THE CANADIAN JOURNAL.

NEW SERIES.

No. XLVII.—SEPTEMBER, 1863.

PHONETIC ANOMALIES OBSERVED IN SOME MODERN FORMS OF ANCIENT PROPER NAMES.

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(Read before the Canadian Institute, April 18, 1863.*)*

It is generally allowed that the usual English mode of pronouncing the ancient languages of Italy and Greece is very far from being correct. However thoroughly our learned men may have entered into the genius and grammar of those tongues, the sounds which they reproduce when they come to express audibly with their lips what their eyes gather up from the written or printed page of Tacitus or Thucydides, are, probably, as like the sounds originally intended to be conveyed by the characters before them, as those uttered by the English proof-reader's assistant are, who, in ignorance of Parisian phonetic niceties, delivers aloud a chance sentence in French.

In regard to the vowel-sounds it would almost seem as if at the outset, when our forefathers,

"Teuton or Kelt, or whatever we be,"

were first made acquainted with alphabetical writing, "some one had blundered;" as if the primitive learner had confounded *a* with *e*, and *i* with *ei* or *ai;* and then that the mistakes of childhood, as is sometimes the case, had been handed on and finally become legitimized by force of custom.

We cannot imagine that Augustine and his monks, fresh from Italy, pronounced, or taught the English people to pronounce, *a*, *ay*, or *e*, *ee*, or *i*, *ei*. They would rather have represented the sound which we call *ay*, by *e* accented or unaccented; whilst the English *e* would have been written *i*; and what we call *i*, would have gone down as *ei* or *ai*.

By strangely deviating in these respects from the general usage, our nation has rendered itself doubly insular, and considerable difficulty has been thrown in the way of foreigners desiring to learn our language. Not even do our Scandinavian brethren, I believe, herein agree with us. But although the continental nations have preserved more truly than we have done the tones of the languages which we are in the practice of calling dead, we are not to imagine that this has been anything more than an accident. These nations, either occupying the ground which was formerly the area of those tongues, or being geographically in contact with it, adopted in the written and spoken developments of their own respective vernacular languages the phonetic systems of vanquished or superseded races, simply as a matter of convenience, with no particular desire to perpetuate the veritable tones of the classic tongues. Ever since the revival of literature in the beginning of the sixteenth century, there has been a school of learned men on the European continent who contend that the classic languages ought to be more completely resuscitated; that many niceties and elegances of utterance which usage in the several nations has failed to secure, might and ought to be recovered and practised.*

* The numerous native "professors" of the Greek tongue who found their way to Italy after, and long before, the fall of Constantinople (1453), naturally pronounced the ancient language as they would their own vernacular Romaic, which bears the same relation to it that Italian does to Latin. Manuel Chrysoloras, who died in 1415, thus taught in Florence, Milan, and Rome. Previous to this, Boccacio, who died in 1375, was a diligent student of Greek under similar tuition.

Reuchlin (1455—1522) advocated the Romaic pronunciation in Germany. In 1528 Erasmus published his treatise "De rectâ Latini Græcique Sermonis pronunciatione," in which, in opposition to the great German scholar, he maintained that the ancient sounds are not reproduced by the modern modes. Henceforward there were two schools of Greek orthoepists, the Erasmian and the Reuchlinian—the *etists* and the *iotacists*, (the latter so called from their giving the sound of *iota* to η, ι, υ, and the diphthongs œ and æ.) At Oxford, Grocyn (1442—1519) taught Greek, probably *Romaicè*; and strangely enough, under him it is said that Erasmus first began the study of this language in 1497. At Cambridge, Cheke (1514—1577) inculcated a method resembling the Erasmian in his "Disputatio de Pronuncia-

In unchanged proper names, as they are read, we may say by all scholars except those of the British Islands—such as *Italia, Germanica, Roma, Terracina*—we most probably hear the words very much as Cicero or Virgil uttered them. To this day the stranger from the north, when listening to the psalms and hymns sung in the churches at Marseilles, is scarcely able to decide whether the language is Latin or Italian.

In words that have undergone a slight alteration, according to certain dialectic principles,—such as *paradiso, vino, teatro, civita, podesta*—we feel pretty sure, also, that we hear sounds and syllables of veritable Latin, as it was spoken in the villas of Italy and in the *Castra stativa* of the frontiers.

In other words and proper names that have suffered a very great metamorphosis, Latin still meets the ear, but it is Latin disguised. In the French *feu, œil,* we scarcely recognize *focus, oculus;* nor in the Italian *vescovo, chiesa, episcopus, ecclesia.* Here popular corruptions have become fixed in certain phonetic forms; orthographic we cannot style them.

Nor was rapid and vulgar pronunciation the only source of corruption. Ancient classic words suffered also from the difficulty which the northern and other races experienced in enunciating the names of the places of which they made themselves masters.

In *Aosta, Saragossa, Grènoble,* we hear some barbaric chieftain endeavouring to articulate *Augusta, Cæsar Augusta, Grantianopolis.* In *Watling Way* we have an Angle or Saxon trying to say *Vitelliana Via.**

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tione Græcæ potissimum Linguæ," which drew forth a prohibition of the new practice from Gardiner, then Chancellor. "In sonis omnino ne philosophator, sed utitor præsentibus,"—the decree ran. "It were much better," the conservative Chancellor added, "that the Greek language itself with its sounds were wholly banished, than that the youth by his (Cheke's) teaching should imbibe rashness, arrogance, and vanity, most pernicious pests to all the rest of the life."

Caius also, the "Fui Caius" of Caius College, supported the old way in a treatise "De Pronunciatione Græcæ et Latinæ Linguæ cum Scriptione novâ." Erasmus himself had filled the Greek chair at Cambridge in 1510, where he lectured to small classes on the *Erotemata* of Chrysoloras. A well-known walk in the grounds of Queen's College retains his name. The question of pronunciation, after enlivening the learned world for a time, was at length decided practically. European scholars (the English included) adopted the new method. That is to say, in the several countries scholars took the liberty of reading the dead languages, as they did their own respectively. The result in England has been seen above.

* In some modern forms of ancient names we also probably hear conventional abbreviations similar to those which are so common in the British Islands, as Lemster for Leominster, Lanson for Launceston, &c., &c.

To the vocal organs of some of the early Norse immigrants in Italy *l*, in certain combinations, appears to have been a difficult letter: hence *Firenze* for *Florentia;* and generally *i* for *l* when followed by a vowel: as in the familiar *piano, piazza,* for *plano, plazza.* We may notice that some of our Indian tribes have the same difficulty in the utterance of English words: with Ojibways, *Montreal* is *Moneong*, *English*, *Yaganash*, and so on. It used to be considered amusing by Canadian boys that the Indian could not say "plenty;" it was always "pnenty."

R appears to have been occasionally another awkward letter. Hence we have for *Pistoria, Pistoia;* for *lavatorium, lavatoio;* for *cochleare, cucchiajo, &c.* Such a word as *bore* would inevitably have become *baw,* as an amusing periodical sometimes renders it. Some of our Indians again experienced the same difficulty with *r*. In Lewis's Iroquois Map, Toronto is set down as Deonda, Onyagara as Neageh, &c.*

The generality of the inhabitants of Saragossa and Grenoble would at this day as little recognize Cæsar Augusta and Grantianopolis, as the plain people of Brighton, Exeter, or Windsor would Brighthelmstone, Exanceaster, Wyndleshore.

Still these corrupted forms of ancient proper names, when placed side by side with their respective originals, have helped to preserve for us certain sounds and pronunciations, current long centuries ago, which would otherwise, perhaps, have vanished without a trace.

Sounds and pronunciations are, we know, very impalpable and fluctuating things; it is almost impossible to fix them—to embalm them, so to speak, from age to age—except by a musical notation.

In languages where rhyme has been admitted into poetical composition, a proof of ancient pronunciation may occasionally be discovered. Thus we learn from Spencer (1553—1598) that our curious modern pronunciation of "Tems," for Thames, is at least 300 years old. In his Prothalamion in honour of the Ladies Elizabeth and Katherine Somerset, "he walked forth," he says,

> "Along the shore of silver-streaming Thames,
> Whose rutty bank, the which his river hems
> Was painted all with variable flowers,
> And all the meads adorn'd with dainty gems
> Fit to deck maidens' bowers."

* In Baraga's "Otchipwe Dictionary" the articles *F, L,* and *R,* do not appear.

The wonder is that the name of the river has not come to be written, as so persistently pronounced. This is the kind of change which *has* taken place in the names which I am about to adduce. The traditior pronunciation was at length phonetically expressed and perpetuated.

Again, a pun or play upon words may sometimes determine the pronunciation of a name at a particular time; as in Warwick's

"Roam hither then!"

in reply to the Bishop of Winchester's reference to "Rome."—(1 Hen. IV. iii. 1.) This tends to shew that the pronunciation of *Room*—which was prevalent among old-fashioned orthoepists not many years ago—was not Shakspeare's rendering of "Rome." In *Roumelia,* however, and the *Roumans* of Moldavia and Wallachia, and in the Turkish sultanate of *Roum,* we have intimations that this was a pronunciation of Rome, at least in the Eastern Empire. Stocqueler (Oriental Interpreter, p. 198) gives *Room* as the Persian name to this day, of Constantinople, the *Nova Roma* of Constantine. In a somewhat similar manner, the familiar title "John of Gaunt" shews, by an incorrect anglicised form, how our forefathers designated the birth-place of that personage.*

But in the case of the ancient Greek and Roman proper names, to which I am about to refer, we are not guided to their pronunciation by the aid of rhyme—nor by a play upon words—although instances of this I think I have seen—but simply by the modern forms which they have assumed.

I begin with some proofs of an unexpected deviation from the usual European pronunciation of the first vowel.

1. The normal sound of the first vowel we may take to be *ah.*—We shall be pretty safe if we give it this sound in most of the foreign words we meet with. Its peculiarly English force is in many words, as we have seen, *ay,* which continentals would rather express by *e.* Still the curious thing is, that in some ancient proper names, as preserved in their modern form, the *a* seems to have had something of this anomalous English sound. Take the name for example, of a tributary of the Rhone, entering the main river, near Valence—the Isère: the letter which this accented *e* represents is *a* in the

* Ghent: Fr. Gand. Shakspeare, of course, plays on "Gaunt,"—as, for example, in "Gaunt am I for the grave," (Ric. II. ii. 1); and Charles V. boasted that he could put all Paris into his "Gant" (glove), alluding to the great extent of the city (also *his* birth-place) in his day.

original word, *Isar* or *Isara* ; so that locally this *a* must have been sounded somewhat in our English way, or the name would not have been phonetically expressed and handed down in the modern dialect as *Isère*.

Again, take the familiar word *Clermont*, the name of the principal town in the Department of Puy de Dôme : the *e* also here represents *a* in the Latin word *clarus—Clarus Mons*. And similarly in *Clairvaux* in the Department of Aube=*Clarus vallis*,—although here the *ay* sound of *a* is represented by *ai*, as in *Aquitaine* also, from *Aquitania*, *Aix* from *Aquæ*, &c. In *Seine* from *Sequana*, the dipthong *ei* to some extent represents the same sound.

