697	.7392	42.2	55.6	44.3	48.47	+ 0.62	.230	.325	.239	.274	.86	.76	.83	.82	N N W	S b W	Calm.	S 16 W	7.3	5.5	0.0	1.27	2.46	......	...
8	.692	.626	.618	.6438	38.9	62.2	52.3	52.43	+ 4.98	.211	.342	.343	.311	.90	.63	.89	.81	S	S S W	N N W	S 51 W	1.0	8.5	0.5	1.79	2.62	......	...
9	.686	.718	.768	.7323	51.6	59.0	51.4	54.42	+ 7.35	.344	.382	.334	354	.91	.78	89	.85	N b W	Calm.	Calm.	N 52 E	0.5	0.0	0.0	1.33	1.36	......	...
10	.848	.751	.829	.8112	45.8	54.8	48.7	49.97	+ 3.30	.206	.286	.298	.268	.68	.68	.88	.76	N E	E b N	N E	N 72 E	5.5	11.0	4.8	5.90	6.09	......	...
11	823	.763	—	—	44.0	57.0	—	—	—	268	.232	—	—	.94	.51	—	—	E N E	E S E	N E b E	N 85 E	1.2	6.2	1.0	3.40	3.92	......	...
12	.688	.662	.731	.6918	50.9	59.9	58.4	57.03	+11.07	.320	.417	.439	.411	.87	.88	.92	.89	E b N	S S W	Calm.	S 11 W	5.2	15.2	0.0	2.43	3.79	0 385	...
13	.736	.751	.788	.7658	56.0	61.0	50.9	55.53	+ 9.97	.391	.376	.301	.353	.89	.72	.82	.81	N N W	E S E	E b S	N 27 E	9.0	3.0	6.5	2.72	4.23	0.010	...
14	.780	.714	.667	.7143	42.2	57.0	49.1	50.47	+ 5.20	.247	.320	.267	.277	.93	.70	.78	.77	N b E	E S E	E S E	N 81 E	1.7	3.0	1.2	3.47	4.13	......	...
15	.544	.425	.308	.4138	50.1	51.6	49.5	50.63	+ 5.78	.301	.343	.243	294	.85	.91	.69	.81	N	N N W	N	N 3 W	10 0	5.8	6 2	6.28	6.49	Inap	..
16	.289	.336	.471	.3743	45.8	51.0	41.8	46.18	+ 1.65	.227	.246	.171	.211	.75	.67	.64	.68	N b W	N W b N	N W b N	N 30 W	13.4	17.0	11.8	10.67	10.96	......	...
17	.641	.592	.664	.6462	32.3	52.5	48 0	45.03	+ 0.80	.153	.216	.228	.204	.83	.56	.69	.69	N W b W	S S W	W b N	S 61 W	0.5	14.8	7.0	5.38	6.26	......	...
18	.924	.954	—	—	36.4	49.1	—	—	—	.178	.293	—	—	.81	.85	—	—	W	S b W	S E b S	S 29 W	2.2	6.2	0.8	2.50	4.96	0.240	...
19	.540	.423	.453	.4663	49.0	51.6	39.7	46.32	+ 2.53	313	.236	.185	.236	.92	.63	.77	.74	S W b S	W	W b N	S 86 W	5.4	12.6	16.0	13.11	13.89	0.055	...
20	.540	.712	.865	.7263	32.1	38.6	31.0	32.82	—10.75	.105	.117	.144	.122	.57	.49	.82	.66	W b N	N W b W	W b N	N 61 W	23.6	34.0	5.0	16.71	17.04	......	...
21	.863	.856	.946	.8925	29.5	44.6	31.6	35.60	— 7.65	.155	.134	.146	.143	.95	.46	.81	.71	W	W b N	W b N	N 75 W	2.2	14.7	1.5	6.55	6.61	......	...
22	986	.940	.883	.9330	28.8	46.3	39.3	38.42	— 4.55	.140	.208	.214	.192	.88	.67	.90	.82	W b N	E b S	N E	N 79 E	3.5	[illegible]	4.0	2.59	4.10	......	...
23	.851	.817	.818	8240	40.0	50.2	38.9	43.50	+ 0.75	.206	.273	.212	.236	.84	.76	.91	.85	N E	S b E	Calm.	S 37 E	1.6	9.0	0.0	2.60	3.59	......	...
24	.741	.609	.493	.6078	43.3	49.1	46.5	46.35	+ 3.85	.254	.293	.304	.283	.92	.86	.97	.91	N E	E	N E b E	N 63 E	5.8	5.8	3.7	4.30	4.44	0.235	...
25	.407	.419	—	—	47.3	49.1	—	—	—	.301	.309	—	—	.93	.90	—	—	E N E	N b W	N b W	N 11 W	2.6	6.2	18.3	13.08	13.60	0.020	...
26	.500	.422	.482	.4778	39.7	46.5	36.1	39.77	— 2.22	.202	.166	.120	.160	.83	.53	.57	.66	N N W	N b W	N b W	N 14 W	27.0	34.6	32.6	27.03	27.08	......	...
27	.568	.562	.587	.5775	30.3	42.8	40.0	37.67	— 4.12	.114	.143	.133	.128	.67	.52	.54	.57	N N W	N b W	N N W	N 25 W	14.0	8.8	6.5	6.78	9.83	......	...
28	.563	.510	530	.5387	36 8	39.3	33.9	36.13	— 5.35	.124	.139	.170	.150	.57	.58	.88	.72	N	E	N E	N 51 E	4.0	2.8	3.3	3.33	3.76	......	0.2
29	.474	.433	.440	.4518	34.1	37.9	37.1	36.47	— 4.80	.173	.188	.192	.183	.89	.82	.87	.85	N E b N	N E	Calm	N 36 E	2.0	0.2	0.0	1.61	1.62	......	Inap
30	.432	.418	.459	.4380	31.7	44.3	39.7	38.15	— 2.80	.160	.199	.163	.182	.90	.69	.67	.79	N N E	S	Calm.	S 84 W	2.6	1.2	0.0	0.64	1.97	Inap	...
31	.454	.481	.538	.4958	39.1	45.1	37.6	40.20	— 0.55	217	.229	.168	.192	.92	.76	.75	.78	S E b S	S S W	W	S 88 W	1.4	9.0	5.5	3.59	5.18	0.015	...
M	29 6771	29.6473	29.6708	29.6671	41.21	50.93	43.88	45.42	+ 0.38	.225	.267	.236	.243	.84	.70	.80	.78	....	....	....	....	5.38	8.84	4.93	......	6.24	1.040	0.2

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR OCTOBER, 1857.

Highest Barometer . . . . 29.994 at 8 a.m. on 22nd } Monthly range=
Lowest Barometer. . . . . 29 289 at 6 a.m. on 16th } 0.705 inches.

Self-register-ing Ther. { Maximum temperature . . . . 64°0 on p. m. of 6th } Monthly range=
Minimum temperature . . . . 26.5 on a.m. of 21st } 37°5
Mean maximum temperature . . 51°93 } Mean daily range = 14°45
Mean minimum temperature . . 37°47 }
Greatest daily range . . . . 26°2 from a. m. to p. m. of 8th.
Least daily range . . . . 7.0 from p. m. of 4th to a. m. of 5th.

Warmest day . . . 12th ... Mean Temperature . . . 57.03 } Difference=24°21.
Coldest day . . . . 20th ... Mean Temperature . . . 32°82 }

Maximum. { Solar . . . . 80°0 on p. m. of 13th } Monthly range=
Radiation. { Terrestrial . . . . . . 17.4 on a. m. of 21st } 62°6

Aurora observed on 2 nights, viz.: on 17th and 23rd; possible to see Aurora on 13th night; impossible on 18th night.

Snowing on 2 days; depth, 0.2 inches; duration of fall 11.0 hours.
Raining on 10 days; depth, 1.040 inches; duration of fall, 42.0 hours.

Mean of cloudiness=0.62; most cloudy hour observed, 6 a. m., mean=0.66: least cloudy hour observed, midnight; mean=0.54.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2570.76	512.76	1006.69	1718.43

Resultant direction of the wind, N 19° W; Resultant Velocity, 2.93 miles per hour.

Mean velocity of the wind 6.24 miles per hour.
Maximum velocity . . . 44.2 miles per hour, from 10 to 11 a. m. on 20th.

Most windy day . . . . . . 26th—Mean velocity, 27.08 miles per hour.
Least windy day . . . . 5th—Mean velocity, 0.99 do

Most windy hour 1 to 2 p.m.—Mean velocity, 8.94 do } Difference
Least windy hour 9 to 10 p.m.—Mean velocity, 4.43 do } 4.51 miles.

2nd. Halo round the moon at 10 p. m. 5th. Halo round the moon at 9 p. m. 5th. Corona round the moon at midgt. 12th. Sheet-lightning in S W, 8 to 9 p. m. 14th. Halo round the sun at 4 p. m. Very perfect. 15th. Large meteor, course from zenith towards E, at 7 h. 55 m., p. m. 17th. Thin ice at 6 a. m.—the first observed this season. 17th. Sheet-lightning during the evening. 20th, 21st and 22nd. Thin ice on the pools at 6 a. m. 21st. Shooting stars numerous during the night. 28th. Slight snow from 2 to 9 p. m. First of the season.

The barometer and the temperature through the month exhibit no remarkable fluctuations.

Rain.—There was a considerable deficiency in the rain, its amount being less than half that which usually falls in October.

Wind.—The resultant direction and velocity for October, from 1848 to 1857, inclusive, were N 55° W, 1.44 miles.

The 26th was the most windy day but one ever recorded, its mean velocity being exceeded only on the 14th Dec., 1856, when it amounted to 28.06 miles per hour. From the 26th at midnight to the following midnight the average was 29.62 miles, thus surpassing any velocity yet recorded for 24 consecutive hours.