In the common words, *père*, *mère*, *frère* from *pater*, *mater*, *frater*, —*cher* from *carus*, *chair* from *caro*, *aimer* from *amare*, *taire* from *tacere*, *plaire* from *placere*, &c., there seem to be traces of the English long-sound of *a*. So also in *maire* from *major*—although there can be no doubt that in *Lago Maggiore*, we approach nearer the real vocable *major*. In the Italian word for an apple—*mela*—we are compelled to pronounce at least the stem of the Latin name for that fruit in the English manner—*mal-um* : this word ought to have been transmitted to us pure and simple, if *mah-la* was the sound that struck the ear of those who first wrote down the modern word.

One more instance will suffice to show that our English *a*-sound, however wrong it may be, has more to say for itself, than could have been conceived.

Take *Reate—Ree-ay-tee*, as the ordinary Englishman would call it ; a very ancient city in Central Italy. Its modern existing name is *Rieti—Ree-ay-tee*—proving that the *a* in this case had the English sound in the ear of the person who reduced the popular language to writing. Compare *Teate*, *hodie Chieti*.*

* *Castra*, which in so many instances became *Caster* (comp. *Lancaster*), in more than one became *Caister*. (*e.g.* in Lincolnshire) in which we have phonetically the English sound of *a*. The Anglo-Saxon form of *caster* was *ceaster*, wherein *ea* was still pronounced *ay*. Where we have *chester* for *caster*, the *e* had probably the sound which we give it in Derby, Hertfordshire, &c. In other words the *ea* came at length to be written *a*, as in *shame* identical with *sceam* modesty. In the fact that *a* came to represent *ea*, we have probably the origin of the English sound of *a*.

The Anglo-Saxon *æ* also, was converted in some cases into *ea*, still sounded *ay*, as in *læfan* to leave. *Great* and *break*, with us, retain the sound of *ea* ; but to call *leave*, *lave* is not considered polished. *Shame-fast-ness*, from *sceam-fæst-nes*, has been changed to *shame-faced-ness*: "faced" is, of course, the phonetic blunder of some unweeting person, but it serves to shew that the *a* representing *æ* of *fæst*, (firm, resolute,) had the *ay* sound. In Wessex (Devon *e.g.*) the Anglo-Saxon rendering of *ea* survives: *heal* is popularly *hayle*.&c.—Query: Was *tea* intended to be the French *thé*, or the unusually elegant botanical *Thea*? The Chinese word is said to be *tcha*. In Persian *cha-khutai* = tea of Cathay.

2. The true sound of *e* is *ay*, but that this was not its sound invariably, this word *Rieti* compared with *Reate*, shews twice over.—The same thing can be seen also in the numerous Italian words, in which *ri* represents the inseparable particle *re*, denoting repetition, &c. Take *rifacimento*, *i riformati*, for examples, and *di* for the familiar *de*. The same anomaly appears in *Avignon* on the Rhone. The ancient name of this celebrated city was the same to all intents and purposes—*Avenio*—where the *e* must have been pronounced like *i*, that is, like *ee*. Once more: compare *Monte Viso*, the point of junction of the Maritime and Cottian Alps. Its ancient name was *Mons Vesulus*, where the *e*, to have begotten the *i*, must have possessed the English sound. So in *Sena Gallica*, on the sea-coast of Umbria—the *e* is represented in the modern name *Sinigaglia* by *i*, that is *ee*.

Similarly the common Italian pronoun of the first person *Io*, *I*, is almost literally the Latin Ego, pronounced *Anglicè*. Also *mio*=*meus*, *Dio*=*Deus*, &c.

Let us turn also for a moment to the Greek ἦτα, the long *e*. In relation to it the anomalies are at first sight very extraordinary.—Most continentals call this vowel *ayta*; and so the recent Greek grammars instruct our youth to do. Still, take *Messina* for example, from which the strait between Sicily and the mainland has its name. The Attic form of the name is Μεσσήνη. The *i* in the modern name, pronounced of course *ee*, therefore shews, that one, at least, of the ancient pronunciations of η was just what we call it in English.—Similar examples are numerous: *Athens* itself—Ἀθῆναι—has for one of its modern popular appellations *Settines*—where *i*, that is, *ee*, does duty again for η. On the same principle the modern name of *Lemnos*, Λῆμνος, is *Stalimine*.* So *Macronisi*—literally Long Island—off the south east coast of Attica—gives again *i*, that is, *ee*—for the ἦτα of νῆσος island.†

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* As to the forms *Settines*, *Stalimine*, for *Athens*, *Lemnos* it may not be uninteresting to explain, in passing, that the *s* prefixed seems to have arisen from ἐς a preposition of motion. Turks and others learning from native sailors the destination of their craft for such and such a place, erroneously mixed up the sound of the preposition with the local name, incorporating also in some instances, the definite article. Thus the island of *Cos* acquired the extraordinary name of *Stanco*; and Constantinople, in like manner, became *Stamboul*, or *Istamboul*—the *City*—literally "To the City." This syllable, *boul* reminds us of a pronunciation of *Sebastopol*, popularly prevalent during the Crimean war.

† The learned Theodore, Augustine's successor in A. D. 668, was a native Greek. This will help to account for the phenomenon noticed by Hallam on an examination of a certain MS. in the British Museum, of the Lord's Prayer in Greek, written in Anglo-Saxon characters.—"It proved," he says, "the pronunciation of Greek in the eighth century to have been mod-

This anomalous sound of ἦτα obtained also in the case of some common nouns.

The early French or Gaulish Christians who first heard the Greek word ἐκκλησία from the lips of their missionaries, caught the sound of the ἦτα as being that of our *i*, that is, as *ee*. Thus they wrote it down as *Eglise*. So we must suppose the traders of the Greek city of Marseilles to have sounded their *etas*, to account for *boutique* shop, being fashioned out of ἀποθήκη store. The same usage must have existed to some extent during the classic times, in Italy—if the Greek λῆρος nonsense, and the Latin *liræ*, pronounced *leeræ*, trifles, are identical.* Compare, finally, as a curiosity, *deer* with θήρ.†

3. But it is time to turn to *i*. The European usage is to call this letter *ee*. Nevertheless it is clear that there was a sound attached to this vowel which approached the *ei*, or almost *oy*-sound, which the English people have chosen, in a multitude of cases, to give it.—*Loire*, for example, represents *Liger*—the ancient name of the largest river of France. With this compare *noir* from *niger*; *loisir* from *licet*, and *moi*, as derived from *mihi*. Also, it is well known that the Latin plural termination *i* is an equivalent for, if not identical with, the corresponding *oi* in Greek. In later Greek, long *i* was often exchanged for *ei* diphthong : not that this diphthong was pronounced like the English *i* ; but a deviation from the common *ee*-sound is certainly indicated.‡

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ern, or Romaic, and not what we hold to be ancient." *Vide* Hallam's *Literary History*, Vol. I., 92. The Greek of Christian missionaries in Britain, six centuries before Theodore, was probably similar. The sound which we give to the Greek *eta* may thus be a very ancient tradition.

* That in Quintilian's time (A. D. 90.) the principles of pronunciation were not the same in the Latin and Greek languages, is plain from what he says of the danger of a Roman child's acquiring faults of pronunciation from a use too long and too exclusive, of the Greek tongue. *Vide* Instit. Orat. Lib. I. iij. 3.

† Θήρ is "wild animal"—and the cognate "deer," we know, is by no means exclusively the *genus Cervidæ* with which we in modern times associate the word. We shall recal Edgar's song in Lear (iij. 4,)

"Mice and rats and such small deer
Have been Tom's food for seven long year."

It may be added as a brief corollary that *venison* is anything taken in hunting, and not exclusively the flesh of *Cervidæ*.

‡ The restoration of the *ei* diphthong to proper names which for a series of years have been printed with a simple *i*—although it may momentarily offend the eye—has the advantage of being a safeguard against false quantities. We may not quite like to see Phidias figuring as Pheidias—but not only do we thereby approach nearer to the actual name of the great sculptor, but the young competitor for classical honours is guarded against a possible heavy discount on his merit-marks. In like manner, although it may not be expedient to alter the

The present German mode of pronouncing *ei* does not appear to secure for us precisely the sound of ancient proper names. Cæsar and Tacitus expressed *Rhein* by *Rhen-us*, conveying to us a sound something like that which is to be heard in *Marseilles*. *Lingua Latina* in German, would be *Lateinische Sprache*: if *i* was pronounced *ee*, this *ei* of *Lateinische* doubtless once had more of this sound.

The rest of the vowels need not detain us long; as in regard to them the usage in ancient and modern times is nearly the same, and English custom is not much out of harmony with the continental.

4. *O* and *u*, we know, were not uncommonly interchanged in many words. In Greek we have *ὄνομα* Attic, and *ὄνυμα* Æolic, whence our second *y* in *synonymous*: in Latin *quojus*, *cujus*, &c. Hence in modern proper names we find the *o* often naturally representing one of the *u* sounds.

Fesoie = Fæsulæ,
Genoa = Genua,
Modena = Mutina, &c.,
so popolo = populus, &c.;
and conversely, currant = Corinth.

And so *do-ge*, the title of the chief magistrate of *Genoa* and *Venice*, from *duc*, and *dogale*, ducal. We may compare with this, the short *u* sound which we in many English words give to *o*: e.g. London, Monmouth, Honiton, money. So "common" from "commun."—But in *Lucca*, pronounced *Lu-ca*, notwithstanding the two *c*'s, we have the long sound of *u*—the sound which is generally to be given to it in continental proper names. *Lucca* retains its ancient name in sound, as well as in form, with the exception of the double *c*.

5. *U* in modern proper names derived from the Latin and Greek, often represents, and no doubt retains the proper sound of *ou*. As in *Siracusa*, the ancient *Syracusæ* of the Romans, and the *Συρακουσαι* of the Greeks.* Compare the imaginary proper name *Utopia*, *Οὐτοπία*, rightly and in every respect denoting "Nowhere."

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popularized *Alexandria*, *Samaria*, *Attalia*, &c.,—yet in grave historical works, it is not amiss to give intimation of the *ei* diphthong which has been displaced by the penultimate vowel in them.

* It is a fixed rule that we are never to give to *u* in Italian words our favourite but anomalous English *ew* sound. The Duke of Newcastle, saluted "Dook" so often by our neighbours, in 1861, thus received in part what by his bearing and wisdom he merited in full, the title of the late rulers of Tuscany—*il granduca* (pron. *dooka*).

6. In regard, finally, to the vowel *y*, it would be difficult to say for what reason it was made to represent in Latin words the Greek *upsilon*, and why it should be called in French *e Grec*, did we not discover that in modern Greek this letter is pronounced *ee*. According to the Grammars for Romaic, ψυχη, strange to say, is *Pseechee;* and so to the Romans the word must have sounded when they wrote it down as *Psyche*.

But that the *upsilon* in very early times had not invariably this sound, may be gathered from *Saguntum*, which, though known to derive its name as well as its origin from Ζάκυνθος, the modern Zante, was still by Roman historians written with the *u* unchanged.—One of the characteristic archaisms of Ennius was, to pronounce the *upsilon* as *u*. We feel as if the Roman Chaucer *ought* to call Pyrrhus, *Burrus*: Phryges, *Bruges*, &c., as we are told he did.