COMPARATIVE TABLE FOR OCTOBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direction.	Resultant Velocity.	Mean Velocity
	°	°	°	°	°							
1840	44.4	— 0.8	68.5	23.9	44.6	13	1.860	3	Not Recor	—	—	—
1841	41.6	— 3.6	58.3	20.3	38.0	6	1.360	2		—	—	0.41 lbs
1842	45.1	— 0.1	68.5	30.0	38.5	8	5.175	...		—	—	0.35 "
1843	41.8	— 3 4	65.7	24.5	41.2	12	3.790	4	2 5	—	—	0.54 "
1844	43.3	— 1.9	69 6	17.8	51.8	7	imp.	4	12.0	—	—	0.43 "
1845	46.4	+ 1.2	62.7	20.0	42 7	11	1.760	1	inap.	—	—	0.26 "
1846	44.6	— 0.6	69.7	20.7	49.0	14	4.180	2	inap.	—	—	0.44 "
1847	44.0	— 1.2	65.0	20.3	44.7	13	4.390	2	inap.	—	—	0.19 "
1848	46.3	+ 1.1	62.2	26.4	35.8	11	1.550	...	...	N 54 W	1.24	4.60 mls
1849	45.3	+ 0 1	59.2	25.5	33.7	13	5.965	1	inap.	N 12 W	1.27	4.76 "
1850	45.4	+ 0.2	66.6	24.8	41.8	10	2.085	...	...	N 66 W	1.10	5.30 "
1851	47.4	+ 2.2	66.1	25.0	41.1	10	1.680	2	0.3	S 72 W	1.06	4.39 "
1852	48.0	+ 2.8	70.7	29.8	40 9	12	5.280	...	...	N 5 E	1.19	4.47 "
1853	44.4	— 0.8	64.7	25.5	39.2	10	0.875	2	inap.	S 38 W	1.78	4.72 "
1854	49.5	+ 4.3	74.2	29.8	44.4	15	1.495	3	inap.	N 25 E	1.20	4.60 "
1855	45.4	+ 0.2	64.3	28.0	36.3	14	2.485	5	0.8	N 82 W	4.91	9.88 "
1856	45.3	+ 0.1	70.1	23.3	46.8	10	0.875	2	0.1	N 76 W	2.15	6.07 "
1857	45.4	+ 0.2	63.5	27.7	35.8	10	1.040	2	0.2	N 19 W	2.93	6.24 "
Mean	45.20	...	66.09	24.63	41.46	11.1	2.697	1.9	1.06	—	—	5.50

MONTHLY METEOROLOGICAL REGISTER AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—NOVEMBER, 1857.

Latitude—43 deg. 39.4 min. North. Longitude—5h. 17m. 33s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Mean Temp. + or — of the Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Direction of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A. M.	2 P. M	10 P. M.		6 A.M.	2 P.M.	10 P.M.	Re-sult'.	ME'N		
1	29.516	29.411	—	—	37.5°	45.8°	—°	—°	—°	.166	.186	—	—	.74	.61	.—	.—	w	s w b s	s w b w	s 42° w	2.0	10.4	10.5	8.17	8.71	inap.	...
2	29.268	29.195	29.281	29.2570	37.5	44.0	38.9	39.92	— 0.35	188	181	.180	.180	84	63	76	74	s w b w	w b n	w b s	s 77 w	5.0	15.5	13.6	12.07	12.51	inap.	...
3	.429	.505	.628	.5355	35.3	41.8	37.1	38.22	— 1.78	172	161	166	160	85	62	76	70	w b n	w b s	w b s	w	13.0	15.5	4.0	9.57	9.93	...	...
4	.700	.680	.633	.6750	34.6	42.7	41.1	39.15	— 0.62	151	186	218	190	75	69	85	79	Calm.	s e b s	n e b e	n 69 e	0.0	4.2	6.2	4.59	5.43	0.005	...
5	.546	.282	.117	.2960	39.7	43.8	50.9	45.57	+ 6.08	218	242	331	275	90	85	90	90	n e	e b n	s w	s 61 e	6.8	13.5	7.0	3.44	10.08	0.415	...
6	.177	.200	.356	.2677	47.3	57.8	46.2	49.92	+10.75	249	171	174	200	77	36	56	57	s s w	w s w	w b s	s 64 w	7.5	21.0	10.3	7.38	8.42	...	...
7	.520	.453	.465	.4932	38.6	45.4	43.6	42.70	+ 3.70	206	207	238	218	89	69	85	81	Calm.	e n e	e n e	n 64 e	0.0	11.0	14.5	9.35	10.08	0.115	...
8	.456	.366	—	—	46.9	51.4	—	—	—	291	325	—	—	91	86	—	—	e n e	e	s s e	s 85 e	10.2	9.6	7.5	4.17	8.83	0.370	...
9	.308	.344	.501	.4095	50.5	46.5	39.8	45.05	+ 6.65	344	285	217	275	95	91	89	91	w b s	w b n	w s w	s 67 w	4.5	5.5	9.8	8.17	8.62	1.020	...
10	.729	.805	.915	.8342	34.2	43.5	37.0	37.72	— 0.37	140	151	131	144	71	53	60	64	s w	s w	w b s	s 55 w	11.2	14.2	10.0	9.58	9.82	...	...
11	30.048	30.056	29.992	30.0317	33.5	43.3	36.4	37.08	— 0.70	167	121	153	144	87	44	72	67	s w b w	s w b w	w s w	s 52 w	8.9	11.8	4.2	6.79	6.86	...	...
12	29.796	29.525	.519	29.6020	36.1	42.9	39.8	39.75	+ 2.25	166	225	201	198	79	82	82	81	w s w	s s w	w s w	s 46 w	2.4	13.4	5.5	6.42	7.34	0.030	...
13	.491	.495	.636	.5467	34.2	38.4	33.2	35.22	— 1.97	131	151	109	139	76	65	57	67	s w	w s w	n w b n	n 77 w	4.6	15.0	13.8	9.41	11.88	...	inap.
14	.789	.947	30.056	.9428	22.4	29.5	24.8	25.03	—11.87	075	099	099	091	62	60	72	65	n n w	n w b n	n w b n	n 32 w	10.5	15.8	6.5	7.03	7.25	...	...
15	30.004	29.904	—	—	23.7	38.2	—	—	—	111	150	—	—	84	65	—	—	w s w	w b s	s w b s	s 55 w	2.8	5.8	0.5	4.20	4.43	...	...
16	29.698	.464	29.369	.5040	30.8	35.5	33.2	33.02	— 3.18	147	189	174	164	84	91	93	87	s s w	s s e	Calm.	s 33 w	3.0	2.4	0.0	2.54	3.19	0.145	0.7
17	.286	.085	.067	.1308	34.6	35.3	34.2	34.97	— 0.83	158	167	145	159	78	81	73	78	s w b s	s w	s w b w	s 52 w	14.0	15.0	11.4	12.06	12.15	0.025	...
18	28.980	28.906	28.793	28.8800	34.6	39.4	37.9	37.10	+ 1.62	149	123	145	148	74	50	63	67	s w	s w b w	s b w	s 21 w	10.8	14.0	2.5	7.10	10.39	0.140	...
19	28.548	28.548	28.869	28.6707	42.2	33.9	25.2	33.53	— 1.55	230	166	118	168	86	87	85	84	s s e	s w b s	s w b w	s 45 w	15.2	23.8	19.5	16 18	19.80	0.055	0.2
20	28.939	28.915	28.975	28 9533	18.2	27.0	23.8	22.68	—12.08	084	128	115	101	81	86	87	80	w s w	s w b w	s w b w	s 57 w	18.0	17.0	20.0	19.59	19.63	...	0.5
21	29.155	29.191	29.130	29.1645	25.2	28.1	29.9	27.75	— 0.63	103	135	131	127	75	87	78	82	s w b w	s w	s w	s 44 w	21.0	7.8	11.0	17.69	18.90	...	2.0
22	.246	.454	—	—	29.2	24.2	--	—	—	127	100	—	—	78	74	—	—	w s w	w b s	Calm.	s 73 w	14.5	13.0	0.0	7.91	8.64	...	0.5
23	.214	.109	.390	.2455	28.8	24.5	19.1	24.03	— 9.63	146	084	091	109	92	62	83	81	s b e	n w b w	w b s	n 75 w	4 4	20.4	4.2	7.42	9.59	...	2.5
24	.444	.410	.788	.5790	18.0	19.3	7.2	14.25	—19.02	080	090	044	071	77	82	68	78	s w b w	w s w	n w b n	n 87 w	11.5	13.8	17.2	8.60	11.13	...	0.5
25	30.059	30.161	30.220	30.1560	-2.3	18.0	15.4	11.00	—21.97	033	074	073	062	74	71	78	76	n w b w	w s w	w s w	s 75 w	4.2	8.0	9.0	9.00	9.33	...	inap.
26	30.243	30.200	30.138	30.1913	16.9	25.6	19.1	20.43	—12.13	079	087	086	086	81	61	80	76	w s w	s w b w	w s w	s 64 w	9.2	10.0	6.7	6.89	6.99	...	...
27	30.123	30.055	30.044	30.0750	19.1	35.0	30.3	27.82	— 4.37	086	168	106	121	80	83	62	77	w s w	s s w	s w b s	s 42 w	7.2	12.4	4.0	3.88	4.00	...	...
28	30.014	29.999	30.028	30.0152	29.5	40.7	33.2	34.45	+ 2.57	110	173	165	151	66	.69	87	75	s w b s	s w b s	s s w	s 26 w	2.7	3.4	1.2	1.60	1.98	...	...
29	30.011	29.948	—	—	35.0	40.4	—	—	—	153	194	—	—	75	78	—	—	n e	e b n	e n e	n 67 e	3.0	9.2	8.0	7.22	7.44	0.140	...
30	29.737	.621	29.563	29.6390	40.4	42.9	43.3	42.07	+10.98	231	263	242	248	93	97	88	94	e n e	e s e	s e b s	s 29 e	4.0	7.2	3.2	1.05	4.03	0.745	...
	29.5296	29.4874	29.5397	29.5235	31.20	36.99	32.82	33.54	— 2.61	.155	.161	.154	.157	.80	.71	.77	.77	....	....	....	....	....	....	....	....	9.25	3.235	6.9

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR NOVEMBER.

Highest Barometer........................ 30.281 at 10 a. m., on 26th } Monthly range=
Lowest Barometer .... 28.452 at 10 a. m., on 19th } 1.829

Self-registering Thermom.
- Maximum Temperature........... 58°.2 on p. m. of 8th } Monthly range=
- Minimum Temperature........... —3°.5 on a. m. of 25th } 61.°7
- Mean maximum Temperature .... 39°94 } Mean daily range=
- Mean minimum Temperature .... 26°55 } 13.39
- Greatest daily range ....27°0 from a. m. of 19th to a. m. of 20th.
- Least daily range.................. 5°6 from p. m. of 17th to a. m. of 18th.

Warmest day......... 6th ... Mean temperature......... 49.92 } Difference = 38°92.
Coldest day........... 25th ... Mean temperature......... 11°00 }

Maximum { Solar................................ 69°0 on p. m. of 6th, } Monthly range=
Radiation. { Terrestrial........................—9°.2 on a. m. of 25th. } 78°2

Aurora observed on 2 nights, viz., on 17th and 23rd.
Possible to see Aurora on 14 nights; impossible on 16 nights.