Again, that *y* does not well express the *u*-sound in Συρία is clear from the ancient as well as the modern name of Tyre, viz. *Tsour*, itself probably the stem of Συρία.—Cheke oddly gives *Surri* for Syria.—Similarly *Assouan*—a name familiar to voyagers on the Nile —also preserves the same sound of upsilon, *Assouan* being in Greek letters Συήνη, *i.e.* Syene, from which comes Syenite.

It was possibly the easy interchange of *y* with *u* that suggested to the old chroniclers, *Brute*, as the name of the eponymous hero of "Ynys Prytain,"* the island of Britain.

These mingled *u* and *e* (*i*) sounds of upsilon led at one time to perplexing anomalies and confusions in connexion with "satire" and "satirical." These words in French and Spanish, and in the English of the last century, exhibit a *y*. Two distinct things had come to be confounded—the Greek Σάτυροι, dramatic productions in which "satyrs" were actors;—and the Latin *saturae*—at a later period *satirae*—"dishes full of mixed fruits," literally,—and then, "free

* We cannot but be acquainted with several selections from the animal kingdom which are supposed to symbolize our race and nation; in regard to one of them, *Italus* = *Vitulus* (whence *veau* and *veal*) may help to keep us in countenance; but the generic term contained in the name mentioned above would seem, without explanation, to be carrying symbolism too far. "Brute" is here, however, a highly honourable human appellation. He was a Trojan Prince, a near relative of Æneas, the equally veritable founder of the Roman line of kings. Geoffrey of Monmouth (1152) goes very minutely into his history. In the "Tragedy of Locrine," attributed with some shew of reason to Shakspeare, this founder of the British line of kings i. one of the *dramatis personæ*. Although supposed to be speaking before the time of the building of Rome, he is made, by a bold prolepsis, to say, when presenting a bride, Guendoline to Locrine, who is his son, that she is—

"A gift more rich than are the wealthy mines
Found in the bowels of *America*."

criticisms on things in general." From these latter compositions sprung "Satire"—with which the goat-footed monsters had nothing to do.

7. The continental pronunciation of the diphthong *ae* is *ay*. We have nevertheless *Gallicia* from *Galæcia*, *Isernia* from *Aesernia*, *Turbia* from *Tropæa*, *Vercelli* from *Vercellae*. *Velletri* from *Velitrae*, *Carsoli* from *Carsulae*, &c.; and in a sense different from Porson's

"The Germans in 'Greek,'
Are sadly to seek"—

for with the will and full power to call *ae*, *ay*—they in their own tongue turn *Græca Lingua* into *die Griechische sprache*.

8. *Oi* and *ou* have been virtually noticed.

9. Of *au*, the recent Greek grammars, compiled from German sources, give *ou* naturally, as the sound. This rendering in Greek words is probably right, Aristophanes giving us βαΰζειν, "to utter the sound βαΰ, βαΰ," *i.e.* to bark. The early Gauls, however, assigned to *ou* more of the *o*-power: thus they converted *Aurelianum* into *Orléans*, *Arausio* into *Orange*, and *aurum* into *or*: the latter word their cisalpine brethren made *oro*. Comparing *Claudius* with *Clodius*, *explaudo* with *explodo*, *caudex* with *codex*, &c., we see that a similar dialectic mutation was not uncommon at an earlier period. Our *suffocate*, from *sub* and *fauces*, exhibits the same change.—Wicklif and Cheke germanized in regard to *St. Paul*, the former calling him *Powl*, the latter *Poul*. To identify, as some do, the mythic Italian *Faun-us* with the Arcadian Πάν, we must suppose that in this instance at least, the *au* must have had something of the English sound, for *ā* = *au* nearly.

10. The diphthong *oe* remains. Of this combination, by which we know the Latins represented the Greek οι, and which we have reduced to *e* in "economy," the continental pronunciation is *ay*, or else the un-writable sound which we hear in "Goethe." Still I have one or two anomalies to offer: more doubtless could be found. Take the first syllable of the well-known proper name *Innsprück*, i.e. "Bridge over the Inn." This "Inn" is Latinized into *Œn-us*, where *oe* represents *i*, that is, *ee*. In a similar manner the modern *Vitulo* in the Morea is the ancient *Œtylus*.—In the French *ciel*, has descended to us a like pronunciation of *oe* in *coelum*.

These irregular jottings, casually made from time to time, have not I fear, presented anything that will be deemed of very great importance. Still, for us μέροπες ἄνθρωποι as we are, beings constituted to syllable their utterances, matters of the kind I have touched upon, however minute and trivial they may seem, must have a degree of interest. It is a collection, as it were, of verbal fossils that I offer—philologic "flies in amber," of considerable antiquity, yet modern in their aspect.

The vocal solecisms just enumerated, have been adopted by most of us as proprieties of speech. I might have urged them in the way of precedent to justify, to some extent, the traditional usages of our old-fashioned English grammarians; but I have adduced them not at all for this purpose, but simply as phenomena that require to be accounted for.

It would seem as if, at the period of transition from the old languages of Europe to the new, some one, on seeing the particular proper names and other words to which I have referred, had read them out in what we may call the English manner, giving to the vowels very nearly the sounds which we are accustomed to give them when we make use of our own language; and that then, a scribe or reporter, writing from ear, and accustomed to pronounce the vowels in the general European manner, had committed them to paper phonetically, producing thereby no longer the ancient classic names, but Italian, French, and Romaic appellations. How else came *Reate*, for example, to be handed down to posterity, in Italian, as *Rieti?*

All the subdivisions of the great families of language, we know, were themselves subdivided into dialects, originating in isolation of locality,—imitation of the individual peculiarities of chiefs, bards, &c., and other conceivable causes When, then, new languages developed themselves from the intermixture of the Northerners and Southerners of ancient Europe,—an intermixture arising not only from conquest, but from joint service in Roman armies long before the fall of the Western Empire,—it is certain that dialects did not cease, but rather multiplied. Not one of the new tongues was uniformly spoken, any more than the old ones had been.

Now amongst the multitudes who, as adventurers or as soldiers, found themselves transplanted from trans-Rhenane or trans-Danubian regions, to sunny Provence, Lombardy, or Thessaly, we may be sure there were many of our ancestral blood-relations from the neighbourhood of the Elbe and the Weser. Did some of these, from genius of dialect previously spoken, or from structure of vocal organs and habits of speech combined, fall, when they began to articulate the euphonious vocables of the South, into some of the customs of pronunciation which distinguish ourselves, and so originate local dialects possessing, in respect of literal sounds, an affinity with the English tongue?

NOTE ON THE PRESERVATION OF SOME INFUSORIA WITH A VIEW TO THE DISPLAY OF THEIR CILIA.

BY JAMES BOVELL, M.D., TRIN. COLL., TORONTO.

In No. XXII. of the *Microscopical Journal* for 1858, Dr. Ralph writes: "Some months ago, I have made a decided advance in the preparation of insect tissues. I adopt the following plan: Place the insect alive in sweet spirits of nitre; it will die rapidly, and the air will be freely expelled, partly by reason of the volatility of the medium, and those with a proboscis, &c., will protrude it. After soaking a day, the specimens are to be rapidly transferred to a small quantity of clean spirits of turpentine, when all the sweet spirits of nitre will be expelled in the form of globules charged with grease; immerse in a further supply of turpentine in a clean bottle, and when the specimen has been a day or two (perhaps a little longer time may be required) it can be mounted in the chloro-balsam. Refractory specimens, or those which are very oily, may, after immersion in sweet spirits of nitre, and cleaning in turpentine, be again soaked in sweet spirits of nitre, when the turpentine will be expelled. If they are then a second time taken out of the sweet spirits and plunged in turpentine, the clearness of the globules which escape will indicate if the specimens are sufficiently cleansed. The sweet spirits of nitre must be fully expelled or the Canada balsam will assuredly quarrel with it, and form a cloud around the object. A modification of the above plan is, sulphuric ether in three times its bulk of spirits of wine."

Finding Mr. Ralph's method a very efficient one for insects, I thought that a similar effect would be produced on the ciliated Infusoria by the sweet spirits of nitre. Accordingly I procured from the ponds at the mouth of the Humber, west of Toronto, some slips of Anacharis and of Chara. On a portion of the latter, I was fortunate enough to discover a few active and finely developed Megalotrocha albo flavicans, and four of Floscularia ornata—these latter, June 27, 1863. Placing a couple of the Megalotrocha which were on the end of the Chara stem on a glass slide, with a drop of clear water, by means of a camel's hair pencil sweet spirits of nitre was added. At first it seemed to cause the active little creature to shrink, but in a moment or two it threw out its prettily arched oral extremity and displayed its ciliated fringed lappets. A little camphorated water with creosote, and which had been filtered through chalk, was allowed to insinuate itself under the glass cover, and the specimen sealed with black varnish. It is still in good preservation, being put up now for some time. Floscularia was not preserved as a permanent specimen.

I beg also to add a list of animalculæ which I have as yet found at the Humber, and in the Island ponds, Toronto.

Amœba princeps, in same place with small green sponges.
Micrasterias Boryana.
Enastrum rota.
Desmidium hexaceros.
Staurastrum paradoxum.
Stentor caeruleus.
Vorticella convallaria.
Leucophrys patula.
Kolpoda cucullus.
Paramecium aurelia.
Megalotrocha albo flavicans.
Floscularia ornata.
Oxytricha gibba.
Chilodon cucullus.
Rotifer vulgaris.
Staurastrum alternans.
Fragillaria capucina.
Gomphonema truncatum.
Cocconema lanceolatum.

The above list has been determined from Pritchard's work, and I hope will be found correct.

A PROPOSED CLASSIFICATION OF THE GENUS HELIX.

BY A. E. WILLIAMSON.

Among the mollusca there are many genera containing a large number of species. Of the fresh water varieties, the genus Unio has over 300 representatives; the genus Melania from 200 to 250; and the genus Lymnœa, although not nearly so numerous as either of the preceding, is still a very important division. Of the land shells the genus Helix bears off the palm in point of numbers, having upwards of 1500 species; the genera Bulimus, Pupa, and a few others also, present many varieties.

It will be seen by these facts that considerable difficulty may be encountered in arriving at the name of any species, even though we be well supplied with works of reference; for the labour of wading through a number of descriptions is not a very pleasing task, and it is only by figures of the shells, by well filled museums, by notes published in scientific journals, or by long practice and study, that we can get over this difficulty.

How much easier it would be, and, at the same time, prevent us from becoming disheartened at the long list of descriptions we may have to read over before finding the name of any shell, if some good classification could be adopted under which the shells might be grouped. This, I think, would in a great measure obviate the difficulties mentioned above. In following out this idea I have attempted the following classification of the genus Helix :—

DIVISION I.

SHELLS TOOTHLESS.

SECTION A.—Umbilicus closed or wanting.

SUB-SEC. A.—Shells large, over ½ inch in diameter.

1. *Lip reflected.*

H. ALBOLABRIS (Say).—Whorls about 5½, with rather obtuse wrinkles, crossed by very minute lines, more obvious on the body whorl than on the spire; shell pale reddish brown; labrum (outer lip) widely reflected, flat, and white; breadth 1 inch. Canada.