Raining on 14 days,—depth 3.235 inches; duration of fall 73.6 hours.
Snowing on 9 days,—depth 6.9 inches; duration of fall 46.2 hours.

Mean of cloudiness = 0.67.
Most cloudy hour observed, 2 p. m., mean = 0.83; least cloudy hour observed, midnight, mean, =0.52.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
781.66	2675.52	920.96	4366.37

Resultant direction S. 61° W.; Resultant Velocity 5.45 miles per hour.
Mean velocity............................ 9.25 miles per hour.
Maximum velocity .... 29.4 miles from 6 to 7 p. m., on 21st.
Most windy day...................... 19th...Mean velocity 19.80 miles per hour.
Least windy day .... 28th...Mean velocity 1.98 ditto.
Most windy hour ... 1 to 2 p. m...........Mean velocity 12.70 ditto. } Difference
Least windy hour ... 9 to 10 p. m...........Mean velocity 7.51 ditto. } 5.19 miles.

5th. Sheet Lightning from 7 p. m. and Thunderstorm from 9 to 9-30 p. m.
8th. Sheet Lightning from 7 to 10 p. m.
10th. Ice on the pools at 6 a. m.
19th, 20th and 21st. Continual high wind and great Barometric depression.
22nd. Faint Halo round the Moon at 8-15 p. m.
25th. Toronto Bay frozen over.
27th. Large and perfect Halo round the Moon from 7 p. m.
29th. Halo round the Moon from 5-30 p. m.

Barometer.—The mean height of the barometer was .095 below the average; the minimum 28.452 was the lowest reading ever recorded; and the monthly range was the greatest for any November during the series.

Temperature.—The mean temperature was 3°08 below the average; the minimum (-3°5) was the lowest entry, and the 25th was the coldest day of any November on record: the monthly range also was never exceeded in any previous November.

Rain and Snow.—The depth of rain was ·294 inches above the average, and the depth of snow also was 3.63 inches in excess of the mean.

Wind.—The resultant direction and velocity from 1848 to 1857 were N. 32° W. 2.06 miles per hour.

There was a marked absence of meteors at the epoch of their usual appearance.

The freezing of the Toronto Bay on the 25th was the earliest instance of this occurrence ever recorded. On the return of the mild weather the ice again broke up.

COMPARATIVE TABLE FOR NOVEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	M'n.	Diff. from Aver.	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant. Direction.	Resultant. V'y	Mean Force or Velocity.
	°	°	°	°	°							
1840	35.9	—0.7	54.4	20.5	33.9	5	1.220	8	...	...	...	....
1841	35.0	—1.6	63.2	7.6	55.6	8	2.150	5	...	...	...	0.91 lbs.
1842	33.3	—3.3	50.6	7.6	43.0	9	5.310	10	...	...	...	1.22
1843	33.5	—3.1	51.2	14.4	36.8	10	4.765	7	1.2	...	...	0.59
1844	34.9	—1.7	49.8	12.0	37.8	8	imp.	4	8.0	...	...	0.48
1845	36.8	+0.2	58.8	7.6	51.2	7	1.105	4	5.0	...	...	0.53
1846	41.3	+4.7	55.5	18.2	37.3	12	5.805	2	0.4	...	...	0.64
1847	38.6	+2.0	58.2	7.8	50.4	14	3.155	3	Inapp	...	...	0.36
1848	34.5	—2.1	49.3	16.5	32.8	9	2.020	3	1.4	N 81° W	1.81	4.81 mls.
1849	42.6	+6.0	56.7	28.4	28.3	10	2.815	2	1.0	N 39° W	1.55	4.78
1850	38.8	+2.2	62.3	18.1	44.2	7	2.955	1	Inapp	N 42° W	1.43	5.27
1851	32.9	—3.7	50.1	16.5	33.6	5	3.885	6	6.7	N 50° W	1.25	4.70
1852	36.0	—0.6	50.4	18.7	31.7	7	1.775	3	2.0	N 59° W	1.53	6.50
1853	38.7	+2.1	54.1	14.4	39.7	15	2.425	6	2.7	N 1° E	0.56	5.52
1854	36.8	+0.2	54.9	15.1	39.8	13	1.115	4	1.3	S 88° W	3.72	7.58
1855	38.6	+2.0	54.1	18.7	35.4	8	4.590	6	3.0	N 66° W	3.18	10.81
1856	37.4	+0.8	56.4	22.8	33.6	10	1.375	9	9.5	S 85° W	2.95	8.75
1857	33.5	—3.1	57.8	-2.3	60.1	14	3.235	9	6.9	S 61° W	5.45	9.25
M	36.62	...	54.88	14.59	40.29	9.5	2.941	5.1	3.27	...	...	6.80 mils.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—OCTOBER, 1857.

(NINE MILES WEST OF MONTREAL.)

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

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

Day.	Barom. corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.805	29.902	29.907	36.0	57.0	41.5	.192	.398	.253	.84	.84	.92	S W	S S E	N b E	1.87	3.57	1.97	...	0.376	...	C. C. Str. 4.	Str. & Ni. 6.	C. St. 8. Thun.
2	30.005	30.114	30.214	30.0	57.8	37.2	.177	.376	.199	.95	.79	.83	N N E	E N E	N E	7.30	9.35	1.43	...	...	...	Clear.	Clear.	Clear.
3	.224	.139	.224	35.0	54.9	42.2	.203	295	.24	.91	.66	.85	N E	N E	E N E	11.37	14.42	2.97	...	...	...	Do.	Do.	Cirr. 2.
4	.114	.047	.095	36.2	65.0	46.5	.192	.425	.302	.86	.68	.93	N E by E	S S W	W S W	2.54	0.18	0.56	...	...	...	Do.	Do.	Clear.
5	.130	.056	29.997	41.2	63.2	50.5	.253	.435	.349	.92	.75	.90	S W b S	W S W	S W	0.22	0.05	0.17	...	...	...	C. C. Str. 4.	C. C. Str. 8.	C. Str. 10.
6	29.800	29.656	.833	48.1	61.6	51.3	.349	.383	.274	.94	.71	.73	W S W	W	N W	0.71	5.05	5.32	...	...	...	C. Str. 10.	C. St. 8.	Clear.
7	.800	.820	.846	44.1	64.0	47.0	.261	.401	.291	.85	.67	.86	W N W	S S W	S W	3.62	3.37	3.75	...	...	...	Clear.	Clear.	Do.
8	.712	.612	.681	46.2	68.2	55.7	.303	.445	.394	.92	.65	.88	S W	S W b W	S W b W	10.98	4.93	3.90	...	...	...	C. Str. 6.	Do.	Cir. Cum. 2.
9	.839	.828	30.050	39.0	57.9	41.0	.220	.316	.217	.88	.66	.79	N E	W N W	N E	4.50	1.20	0.09	...	...	...	Clear.	Do.	Clear.
10	30.098	30.076	.120	36.0	63.0	40.3	.192	.366	.227	.83	.63	.85	E N E	N E b E	E	0.62	1.98	0.17	...	...	...	Do.	Do.	Do.
11	.026	29.989	29.930	37.7	69.0	44.6	.229	.461	.282	.91	.65	.92	E	S	S E b S	0.00	2.10	0.06	...	...	...	Do.	Do.	Do.
12	29.975	.846	.826	35.8	67.0	57.5	.203	.480	.447	.89	.72	94	S	S by E	S W b W	0.12	3.75	0.35	...	...	...	Do.	Do.	Do.
13	.800	.842	.873	37.0	64.0	49.1	.446	562	.336	.96	90	.91	S W b W	S W b W	W S W	0.00	0.10	0.51	...	...	...	Light Cir. 4.	C. C. St. 6.	Str. 10.
14	.929	.866	.895	40.4	61.8	43.3	.253	.456	.272	.91	.84	.91	W S W	S S E	N N W	0.00	0.01	0.00	...	0.350	...	Nimb. 10.	Ni. 10.	Clear.
15	.756	.542	.448	44.0	48.7	46.5	.282	.324	.303	.91	.90	.94	N b E	N E b E	N E b E	5.70	15.03	13.56	...	...	...	Fog.	C. C. Str. 6.	Do.
16	.808	.403	.473	46.0	50.0	46.5	.313	.304	.282	.93	.81	.86	N E by E	N b E	N b W	20.56	6.90	5.06	...	0.933	...	C. Str. 10.	Ni. 10.	Ni. 10.
17	.511	.698	.819	38.0	48.0	37.0	.200	.225	.219	.79	.64	.91	W	W	S W b W	16.82	9.72	6.20	...	1.176	...	Ni. 10.	C. St. 9.	Cir. Str. 10.
18	.883	30.075	30.117	39.9	50.7	38.6	.106	.246	.226	.76	.65	.90	W S W	W	S S E	4.22	11.77	2.92	...	...	...	St. 4.	Clear.	Do. 4.
19	.940	29.562	29.571	42.1	50.0	44.6	.263	.341	.282	.91	.89	90	S S E	S S E	W b N	0.87	9.80	4.67	...	...	...	C. Str. 8.	C. Str. 4.	Do. 10.
20	.564	.512	.716	37.0	33.0	32.5	.218	.197	.191	.91	.95	.94	W b S	W b S	W b N	6.62	11.76	6.15	...	0.478	...	Ni. 10.	Ni. 10.	Ni. 10.
21	.974	.891	30.047	32.0	37.2	29.1	.191	.182	.152	.91	.76	.85	W N W	N W	W b N	23.75	10.70	9.80	...	0.300	Inp	Ni. 10. Sleet	C. St. 8.	C. St. 8.
22	30.131	30.113	.173	24.0	44.0	31.1	.091	.241	.171	.63	.79	.89	N W b N	S S W	S b E	3.40	2.01	0.20	...	...	...	C. St. 4.	Do. 8.	Clear.
23	.111	29.943	.100	31.0	58.0	37.6	.158	.367	.218	.81	.75	.95	S S E	S S E	S b W	0.00	0.02	0.50	...	...	...	Clear.	Do. 2.	Do.
24	.002	.942	29.906	32.5	49.2	42.8	.182	.290	.204	.89	.80	.90	S S E	S E	E	0.08	0.03	0.06	...	...	...	C. St. 4.	Light Cir. 4.	Clear. Aur. Bore.
25	29.836	.704	.604	42.9	46.0	44.0	.263	.303	.292	.91	.93	.95	S E b E	N E b E	N E b E	0.31	1.18	15.75	...	...	...	Clear.	C. Str. 9.	C. St. 4. Do.
26	.525	.454	.529	42.6	49.0	45.0	.272	.326	.282	.96	.91	.89	N E b E	N E b E	N N E	26.24	23.33	33.80	...	1.497	...	C. C. St. 6.	Rain.	Rain.
27	.680	.721	.828	34.2	38.6	34.0	.170	.226	.178	.79	.90	.85	N N E	N E	N E	32.46	10.06	20.61	...	1.713	...	Rain.	Do.	C. St. 9.
28	.800	.755	.800	30.0	32.7	31.7	.160	.187	.175	.86	.89	.87	N E	N E	N E b E	14.77	14.90	6.22	...	...	...	Str. 8.	C. Str. 9.	Do. 10.
29	.640	.638	.650	32.1	35.5	33.5	.160	.203	.187	.84	.90	.90	N E b E	N E b E	N E b E	0.81	0.15	0.35	...	...	...	C. St. 6.	Do. 10.	Do. 10.
30	.631	.658	.752	33.1	41.0	38.1	.188	.235	.226	.89	.85	.91	W S W	S W b W	S S W	0.00	0.06	0.05	...	Inapp	...	Do. 10.	Do. 10.	Do. 10.
31	.786	.733	.774	35.0	44.0	38.2	.203	.261	.226	.91	.85	.91	S S W	S E	S E b E	0.12	0.60	0.32	...	Inapp	...	Do. 10.	Do. 9.	Do. 8.
																			...	...	...	Do. 8.	Do. 10.	Do. 10.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—NOVEMBER, 1857.