H. HORTENSIS (M[illegible]er).—A variety of *H. nemoralis*. Whorls about 5, rounded, wrinkled; shell thin and light; white, yellow, with or without clear brown bands; spire very much elevated; labrum very slightly reflected, except at base, where it is widely reflected; this pretty banded shell is an imported English species. It is found below Quebec.

2. *Lip simple.*

SUB-SEC. B.—Shells small, less than $\frac{1}{2}$ inch in diameter.

1. *Lip reflected.*

2. *Lip simple.*

H. CHERSINA (Say).—Whorls about 6, wrinkles not distinct; shell sub-globose, conic; pale yellowish white, pellucid; body whorl slightly carinated above the middle; breadth about $\frac{1}{10}$ inch. Lower Canada.

H. EGENA (Say).—Whorls 5, not distinctly wrinkled, rounded; shell polished, aperture rather narrow, transverse; labrum at its inferior (lower) extremity, terminating at the centre of the base of the shell; umbilical region deeply indented; breadth over $\frac{1}{10}$ inch; it is broader than *chersina*, and much more elevated, and not so broad as *arborea;* the aperture is also of a different shape. Lower Canada.

SECTION B.—Shells umbilicated.

SUB-SEC. A.—Shells large, umbilicus exhibiting all the whorls.

1. *Lip reflected.*

H. CONCAVA (Say).—Whorls 5, irregularly wrinkled across; shell horn color or whitish, depressed; aperture large and short; labrum towards the base very slightly and inconspicuously reflected; greatest width $\frac{1}{10}$ inch. Canada.

2. *Lip simple.*

H. ALTERNATA (Say).—Whorls 5, striated across, with raised equidistant acute lines, forming grooves between them; shell reddish brown, varied or alternating with pale rays; aperture thin and brittle; breadth $\frac{2}{3}$ inch. Canada.

Mr. Tytler, B.A., has a specimen of this shell in his possession, found at Weston, the dark rays of which are a deep black.

H. PERSPECTIVA (Say).—Specimens from the States are nearly $\frac{3}{4}$ inch in diameter. Our Canadian species do not appear to be quite $\frac{1}{2}$ inch in diameter—*see Sub-Sec. B.*

SUB-SEC. B.—Shells small, umbilicus exhibiting all the whorls.

1. *Lip reflected.*

H. MINUTA (Say).—Ohio, &c.

2. *Lip simple.*

H. PERSPECTIVA (Say).—Whorls about 6, striated across, with raised parallel acute lines, forming strongly impressed sulcæ (furrows) between them; shell brownish; umbilicus very large. Paris, Upper Canada.

H. STRIATELLA (Anthony).—Whorls over 4, rounded, regularly striated with rather strongly raised lines; shell light yellowish brown; aperture thin and brittle; resembles *perspectiva*, but is much smaller, has fewer whorls, is lighter in color, and the umbilicus does not exhibit the whorls as plainly as in that species. Canada.

SUB-SEC. C.—Shells large, umbilicus not exhibiting all the whorls.

1. *Lip reflected.*

H. CLAUSA (Say).—Illinois and Pennsylvania.

2. *Lip simple.*

H. INORNATA (Say).—Pennsylvania.

SUB-SEC. D.—Shell small, umbilicus not exhibiting all the whorls.

1. *Lip reflected.*

H. PULCHELLA (Müller).—Whorls about 4, rounded, striated; aperture circular; labrum reflected, flat, and white; umbilicus round, large, and profound; breadth about $\frac{1}{8}$ inch. Canada.

The small size and reflected lip will readily distinguish this shell from all other species found in Canada.

2. *Lip simple.*

H. PORCINA (Say).—Whorls over 4, depressed above, rounded beneath; shell depressed, yellowish brown; epidermis rugose ( ) with minute very numerous bristles; umbilicus rather small, profound; breadth over $\frac{3}{10}$ inch. *H. hirsuta* (Binney) is identical with this species (Bland) Garafraxa, County of Wellington, U. C.

H. LIGERA (Say).—Whorls over 6, all except apical one, wrinkled across; shell pale yellowish horn color, polished, body whorl pellucid, yellowish white, opaque beneath the aperture; spire but little raised; umbilicus very small; breadth about $\frac{3}{10}$ inch. Toronto.

H. ARBOREA (Say).—Whorls 4, irregularly wrinkled across; shell very thin, fragile, horn color, pellucid; lip thin, brittle; umbilicus large and deep; breadth $\frac{1}{5}$ inch. Canada.

H. HARPA (Say).—Whorls 4, with numerous raised, equal, acute lines across, the spaces between them flat and wrinkled; shell conic, reddish brown; aperture truncated by the penultimate whorl (the whorl preceding the body whorl); spire very much elevated; umbilicus small, nearly concealed; length $\frac{1}{10}$ inch. Lower Canada. In shape somewhat resembles a *Bulimus* for which it might be mistaken.

H. HYDROPHILA (Ingalls).—Whorls about 5, rounded, striated across with very fine lines; shell thin, horn color or whitish and translucent, polished; umbilicus rather large, profound; breadth, $\frac{1}{8}$ inch. Upper Canada. This species and *Striatella* and *Alternata* are very common.

DIVISION II.

SHELLS TOOTHED.

SECTION A —Umbilicus closed or wanting.

SUB-SEC. A.—Shells large, over $\frac{1}{2}$ inch in diameter.

1. *Lip reflected.*

H. ALBOLABRIS (Say).—Occasionally found with a small tooth. *See Division I., Sec. A., Sub-Sec. A.*

H. PALLIATA (Say).—Whorls 5; shell depressed with elevated lines, forming grooves between them; epidermis fuscous, rugose, with numerous tuberculous prominences; labrum widely reflected, white, a prominent tooth on the inner side above the middle, and a projecting angle near the middle of the lip; labrum (inner or pillar lip) with a large prominent white tooth; greatest breadth $\frac{4}{5}$ inch. It much resembles *tridentata*, but is larger and has no umbilicus. Some varieties have an acute carina, and are destitute of the minute prominences; breadth nearly 1 inch. Douglas Village, Garafraxa, Co. Wellington.

2. *Lip simple.*

SUB-SEC. B.—Shells small, less than $\frac{1}{2}$ inch in diameter.

1. *Lip reflected.*

H. INFLECTA (Say).—Lower Missouri.

2. *Lip simple.*

H. GULARIS (Say).—Ohio and Pennsylvania.

SECTION B.—Shells umbilicated.

SUB-SEC. A.—Shells large, umbilicus exhibiting all the whorls.

1. *Lip reflected.*

H. DIODONTA (Say).—New York.

2. *Lip simple.*

SUB-SEC. B.—Shells small, umbilicus exhibiting all the whorls.

1. *Lip reflected.*

H. FALLAX (Say).

2. *Lip simple.*

H. LINEATA (Say).—Whorls about 4, with numerous regular revolving lines; shell much depressed, somewhat discoidal; aperture longer than wide; umbilicus very large. As the shell is somewhat translucent, two pairs of white teeth, remote from each other, may be observed through the body whorl. One pair of these teeth is placed in the throat, and can be readily seen by looking in at the aperture; these teeth are nearly equidistant from each other, and from the extremities of the labrum. The other pair is placed too far in to be seen from the aperture; diameter $\frac{3}{20}$ inch. Lower Canada.

SUB-SEC. C.—Shells large, umbilicus not exhibiting all the whorls.

1. *Lip reflected.*

H. THYROIDUS (Say).—Whorls 5, wrinkled; shell rather thin, pale reddish brown; labrum widely reflected, white; labium with an oblique white tooth, not very prominent; umbilicus narrow, distinct; breadth $\frac{4}{5}$ to $\frac{9}{10}$ inch. Resembles *Albolabris* but is always umbilicated, smaller and toothed. Garafraxa, and Walkerton, Co. Bruce.

H. TRIDENTATA (Say).—Whorls 5, crossed by numerous lines, separated by regular grooves; shell depressed, brownish or horn color; teeth placed triangularly, one on the labium; labrum widely reflected, white, furnished with two teeth; umbilicus moderate; breadth $\frac{1}{2}$ inch. Canada.

2. *Lip simple.*

SUB-SEC. D.—Shells small, umbilicus not exhibiting all the whorls.

1. *Lip reflected.*

H. TRIDENTATA (Say).—About $\frac{1}{2}$ inch in breadth. *See Sub-Sec. C. above.*

H. LABYRINTHICA (Say).—Whorls 5 or 6, with conspicuous elevated lines across, forming grooves between them; shell dark reddish brown, body whorl lighter; labrum rounded; labium with a large lamelliform elongated tooth which appears to revolve within the shell, a smaller raised line revolves nearer the base but becomes obsolete before it arrives at the labium; umbilicus rather large; breadth $\frac{1}{10}$ inch. Lower Canada.

H. MONODON (Rackett).—Whorls 5 or 6, diminishing very gradually in breadth from the outer whorl to apex, marked with fine lines of growth; epidermis russet or chestnut color, with very minute hair-like projections; aperture contracted by a deep groove behind the lip;

labrum white, narrow, extending to the base of the umbilicus, and slightly contracting it ; labium with a compressed white tooth ; umbilical region deeply indented ; greatest breadth ½ inch. Canada.

The hair-like projections, Dr. Gould says, are often wanting at every stage of growth.*

Some objections may be raised against a classification of this kind, such as the finding at times of shells normally without teeth with teeth ; but these are exceptions and by no means common. *H. albolabris* has been frequently found in the United States with a small tooth. I have examined a great many Canadian specimens and as yet have not found one with this peculiarity. This difficulty is, however, easily obviated by placing such shells in each division under their proper sections—the description of course being attached to the section it normally belongs to.

Again, some shells are found occasionally with the umbilicus nearly or entirely covered, as in *H. fraterna* (Say) ; this peculiarity is very rare. I only know of it occurring in *fraterna*. It can be got over in the same manner as pointed out above.

As regards dividing the shells into large and small, I have taken ½ inch as the division line. This division is not a very good one on account of the variation in size of many shells, but it in some measure helps the object in view, as it places fewer specimens under each head.

I do not pretend to say that this classification is a perfect one ; if it assists in the more ready determination of species it has amply fulfilled my object. It is more a classification of convenience than a strictly scientific one. Those who have made a study of Conchology will see its imperfections, but I hope at the same time they will turn their attention to perfecting some good classifications of not only the genus Helix, but of the other large genera.

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* None of the above descriptions are as full as the originals. I have given what I think to be the most important parts, sufficient to distinguish the shells one from another.

I have made brief descriptions of *hortensis*, *striatella*, *pulchella*, and *hydrophila*, from specimens in my possession, not having seen any descriptions of them.

A few more species besides those described in this paper are found in Lower Canada, viz., *H. Sayii* (Binney), *H. astericus* (Morse), and *H. exoleta* (Binney).

SYNOPSIS OF CANADIAN ARCTIADAE, INCLUDING SOME ADDITIONAL SPECIES LIKELY TO OCCUR IN CANADA.

BY WILLIAM SAUNDERS,
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Read before the Entomological Society of Canada, April 16th, 1863.