(NINE MILES WEST OF MONTREAL.)

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

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

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.698	29.613	29.601	38.2	44.6	38.8	.226	.223	.226	.91	.73	.91	S W	SW b W	S b W	0.12	4.23	1.63	...	...	...	C. C. Str. 4.	C. Str. 8.	C. C. Str. 8.
2	.460	.384	.431	37.1	45.0	35.5	.218	.253	.210	.91	.80	.91	S b W	S W	S b E	7.35	7.75	0.76	...	0.416	...	C. Str. 8.	Do. 6.	C. Str. 4.
3	.484	.649	.694	36.0	40.4	36.0	.210	.227	.210	.91	.85	.91	W S W	W S W	W b N	4.65	10.17	2.65	...	...	...	Do. 8.	Do. 6.	Do. 10.
4	.872	.957	30.026	30.1	37.5	27.5	.168	.218	.146	.88	.88	.88	W	W b N	E N E	3.91	2.08	2.12	...	...	...	Clear.	Cirr. C. 8.	Clear.
5	.954	.842	29.697	29.0	40.6	38.7	.161	.210	.234	.89	.79	.92	E N E	N E b E	E b N	0.50	5.80	2.22	...	0.350	...	C. Str. 10.	Cir Str. 4.	Rain, Thunder
6	.420	.472	.432	57.0	60.4	48.0	.218	.371	.290	.91	.71	.81	S W	SW b W	W S W	15.13	8.97	10.05	...	0.550	...	Do. 3.	Clear.	C.Lt. in N.E. at
7	.652	.760	.890	40.3	51.0	42.0	.210	.274	.243	.79	.70	.85	W S W	W S W	N E b E	5.22	4.27	0.07	...	...	...	Clear.	C. Str. 2.	C. Str. 10. [7pm
8	.860	.937	.939	34.4	38.5	38.2	.203	.226	.246	.91	.91	.99	S E b E	N E b E	N N E	19.96	9.60	14.61	...	1.120	...	Nimb. 10.	Rain.	Rain.
9	.610	.533	.595	46.0	64.1	55.0	.292	.565	.420	.89	.94	.98	S E	S S E	W S W	13.35	4.22	9.37	...	1.642	...	Rain.	C. Str. 10.	C. Str. 6.
10	.784	.883	30.009	44.0	44.9	34.1	.289	.241	.178	.96	.79	.83	W S W	W S W	W S W	4.73	24.85	9.22	...	0.330	...	Do.	Do. 4.	Clear.
11	30.092	30.084	.187	32.0	40.9	37.3	.191	.210	.199	.93	.79	.83	S W	S W	W S W	10.02	3.91	8.66	...	...	...	Clear.	Do. 8.	C. Str. 10.
12	30.042	29.848	29.725	30.1	35.0	34.1	.160	.203	.195	.86	.90	.89	S E b E	S W b S	W S W	1.51	1.51	5.20	...	0.160	...	C. Str. 9.	Sleet.	Rain.
13	29.654	.585	.721	33.0	43.0	31.0	.197	.233	.185	.95	.79	.90	W S W	W S W	N b W	5.65	4.83	12.82	...	0.202	...	Do. 6.	C. Str. 8.	C. Str. 6.
14	.883	.930	30.082	20.0	25.6	23.0	.089	.123	.120	.68	.79	.82	N W	W N W	W	2.42	8.30	8.96	...	...	...	Clear.	Do. 4.	Do. 2.
15	30.107	.975	.000	22.7	34.0	32.5	.127	.204	.197	.88	.89	.94	W S W	W S W	W S W	7.27	6.42	6.65	...	...	...	Str. 10.	Do. 10.	Do. 10.
16	29.998	.704	29.650	30.0	37.8	31.1	.177	.218	.185	.95	.90	.96	W S W	S E	S E	1.73	1.62	2.27	...	...	...	C. Str. 6.	Do. 4.	Snow.
17	.401	.297	.221	32.8	37.1	34.0	.189	.201	.204	.90	.83	.94	W S W	W S W	W S W	4.60	2.81	3.00	...	Inp.	2.01	C. Str. 8.	Do. 10.	C. Str. 8.
18	.158	.147	.247	32.4	38.4	34.1	.197	.214	.284	.95	.86	.95	S S W	S S W	S S W	7.31	4.77	9.10	...	...	Inp	Do. 8.	Do. 2.	Do. 8.
19	.183	.003	.010	33.2	47.7	33.6	.204	.271	.204	.96	.80	.92	E b S	S E	W S W	6.42	1.83	23.48	...	...	...	Do. 10.	Do. 4.	Sleet.
20	.104	.140	.218	25.4	27.6	20.6	.147	.187	.101	.92	.82	.77	W S W	S W	S W	15.70	11.68	17.57	...	0.376	Inp.	Do. 4.	Do. 10.	Clear. [a.m.
21	.212	.380	.516	23.5	32.1	27.0	.112	.167	.148	.77	.82	.88	W S W	W S W	S b E	15.57	11.02	12.67	...	...	...	C. C. Str. 4.	Do. 9.	Sno, Mock sun.
22	.504	.500	.797	26.4	38.0	26.6	.146	.173	.135	.88	.70	.83	S W	S W	W S W	4.30	8.31	7.11	...	...	...	C. Str. 10.	Do. 6.	Cirr. Str. 2.
23	.684	.244	.340	26.4	34.0	33.0	.146	.195	.197	.88	.91	.94	E N E	S E	W S W	2.22	3.27	10.73	...	0.613	Inp	Do. 10.	Do. 6.	Do. 10.
24	.484	.508	.657	16.0	25.6	18.0	.093	.147	.105	.85	.90	.87	W S W	S W b W	N W	12.83	13.31	7.60	...	...	...	Do. 4.	Do. 8.	C. Str. 4.
25	30.076	30.201	30.300	1.0	13.0	9.7	.043	.068	.079	.84	.67	.86	W S W	W	W S W	37.64	15.82	12.31	...	...	...	Clear.	Clear.	Clear.
26	.344	.201	.306	10.1	28.3	25.1	.082	.119	.129	.90	.68	.82	W S W	S W	S W	7.90	7.65	5.23	...	...	...	C. C. Str. 4.	C. Str. 10.	C. Str. 9.
27	.197	.164	.233	23.0	36.0	31.8	.112	.192	.182	.77	.83	.90	SW b W	W S W	S S W	14.32	5.45	4.06	...	...	...	Clear.	C. C. Str. 6.	Do. 8.
28	.282	.102	.229	34.1	37.2	35.2	.199	.199	.203	.91	.83	.91	S b W	W S W	W S W	5.03	8.85	3.55	...	...	...	C. Str. 4.	C. Str. 8.	Do. 10.
29	.242	.277	.331	34.6	47.0	33.0	.203	.271	.197	.91	.80	.94	S W	E	N E b E	0.01	0.50	7.31	...	Inp.	...	Do. 10.	Cirr. Str. 2.	Clear.
30	.198	.058	29.967	32.8	42.6	40.9	.199	.243	.253	.93	.85	.92	NE by E	N E b E	S S E	8.36	4.52	14.76	...	...	...	Do. 9.	C. Str. 8.	C. Str. 10.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR OCTOBER.

Barometer	*Highest the 3rd day*	30.224
	Lowest the 16th day	29.308
	Monthly Mean	29.824
	Monthly Range	0.916
Thermometer	Highest the 8th day	70°.0
	Lowest the 22nd day	23°.6
	Monthly Mean	44°19
	Monthly Range	46°40

Greatest Intensity of the Sun's Rays .... 98°.4

Lowest Point of Terrestrial Radiation .... 22° 1

Mean of Humidity .... .859

Amount of Evaporation .... 3.86 inches.

Rain fell on 10 days, amounting to 6.823 inches; it was raining 90 hours and 56 minutes and was accompanied by thunder on one day.

Snow fell on the 20th day. Inapp.

Most prevalent wind, N. E. by E. Least prevalent wind, E.

Most windy day, the 26th; mean miles per hour, 28.78.

Least windy day, the 14th; mean miles per hour, 0.03.

The electrical state of the atmosphere has indicated feeble intensity.

Ozone was in large quantity.

Aurora Borealis visible on 2 nights.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR NOVEMBER.

Barometer	Highest, the 26th day	30.344
	Lowest, the 19th	29.003
	Monthly Mean	29.681
	Monthly Range	1.341
Thermometer	Highest, the 9th day	64°.1
	Lowest, the 25th day	1° 0
	Monthly Mean	33°69
	Monthly Range	63°1

Greatest intensity of the Sun's Rays .... 69°.6

Lowest point of Terrestrial Radiation .... —1.0

Mean of Humidity .... .871

Rain fell on 12 days amounting to 5.719 inches; it was raining 74 hours 15 minutes, and was accompanied by thunder on one day.

Snow fell on four days, amounting to 2.01 inches; it was snowing 12 hours 10 minutes.

The most prevalent wind was the W S W.

The least prevalent wind E.

The most windy day the 25th; mean miles per hour 22.09.

Least windy day the 1st; mean miles per hour 1.99.

The electrical state of the Atmosphere has indicated moderate intensity

Ozone was in rather large quantity.