In pursuance of the plan first adopted by Prof. Hincks, of collecting and publishing in the "Journal" materials for a complete synopsis of our Canadian Entomological fauna, the following paper has been prepared; with the hope that it may be of some assistance to collectors, by enabling them more readily to determine their specimens, and also do something towards clearing up some hitherto doubtful points in connection with the specific characters of several species belonging to this beautiful and interesting family of Moths. The method of taking up, from time to time, certain families or sub-families of insects, and publishing descriptive lists of all the known Canadian species, including those likely to occur in Canada, is, we believe, a good one, and we feel sure that if continued it will greatly stimulate the growth of our favourite branch of science. We trust that those who have time and opportunity will assist us in the work, for the field is a wide one, and there is ample room for all to labour profitably.

In the preparation of this paper, free use has been made of the material collected by Dr. Morris, in the late Smithsonian "Synopsis of North American Lepidoptera," and also of that contained in Dr. Clemens' "Contributions to American Lepidopterology," published in the Proc. Acad. Nat. Sciences. We would also acknowledge our indebtedness to the many kind friends who have freely placed their specimens at our disposal. The collection thus gathered from various parts of the Province, has materially aided in making the list of Canadian species much more complete than it otherwise could have been, and also acquainted us with many interesting variations.

Fam. Arctiadae.—Herr-Schaef. Chelonides Boisd.

Stature usually robust. Maxillæ short, sometimes obsolete. Antennæ pectinate in the male, sometimes filiform. Palpi small pilose.

Thorax and abdomen, most often spotted. Wings entire deflexed. Frenulum conspicuous. Larvæ hairy.

The family may be thus tabulated:

AA. Antennæ of male pectinated.

B. Fore wings streaked and spotted .. ...*Arctia.*

BB. " " white or fulvous, with black spots. Sometimes wanting .... } *Spilosoma. Hypantria.*

BBB. " " bluish grey...... ....*Euchætes.*

BBBB. " " pale yellow or ochre, banded or spotted with a lighter colour ...... } *Halesidota.*

BBBBB. " " white, with many blackish ringlets .... } *Ecpantheria.*

AA. Antennæ of male filiform,

C. Fore wings semi-transparent ....*Phragmatobia.*

CC. " " densely clothed with scales.

D. Hind wings red, with a black border ...*Deiopia.*

DD. " " white or yellow, without spots, or sometimes with one or two small spots near the anal angle........ .... } *Hypercompa.*

Arctia Schr.

Head and thorax with long hairs. Palpi porrect, short, very hairy. Ocelli conspicuous. Thorax not crested. Wings gaily coloured and spotted. Abdomen stout, maculate. Hind tibiæ with four spurs; fore tibiæ simple. Flight nocturnal. Larvæ solitary.

Table of species:

A. Fore wings spotted, not striped.

B. Fore wings brown.

C. Hind wings with blue-black spots. Abdomen spotted with black . ... } *Americana.*

CC. " " black banded. Abdomen with disk black } *parthenos.*

BB. Fore wings black, or blackish, with few spots *placentia.*

AA. Fore wings striped.

D. Fore wings with many stripes.

E. Central stripe wide.

F.	Hind wings red, anterior margin bordered with black	*parthenice.*
FF.	" " red, anterior margin with black spots ...	*virgo.*
FFF.	Hind wings flesh-colour, or slightly tinged with red	*dione.*
FFFF.	" " ochre-yellow or brownish; external edges with a double black border	*nais.*

EE. Central stripe narrow .... *virguncula.*

DD. Fore wings with few stripes.

G.	Hind wings ochre-yellow, with black spots......	*phalerata.*
GG.	" " reddish, with black spots	*philyra.*
GGG.	" " bright red, with a broad black border	*decorata.*
GGGG.	" " lightish brown, with yellow spots	*celia.*

(NOTE.—All known Canadian species will be followed by a note of exclamation (!). The others are natives of the adjoining States, and will probably also be found to occur with us.)

A. Americana !—Harris. Figured in "Agassiz's Lake Superior," Fig. 7.

Palpi dark brown above, red beneath. Head brown. Antennæ yellowish-white above, with brown pectinations. Thorax brown, bordered in front with a white band which extends on each side to the extremity of the shoulder covers. Collar bordered above and below with red, with a front line of the same colour

Primaries brown, deeper in colour towards base, with several white spots on costa, and crossed by broad irregular anastomosing lines of the same colour.

Secondaries bright ochre-yellow, with from four to six blue-black spots, three larger than the others.

Abdomen ochre-yellow, with a reddish tinge, and a dorsal row of large black spots. Legs dusky; thighs and anterior tibiæ fringed with red.

Length of body 9-10 lines. Wings expand 25-28 lines.

The larva of this species does not complete its growth in the autumn, but attains only to about three-eighths of an inch in length, when it hybernates, seeking shelter in some crevice, usually under the loose bark of decaying trees. At this period it presents the following appearance:—Head black; body dark brown, with transverse rows of tubercles, from which spring dense tufts of intermingled black and white hairs. For two summers past we have reared the larva from eggs deposited by captured females, to the period of hybernation; but have failed to preserve them alive during the winter. Several years since we found, in the latter part of May, a full-grown specimen, but it entered the chrysalis state before an opportunity occurred for describing it.† They are somewhat omnivorous in their appetites, but show a preference for the common garden lettuce and lamb's quarter (*Chenopodium album.*)

The perfect insect usually appears in the latter part of June or early in July.

Hab.—London, not common, Toronto (Mr. Bethune); Kingston (Mr. Rogers); Trenton Falls, N.Y.; Lake Superior.

**A. parthenos!*—Harris. Figured in "Agassiz Lake Superior," pl. 7. Var.: *A. Americana.*—Walker.

"Head brown, with a crimson fringe above, and between the black antennæ. Thorax brown above, with an arcuated cream-coloured

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† Since the above was written, specimens of the full grown larva have again been procured. They were found on the 18th of June, under some logs. The following description will serve to complete the history of this species:—Length two inches Head black and bilobed Body deep velvety-black, with transverse rows of tubercles, most of which are of a whitish colour, emitting tufts of hair. Hairs on second, third, and fourth segments dull red—on the latter slightly intermixed with white; those along the back are very long and silky, white mixed with black; while those on the sides are shorter, and of a dull red color. Under surface dull black, with a thickly set row of tubercles, in continuation of those above, on the third, sixth, eleventh, and twelfth segments, from which spring tufts of very short stiffish red hairs. Feet and prolegs black and shining.

* Those species prefixed with an asterisk (*) are not in the writer's collection; he would therefore feel greatly obliged for specimens from any person possessing duplicates of such.

band, which is continued on each side of the outer edge of the shoulder covers; upper edge of the collar crimson-red.

Primaries dark brown, with three small cream-coloured spots on the outer edge; four spots of the same colour in a line near the inner margin, and several more scattered on the disk.

Secondaries deep ochre-yellow; with the base, the basal edge of the inner margin, a triangular spot in the middle, adjoining the basal spot, *and a broad indented band behind*, black.

Abdomen dusky above, tawny at the tip, and beneath. Legs dusky; thighs and tibiæ fringed with crimson hairs."

Larva undescribed.

Hab.—Valley of the River Rouge (Mr. D'Urban); Lake Superior; Mass.

**A. placentia.*—Abbot. Figured in Sm. Ab. pl. 65.

"Fuscous; primaries with one or three pale testaceous spots; secondaries reddish, margin and some sub-marginal spots fuscous. Abdomen above reddish, with the dorsal spots and apex fuscous.

Var. a.—Fore wings with the outer fringe partly pale testaceous; and with several spots and dots of the same colour in the disk.

Var. b.—Fore wings with the outer fringe wholly blackish-brown, unspotted, except two very minute testaceous dots."

Larva undescribed.

Hab.—North America.

A. parthenice!—Kirby. Var. ?—*A. virgo.*

Palpi black, tipped with whitish. Head buff in front, black at the sides. Antennæ dark brown. Thorax flesh-coloured, with two small anterior and three large posterior black stripes.

Primaries black, margined and striped with buff; veins and their branches narrowly striped; a wide central stripe extending to the hind margin, furcate just beyond the base; with the lower branch again furcate near the posterior angle. The central stripe is joined at an acute angle at the tip by a branch extending to the costa; another stripe from the costa, about the apical third of the wing, extends to the median stripe, below which it is furcate,—one part terminating beyond the middle, the other at the end of the lower stripe.

Secondaries bright red, with five or six irregular black spots edged with yellow, *mostly towards the posterior margin. A large patch of black at the apex, which is prolonged along the anterior margin, bordering it to the base.* Ciliæ yellowish.

Under surface paler than the upper, with the markings less distinct; margins yellow.

Abdomen red above, whitish at the tip, with a black dorsal macular band; black below, with a central row of four or five white spots. Legs black, fringed along the thighs and at base with brown; posterior edge of hind tibiæ whitish.

Length of body 8½ lines. Wings expand 25 lines.

Larva.—Length one and three quarters to two inches. Head black, with a light spot on each side. Body black, with a dorsal flesh-colored stripe. A transverse row of prominent tubercles on each segment, of a yellowish flesh-color, from which arise tufts of stiff hairs, which are black on the back and brown on the sides of tke body. Feet and prolegs yellowish, tipped with black.

This larva, like that of *Americana*, hybernates when partly grown, and completes its growth the following spring. It feeds readily on lamb's quarter (*Chenopodium album*) or on grass.

Hab.—London. Not uncommon. Montreal (Mr. D'Urban.)

A. parthenice closely resembles the following species "*virgo*," and has usually been regarded as a mere variety of it; but since the larva described above, of which I have reared several specimens, does not agree with that of "*virgo*" as described by Harris, it is probable that they are distinct.

A. virgo!—Hubner.

Palpi black. Head buff in front; black at the sides. Antennæ ferruginous. Thorax buff or flesh-color, with five black spots; two small ones in front and three larger on disk.

Primaries black, margined and striped with buff, flesh-color, or sometimes reddish. Veins and their branches striped; two wide longitudinal stripes joined near the base, and extending to the hind margin; the lower one furcate near the end; three transverse from costa; the two outermost extending to the hind margin, the inner one to the median stripe or just below it. A short transverse stripe unites the upper with the lower longitudinal ones beyond the middle of the wing.

Secondaries deep red, sometimes with a pinkish tinge, with from seven to nine irregular black spots edged slightly with yellowish, not collected towards the posterior margin, but scattered uniformly over the surface of the wing. Cilia yellowish-red.

Under surface paler in color, with the same markings.

Abdomen of the same color as secondaries, with a macular black band, or sometimes a row of black spots, along the back. Under surface black, or very dark brown, with sometimes two or three faint whitish spots along the centre. Posterior edge of hind tibiæ buff.

The perfect insect appears about the end of July.

Length of body 8–9 lines. Wings expand 21–27 lines.

"Larva brown, rather thickly covered with tufts of brown hair."

Var.—Primaries with all the stripes wider, occupying the greater portion of the surface of the wing.

Hab.—London. Not uncommon. Cobourg (Mr Bethune.). St. Catherines (Mr. Beadle). Hamilton (Mr. Reynolds). Toronto (Prof. Croft; Dr. Morris). Kingston (Mr. Rogers). Montreal Mr. D'Urban). Nova Scotia; New York; Illinois.

A. dione!—Hubn. *Argæ.*—Drury. Figured in Drury i. pl. 18; Sm. Ab. pl. 63; Naturalist's Library, vol. xxxvi. pl. 19.

Palpi black above, reddish below. Antennæ whitish above, under surface brown, extremities nearly black. Head and thorax pale buff, with a pinkish tinge, especially towards the front; thorax with five black spots, two small ones in front and three larger on disk, one central and one on each tegulæ.

Primaries black, widely margined and striped with pale buff or cream-color, sometimes with a pinkish tinge. Stripes all wide (especially the central one and its lower branch), occupying the largest portion of the surface of the wing.

Secondaries reddish flesh-color, with a fulvous marginal line behind, and eight or nine black spots, chiefly along the hind margin.

Under surface with similar markings, the black spots less distinct, and costal edge of primaries yellowish-red.

Abdomen reddish above, pale below, with five rows of black spots, one dorsal two lateral, and two on the underside; the latter, largest. Under surface of thorax, reddish, with two black spots below the eyes. Legs whitish, edged with brownish-black; anterior and middle thighs bordered in front with red.

Length of body 7 lines. Wings expand 18 lines.

The perfect insect may be taken from early in June to the end of July.

The description given of the larva in the "Smithsonian Synopsis" does not exactly agree with that given by Harris, which is as follows: "Length one inch and a half. Color dark greenish-grey; appearing almost black from the black spots with which they are thickly covered. There are three longitudinal stripes of flesh-white on the back, and a row of kidney-shaped spots of the same color on each side of the body. The tubercles are dark grey, each producing a thin cluster of spreading blackish hairs. It attains its full growth in the month of October."

Food plants.—"Plantain and other herbaceous plants. Abbot states that they sometimes make great devastation among young Indian corn in the Southern States."

"Var. a.—Primaries reddish-white, with cuneiform black spots. Secondaries red, with black-yellow bordered spots.

Var. b.—Spots of the primaries much larger, and forming a stripe towards the hind border.

Var. c.—Spots of the primaries still larger, and more inclined to form stripes. Spots of the secondaries without yellow borders."

Var. d.—Secondaries whitish, spots small and without yellow borders.

Hab.—Niagara (Dr Morris). Toronto (Prof. Croft). Mass.; New York; Illinois; Georgia.

A. nais!—Drury. Figured in Drury, pl. 7.

Palpi black. Antennæ black above, lighter beneath. Head and thorax dull buff, with a brownish tint; thorax with five black spots, two small ones in front and three larger on disk, one central and one on each shoulder cover.

Primaries black, with pale ochre stripes; margins, veins, and their branches narrowly striped; central longitudinal stripe wide, furcate not far from the base, sending a wide branch to the posterior angle, where *it* is also furcate near its termination; the central stripe is again furcate about the apical third of the wing, emitting a wide branch, which joins the lower one; a short wide stripe crosses the apex, extending from the extremity of the central one to just under the costal edge.

Secondaries ochre-yellow, with a brownish tinge; with one or two small black spots, and a broad irregular dusky black border along the external edges, widest at the apex and narrower towards the inner angle; a line of ochre-yellow extends half through the black border, about the middle of the wing, and the border has also one or two small, dull, ochre spots in it.

Under surface paler, with similar markings; veins on secondaries narrowly striped with pale buff while passing through the black border.

Abdomen deep ochre, whitish towards the tip, with a black dorsal band, and lateral rows of spots of the same hue; under serface, thorax dull brownish, abdomen black, annulated with whitish. Legs brownish black, femora edged externally with buff.

Length of body 7 lines. Wings expand 18 lines.

Larva undescribed.

Var. a.—*Male.* Fore stripe of the primaries not joining the costa.

Var. b.—*Male.* Inner border of the secondaries reddish.

Var. c.—*Male.* Primaries with no pale oblique band towards the tip.

Var. d.—*Female.* Like Var. c. Secondaries red, with broad blackish borders. Abdomen wholly brown, except on each side above towards the base.

Var. e.—*Female.* Primaries with testaceous veins; fore stripe and part of the middle stripe almost obsolete."

Hab.—Hamilton (Mr. Reynolds). Massachusetts.

A. virgincula !—Kirby. Figured in Faun. Bor Amer. iv. pl. 4.

Palpi small, brownish black Antennæ black, with a brownish tinge. Head flesh-colored above, black at sides. Thorax pinkish-buff, with five black spots, two small ones in front, and three larger on disk.

Primaries black, margined, and striped with pale flesh-color. Costal margin, veins, and their branches, narrowly striped. *The central longitudinal stripe along the median vein linear throughout.* A wide stripe, having its origin at the base immediately under the median vein, and deflected from thence to the hind margin, where it is furcate. A zig-zag subterminal band, beginning on the costa near the apex and terminating near the posterior angle, where it joins the end of the wide longitudinal stripe. Two wide stripes arise from the costal edge; the first, about the middle of the wing, extends to the median vein, or just below it; the second at the apical third, uniting with the wide longitudinal stripe below.

Secondaries pale reddish-buff, with five or six black spots, *one within, the others along the posterior margin, where they form an irregular macular band.* Ciliæ whitish.

Under surface paler, with markings less distinct, excepting towards the apex.

Abdomen reddish above with the tip, and a dorsal macular band black. Under surface dark brown, imperfectly annulated with whitish hairs.

Length of body 5-8 lines. Wings expand 17 to 20 lines.

Larva undescribed.*

Var. a.—Primaries with the stripes reddish; secondaries pinkish-red. Abdomen with two additional rows of spots at the sides; under surface black, centered with yellowish-brown.

Var. b.—Primaries with the stripes nearly white; secondaries pinkish-orange. Abdomen with two additional rows of spots; black, with some faint lightish central spots.

Var. c.—Primaries with the stripes pale; secondaries hright red. Abdomen entirely black below.

Var. d.—Primaries with all the stripes narrower and reddish; secondaries bright red. Abdomen with macular band above very wide; entirely black below.

Var. e.—Primaries with the stripes reddish-ochre, costa edged only to about the basal third of wing; secondaries vermillion-red. Abdomen deep black below.

Hab.—London: common. Toronto (Mr. Bethune; Prof. Croft; Dr. Morris). St Catharines (Mr. Beadle). Hamilton (Mr. Reynolds). New York.

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* A single specimen of the larva of this species was taken during the present season, on the 2nd of June, under a log. Length 1¼ to 1½ inches Head *small*, black, reddish at sides. Body dull black, *rather glossy*, with a slightly reddish tinge. On each segment is a transverse row of black tubercles, emitting tufts of stiff bristly hairs *of the same hue*. Hairs on the two hinder segments longer than those on the other. A faint whitish dorsal line from the head to the third segment, and another faint mark of the same color on the terminal segment. Under surface dull red, feet and prolegs of the same color.

A phalerata !—Harris. Figured in Harris' Insects, new Edition, Fig 166.

Male. Palpi black. Antennæ black above with light-brown pectinations. Head ochre-yellow, narrowly bordered with black at the sides. Thorax ochre-yellow with THREE black stripes, one central, and one on each tegulæ.

Primaries black, with *very wide stripes of ochre yellow*, one along the costa to near the tip, another along the hind margin, and a third very wide central stripe, furcate about the middle, both branches extending to the hind margin ; the end of the lower branch is joined by a transverse stripe, which extends obliquely to the costa ; and from the termination of the upper branch arises another extending across the tip to near the costa.

Secondaries bright ochre-yellow, with three black spots along the posterior margin, and a patch of black at the anterior angle, which is prolonged along the anterior margin to near the base of the wing. Ciliæ buff.

Under surface with the same markings and nearly as distinct.

Abdomen ochre-yellow, with a wide dorsal black band narrower towards the thorax, below black, with a central yellow band, wider towards thorax. Legs black, fringed with brownish-yellow hairs at their base ; anterior thighs spotted with reddish-yellow.

Length of body 7 lines. Wings expand 16 lines.

Larva undescribed.

Var. Secondaries with a reddish tinge towards the inner margin. Under surface of abdomen black, with one small yellow dot near base.

Hab.—Cobourg. (Mr. Bethune.)

A philyra !—Drury.

Male. Palpi black. Antennæ blackish brown. Head and thorax reddish flesh color, the latter with two small black spots in front, three larger on disk, and a short one on each side at base of primaries of the same hue.

Primaries black, with pale flesh-colored stripes ; one along the costa deflected at the apical third of the wing to the posterior angle ; a broader stripe beneath the median vein, furcate about the middle, and extended to the hind margin, where it is turned at an acute angle towards the costa. The lower branch is also extended to the hind margin, where it is again slightly furcate, and joins the deflected portion of the costal stripe near the posterior angle. Inner margin bordered with the same color.

Secondaries reddish flesh color, deeper in color towards base, with three black spots along the hind margin, and a patch of the same color extending from the anterior angle along the front margin to near the base.

Under surface with the same markings, but paler.

Abdomen reddish, with a black dorsal band above; below brownish-black. Anterior thighs edged with buff.

Length of body 5½ lines. Wings expand thirteen lines.

Larva undescribed.

Hab.—St. Thomas, seventeen miles from London. Rare.

A decorata!—Saunders. Described in Proc. Ent. Soc. Philada.—Vol. 2. No. 1.

Female. Tongue bright yellow. Palpi black. Antennæ black, slightly pectinate. Head black, with a tuft of yellow hairs between the antennæ. Thorax ochre yellow, with two small linear spots in front, and three larger ones on disk, one central, and one on each shoulder cover, and a small spot of the same hue on each side at base of primaries.

Primaries deep velvety black, with rich ochre-yellow stripes, one on costa terminating at the apical third of the wing; one broad central stripe along the median vein to within a third of the hind margin, slightly enlarged at the tip, where it is joined at an acute angle by a smaller stripe which terminates just under the extremity of the costal band. This central stripe is notched or obscurely furcate about the middle; the lower part of the notch extends a very short distance towards the hind margin, terminating in a point, and in a line with this further towards the posterior angle, are one or two very minute yellow dots. Inner margin with a border of the same color, gradually widening towards the base.

Secondaries bright red, widely bordered with dull black, excepting on the inner margin; a small red dot set in the black border not far from the apex. Ciliæ vary in color from ochre-yellow to dark brown.

Under surface paler with the same markings.

Abdomen deep black, with a patch of ochre-yellow or orange on each side at base, wide where it joins the thorax and narrow at its termination on the third segment. A yellowish dot on each side of fourth and fifth segments, and one on centre of back near tip. Under surface entirely black.

Length of body 6 lines. Wings expand 16 lines.

Larva undescribed.

Hab.—St. Catherines. Rare. (Mr. Beadle.)

A celia !—Saunders. Described in Proc. Ent. Soc. Philadelphia, Vol. 2. No. 1.

Male. Palpi black above, yellowish beneath. Head yellow, with black lateral stripes. Antennæ brown, pectinated. Thorax yellowish-white, deeper in color towards the head, with two short black stripes in front, and three longer and larger on disk, one central and one on each tegulæ.

Primaries brownish-black, with white stripes, a wide stripe having its origin at the base of the median vein, and from thence deflected towards the posterior angle, where it grows narrowly linear, from this two branches proceed: the first from about the centre of the wing extends in a straight line to the costa, the second obliquely towards the apex, terminating under the costal edge; a subterminal zigzag line forming a distinct W, crossed at the top by the oblique band.—Costa edged with yellowish to about the apical third of the wing.

Secondaries lightish-brown, with two irregular yellow spots about the middle of the wing, and a stripe of the same color extending from the base along the submedian vein, to within a third of the hind margin. Inner margin yellow. Ciliæ brown, intermixed with white.

Abdomen yellow, with a dorsal macular band black, and a row of black spots on each side; under surface whitish, with imperfect black bands. Legs black, spotted with yellow, and with tufts of yellow hairs at their base.

Length of body 6 lines. Wings expand 14 lines.

Larva undescribed.

Var. a. *Male.* Secondaries dark-brown, with the yellow spots somewhat smaller, inner margin brown. Legs edged with yellowish-white.

Var. b. *Male.* Antennæ light-brown. Head and thorax with a pinkish tinge. Secondaries with the central spots smaller than the type, and of a reddish color. Abdomen yellowish-red, with the central portion of under surface greyish-white.

Hab.—Toronto. The type from Mr. Bethune, Vars. a and b from Professor Croft.

Spilosoma.—Stephens.

Palpi more or less exceeding the clypeus, hairy beneath, first and second joints usually short, sometimes the joints nearly equal.—Wings white or fulvous with black dots, sometimes wanting. Abdomen with five or six rows of black dots, sometimes indistinct; one above, one below, and two on each side. Hind tibiæ with two pairs of spurs near the tip, sometimes minute.

Table of species :

A. Wings white.
- B. Wings with few dots .... *Virginica.*
- BB. Wings with many dots .... *acrea.*
- BBB. Wings without dots .... *collaris.*

AA. Wings fulvous.. *Isabella.*

S. Virginica!—Fabr.

Palpi black above, yellowish below. Antennæ white above, with black pectinations. Head and thorax white and very woolly.

Primaries white, with a black discal dot.

Secondaries white, with three black dots, one on disk, and the others towards the hind margin.

Under surface with the same markings; the dots on secondaries, especially the discal one, more distinct.

Abdomen deep yellow above, whitish beneath, with five rows of black spots, one dorsal, and two on each side. Anterior coxæ, and femora ochre-yellow, the latter with a black spot; tarsi annulated with black.

Length of body 6–7 lines. Wings expand 17–19 lines.

"The Larva varies much in color, often of a pale yellow or straw color, with a black line along each side of the body, and a transverse line of the same color between each of the segments, and it is covered with long pale yellow hairs. Others are of a brownish-yellow or foxy red. Head and ends of the feet ochre-yellow. Body below blackish." Will feed on almost any herbaceous plant.

Var. a. Wings wholly white.

Var. b. Wings wholly white above, below primaries with a small black dot above the disc; secondaries with three black dots.

Var. c. Primaries with one black dot, secondaries with two.

Var. d. Same as c, with an additional black spot on underside of primaries near base.

Var. e. Primaries with two black dots, secondaries with same number.

Var. f. Primaries with two black dots, secondaries with four black dots, primaries below with a dot at base.

Var. g. Primaries with three black dots, secondaries the same.

Var. h. Same as g, with the black basal dot on primaries below.

Var. i. Primaries wholly white, secondaries with three black dots.

Hab.—London, very common; Cobourg (Mr. Bethune); St. Catherines (Mr. Beadle); Hamilton (Mr. Reynolds); Toronto (Prof. Croft, Dr. Morris); Kingston (Mr. Rogers); Montreal (Mr. D'Urban.)

S. acrea !—Drury.

Female. Palpi black above, yellowish beneath. Antennæ black. Head and thorax white and woolly.

Primaries white, with many black dots, those along the costa largest.

Secondaries white, with from three to six black spots chiefly along the hind margin.

Wings below white, with fewer spots, veins tinged with yellowish.

Abdomen deep ochre-yellow above; apex and under surface white, with six rows of black spots, the dorsal row largest. Thighs and fore tibiæ ochre-yellow. Tarsi black, annulated with white.

In the *Male* the primaries are white, with a yellowish tinge; secondaries deep ochre-yellow; under surface of body and wings ochre-yellow.

Length of body 6-8 lines. Wings expand 18-23 lines.

"Larva white when young, nearly black when full grown; intermediate stage reddish brown; two yellow lines along the sides, and a transverse series of orange spots on each segment. From the back of each segment arises a tuft of blackish hairs." Feeds on almost every herbaceous plant.

Hab.—London, common; Cobourg (Mr. Bethune); Toronto (Dr. Morris, Prof. Croft); St. Catherines (Mr. Beadle); Hamilton (Mr. Reynolds); Kingston (Mr. Rogers); Montreal (Mr. D'Urban.)

S. collaris !—Fitch.

Palpi brownish-black above, yellow below. Antennæ whitish above, with brown pectinations. Head yellow. Thorax yellow in front, nearly white behind.

Primaries glossy white, semi-transparent; with the costal edge, sub-costal vein, and space between, yellow; paler towards apex.

Secondaries wholly white, semi-transparent.

Under surface same as upper, but paler, with the discal cell on primaries partly dusky.

Abdomen rather slender, whitish annulated with yellow, with a dorsal and double lateral rows of black dots. Anterior femora pale yellow; feet rather long and slender, brownish. Hind tibiæ with the two pairs of spurs long.

Length of body 5 lines. Wings expand 14 lines.

Larva undescribed.

Hab.— London, rare; Mississippi.

S. Isabella !—Abb. and Sm.

Palpi brown, short, and hairy. Antennæ filiform whitish above, brownish-yellow below. Thorax yellowish-brown, anterior portion darker.

Primaries fulvous or brownish-ochreous, sometimes tinged with red; with a discal spot, and an indistinct sub-terminal line of spots along the outer margin, black.

Secondaries yellowish-ochreous with a roseate tinge, semi-transparent; with two black discal spots, and several more of the same hue along the hinder margin.

Under surface of primaries rosy, margined with ochre-yellow, and with a short black stripe on sub-median vein near base; secondaries similar in color to the upper surface, with discal spots on both larger and deeper in color.

Abdomen ochre-yellow, with a reddish tinge, and three rows of black spots. Anterior thighs crimson in front; legs black.

Length of body 7–8 lines. Wings expand 14–16 lines.

Larva. Head black and shining; body brownish-black, with irregular transverse rows of tubercles, from which arise tufts of stiff hairs, which are dull yellowish-red along the middle of the body and black towards each end. Under side lighter in color than upper. This larva, which is one of our commonest species, completes its growth in the autumn, and hybernates through the winter. In spring they usually feed for a few days before going into chrysalis; they will eat almost any herbaceous plant. Length, about one and a half inches.

Var. a. Primaries deeper in color both above and below, crossed above by three wavy bands of dusky black; underside with an additional black line on disk.

Var. b. Primaries like the type; secondaries whitish-yellow.

Var. c. Markings on primaries very indistinct; secondaries immaculate.

The perfect moth appears from late in May to the middle of June.

Hab.—London, very common; Cobourg (Mr. Bethune); Toronto (Prof. Croft, Dr. Morris); St. Catherines (Mr. Beadle); Hamilton (Mr. Reynolds); Kingston (Mr. Rogers); Montreal (Mr. D'Urban.)

Hyphantria.—Harris.

Palpi hairy beneath, *scarcely extended beyond the clypeus.* Second joint very short, terminal joint nearly rudimental. Wings white, sometimes spotted with black. Abdomen with rows of black dots. Hind tibiæ with *one pair* of small apical spurs.

Table of species:

A. Wings white, without spots ....*textor.*

AA. Wings white spotted ....

B. Primaries with many black spots ....*cunea.*

BB. Primaries with one black dot ....*punctata.*

**H. textor.*—Harris.

"Palpi blackish. Antennæ blackish-brown.

"Wings pure white, without spots.

"Fore femurs tawny yellow, without spots.

"Larva greenish, dotted with black; a broad blackish stripe along the top of the back, and a bright yellow stripe on each side. The warts from which the thin bundles of hairs proceed, are black on the back, and rust yellow or orange on the sides. Head and feet black. They spin large webs, and live in communities."

Hab.—Mass.; Penn.; Georgia.

**H. cunea.*—Drury. Figured in Drury I, pl. 18; Sm. Abb., pl. 70.

"Antennæ blackish brown. Thorax ash color, usually unspotted, sometimes with a few black spots.

"Primaries white, with highly variable markings, usually with numerous black spots; external margin with five spots; those nearest the tip triangular; sometimes the spots fewer.

"Secondaries without spots, sometimes with a dark spot near the external edge, and faintly marked near the external angle.

"Abdomen white, with three rows of minute black spots, frequently inconspicuous. The fore coxæ and femora luteous; tarsi blackish.

"Length of body 5-6 lines. Wings expand 13-18 lines."

Larva undescribed.

Hab.—Mass.; Penn.; Georgia.

***_H? (Spilosoma) punctata._**—Fitch. Fitch's Third Report, p. 265.

"Primaries white, with a black central dot, and in the males a row of small blackish spots, extending from the middle of the inner margin to the tip.

"Secondaries white.

"Thighs and hips yellow in front; a continuous black stripe on fore side of anterior feet and shanks."

Larva undescribed.

Hab.—New York.

Euchætes.—Harris.

Wings bluish-gray, without spots. Abdomen smooth, spotted. Hind tibiæ with two pairs of spurs.

***_E. Egle._**—Drury. Figured in Drury II., pl. 20. Larva figured in Harris' Insects, new edition, fig. 172.

"Head gray; occiput with a narrow luteous line. Thorax gray.

"Wings rather long, thin, and delicate, of a bluish-gray color, paler on the front edge, and without spots.

"Abdomen above dark yellow, with a dorsal and lateral row of black spots; beneath whitish or gray. Fore coxæ woolly, and touched at the sides with luteous."

Wings expand 17-20 lines

"Larva black, with a whitish line on each side, and thickly covered with short tufts of hairs, proceeding from little warts. Along the top of the back is a row of short black tufts, and on each side, from the fifth to the tenth ring inclusive, are alternate tufts of orange and yellow hairs, curving upwards so as nearly to conceal the black tufts between them; below these, along the sides of the body, is a row of horizontal black tufts. On the first and second rings are four long pencil-like black tufts, extending over the head; on each side of the third ring is a similar black pencil, and two which are white placed in the same manner on the sides of the fourth and tenth segments. These larvæ are gregarious; they feed on milkweed (*Asclepia Syriaca*). They are full grown about the month of September, when they leave off feeding, disperse, conceal themselves, and make their cocoons, which mostly consists of hairs. The chrysalis is short, almost egg-shaped, blunt, and rounded off at the hind end, and is covered with small punctures.

"The perfect moth appears between the middle of June and the beginning of July."

Hab.—Mass.; New York.

Halesidota.—Hubner. *Lophocampa.*—Harris.

Palpi stout, porrect, not long; third joint conical, very minute. Primaries long and narrow. Body stout; abdomen smooth, extending beyond the secondaries. Legs stout, smooth; hind tibiæ with four spurs, moderately long.

Table of species:

A. Primaries semi-transparent..............................*tesselaris.*

AA. " densely clothed with scales................

B. Primaries with transverse rows of silvery white spots.................................*caryæ.*

BB. Primaries with yellow spots...................*maculata.*

BBB. " with whitish tawny bordered spots *fulvo flava.*

H. tesselaris!—Sm. Abb. Figured in Sm. Abb, pl. 75.

Palpi deep yellow, tipped with black. Antennæ brownish-yellow. Head and thorax whitish-yellow; inner edges of shoulder-covers fringed with bluish-green, with the space between the fringes bright yellow.

Primaries semi-transparent, whitish, tinged with ochre-yellow, with five irregular transverse dusky bands, edged on each side with delicate blackish lines.

Secondaries paler than the primaries and more transparent.

Abdomen ochre-yellow above, paler below. Feet ochre-yellow, spotted with black.

Length of body 5–6 lines. Wings expand 19–20 lines.

Larva: "Head brownish-yellow. Body yellowish-white, with dusky tubercles, from which spring tufts of light yellow or straw-colored hairs, those along the crest being a very little darker: on the second and third segments are two orange colored pencils, which are stretched over the head when at rest, and before these are several long tufts of white hairs. On each side of the third segment is a white pencil, and there are two pencils of the same color on the eleventh segment directed backwards. They are gregarious, and feed upon the buttonwood or sycamore tree, upon which they may be found in July and August. In August or September they leave the trees and secrete themselves under logs, stones, &c., and construct their cocoons, which are oval, thin, and hairy."

Hab.—London, not common; Port Stanley (Mr. Edwards); Montreal (Mr. D'Urban.)

H. caryæ!—Harris. Figured in Harris' Insects, Mass., new edition, fig. 175. H. annulifascia.—Walker. C. B. M., 374.

Palpi dusky yellow, with a minute black dot at the tips. Antennæ deep brownish-yellow. Head and thorax pale ochre-yellow. Shoulder covers edged internally with pale brown.

Primaries pale ochre-yellow, thickly covered with minute brownish dots; two oblique brownish streaks passing backwards from the costa, the inner one most distinct, and three or four irregular transverse rows of silvery white spots, edged with brown; veins brown.

Secondaries paler, semitransparent, and without spots.

Under surface paler than upper; primaries with the same markings, more distinct towards the apex.

Abdomen bright ochre-yellow above; under surface paler, with three longitudinal rows of light brown spots; legs brownish-yellow.

Length of body 6–7 lines. Wings expand 19–21 lines.

Larvæ: "Length one and a-half inches. White, sprinkled with black dots, and covered with short spreading tufts of white hairs, with a row of eight black tufts on the back, and two long, slender black pencils on the fourth and on the tenth segments. The tufts along the top of the back converge on each side so as to form a kind of ridge or crest; and the warts from which these tufts proceed are oblong, oval, and transverse, while the other warts on the body are round. The hairs on the fore part of the body are much longer than the rest and hang over the head; the others are short as if sheared off, and spreading. The head, feet, and under surface are black, and the spaces between the segments have transverse black lines. They feed on hickory, ash, and elm trees; are full grown in September, when they secrete themselves and make their cocoons, which resemble those of the last species."

The perfect insect appears late in May or early in June.

Var. Primaries much darker in color, giving a greater prominence to the silvery white spots; under surface also darker, with markings more distinct.

Hab.—London, common; Toronto (Mr. Bethune); Prescott (Mr. B. Billings); Montreal (Mr. D'Urban).

H. maculata !—Harris. Ins. Mass., p. 259.

Palpi yellow. Antennæ brownish-yellow. Head and thorax deep ochre-yellow.

Primaries yellowish-brown, paler towards the hind margin; with three or four very irregular transverse bands of pale yellow spots, which are largest along the costa, at base, and along the inner margin.

Secondaries whitish, semitransparent, and without spots.

Under surface paler with the markings much less distinct.

Abdomen tawny-yellow above, somewhat paler below with a few brownish dots along the sides. Legs yellow; tarsi tipped with black.

Length of body 7 lines. Wings expand 16 lines.

The larva, as described by Harris from a shrivelled specimen, "is covered with whitish tufts forming a crest on the back, in which are placed eight black tufts; a black pencil on each side of fourth and tenth segments, and a quantity of long white hairs overhanging the head, and the hinder extremity. Head black."

Hab.—London, not common; Cobourg (Mr. Bethune); Kingston (Mr. Rogers).

**H. fulvo flava.*—Walker. C. B. M., 733.

"Proboscis tawny. Thorax with two tawny stripes which converge hindwards, and with two tawny spots in front between the stripes.

"Primaries yellow with a tawny spot at the base, with two oblique tawny bands, with darker borders; these bands are partly connected; and the inner one is especially irregular and ramose, being forked in front, and dilated in the disk, towards the base, and emitting a branch to each border.

"Secondaries whitish with a slight testaceous tinge.

"Femora and tibiæ hairy; fore femora and fore tibiæ tawny above.

"Length of body 6–7 lines. Wings expand 16–18 lines."

Var. "Primaries tawny with yellow spots at the base, at the tips, along the costa, and forming an oblique band beyond the middle."

Hab.—North America.

It is probable that this species is identical with "*maculata.*"

Ecpantheria. *Walker.*

Proboscis moderately long. Palpi very short, not extending beyond the clypeus. Antennæ of *Male* serrated, of *Female* simple. Wings moderately broad. Primaries much longer than secondaries. Body stout. Abdomen extending beyond the hind wings. Legs stout; hind tibiæ with two minute apical spurs.

E. scribonia!—Stoll. *Macularia,* Fab. cram. *Oculatissima,* Sm. and Abb. *Chryseis,* Godart. Figured in Sm. Abb., pl. 69, Nat. Lib. vol. 37.

Palpi dark brown above, whitish below. Antennæ black above, lighter below. Head white, with a wide blue-black band across the front. Thorax white with ten or twelve black rings centred with bluish-white.

Primaries white with numerous dark brown rings and spots, arranged in five or six illy defined transverse bands.

Secondaries white with few spots, chiefly along the hind margin; inner margin very hairy with a blackish stripe.

Under surface somewhat paler than upper with the markings distinct.

Abdomen bluish-black with a metallic gloss; a dorsal row of orange spots and a macular band of the same color along each side; also somewhat banded between the segments with orange; under surface whitish, with three rows of black spots. Legs white spotted with black; anterior thighs blue-black in front.

Length of body 8–10 lines. Wings expand 24–30 lines.

Larva: Length two and a half inches. Head bilobed, black and shining; reddish at the sides. Body black; each segment with a transverse row of elevated tubercles from which spring tufts of rigid, black, shining hairs. Sides brownish-black near under surface with tufts of hair of same color. The spaces between each segment from fourth to tenth inclusive are banded with red, bands wider and more conspicuous from sixth to ninth. Color of under side varies from reddish to yellowish-brown ; feet reddish ; legs brown, thickly clothed with short hairs.

These larva attain their full growth in the autumn, when they may be found feeding on the wild sunflower, and hybernate through the winter under logs, the loose bark of decaying trees, &c. When aroused from their torpor by the warmth of spring, they feed a little on almost any green thing they meet with, before going into chrysalis They will feed readily on grass. They enter the chrysalis state about the last of April or beginning of May, and the perfect insect is evolved early in June.

Var. Thorax with bluish-black spots instead of rings; abdomen tipped with white; dorsal row of orange spots wanting.

Hab.—London, not common ; St. Catherines (Mr. Beadle) ; Port Stanley (Mr. Edwards).

Phragmatobia. Stephens.

Palpi short, scarcely distinct, very pilose. Antennæ short; of the *Male* serrate, of the *Female* simple. Head and thorax with long hairs. Wings semitransparent. Body stout. Abdomen maculate. Anterior tibiæ unarmed ; posterior tibiæ with four spurs.

Table of species :

A. Primaries red, with brown markings.............. *assimilans.*
AA. " brown .... *rubricosa.*

*P. assimilians.—Walker. C. B. M., 630.

"*Male*. Red. Antennæ testaceous. Thorax with brown hairs.

"Wings red ; veins darker. Primaries slightly brown along the costa, and elsewhere indistinctly sprinkled with pale brown, with two blackish dots.

"Secondaries brighter red, with three black dots, two on the disk, and one near the hind border towards the inner angle.

Length of body 6 lines. Wings expand 16 lines."

Var. " Primaries almost wholly brown. Secondaries with a broad blackish submarginal stripe."

Larva undescribed.

Hab.—United States.

P. rubricosa !—Harris. Arctia rubricosa, Harris' Insects; new edition.

Antennæ whitish. Palpi, head and thorax dark reddish-brown.

Primaries dull reddish-brown, with the discal cell terminated by a blackish line, enlarged into a dot at each end.

Secondaries paler in color than primaries, with a rosy tint becoming blacker behind. Inner margin and fringe of hind margin red.

Under surface of both primaries and secondaries reddish excepting along the hind margins. The lines which, on the upper surface, unite the dots on discal nervure, wanting.

Abdomen red, with dorsal and lateral rows of black spots; under surface dull reddish-brown. Fore femora bright red.

Length of body 4–5 lines. Wings expand 11–12 lines.

The larva has been reared by D. W. Beadle, Esq., of St Catherines, who has kindly furnished me with the following notes: "They were found in the fall, feeding on a young ash tree, near St. Catherines; they spun a web over nearly the whole of the tree before they had done feeding, spinning as they fed, so as to keep themselves covered. The web is not so dense as that of Clisiocampa Americana.—The larvæ were of a dingy smoke color, deepening into a dark brown. Hairs not stout and bristle like, as in '*S. Isabella,*' but finer and softer, like '*virginica.*' The perfect insect did not appear until the following spring."

Var. Secondaries reddish pink; hind margin widely bordered with dull blackish.

This species closely resembles the European "*fuliginosa,*" and has usually been regarded as identical with it; Harris, however, held a different view, and named it rubricosa. The habits of the larvæ appear to be different, and there are slight differences also in the markings on the wings. In "*fuliginosa,*" the black dots on wings are more prominent, and the red on secondaries much deeper and brighter in color. In "*rubricosa*" the secondaries are margined behind throughout with black, whereas in fuliginosa the red color of the ciliæ encroaches upon the wing, especially towards the apex; and the black is somewhat broken towards the anal angle into irregular spots; in the latter also the primaries are somewhat less transparent, and the dorsal spots on abdomen coalesce forming a macular band.

Hab.—St. Catharines, (Mr. Beadle). Hamilton, (Mr. Reynolds), Matan. Gulf of the St. Lawrence, (Mr. Bell). St. Martin's Falls, Hudson's Bay Territory, (Dr. Barnston.)

Deiopeia Curt.

Body slender. Head small. Eyes prominent. Antennæ simple in each sex; rather short and slightly pilose beneath in the males.— Palpi curved, ascending nearly to the middle of the face, basal joint tumid, middle joint long, terminal joint short, ovate. Tongue about equal to the thorax beneath. Legs moderate, tibiæ very short, hind tibiæ with four spurs at the apex. Flight diurnal.

D. bella !—Linn.

Palpi yellowish-white, tipped with black. Antennæ black. Head whitish, with four black spots. Thorax white, with about twelve black spots; and a patch of ochre-yellow on each side, at base of primaries.

Primaries orange-yellow, with from five to seven irregular transverse whitish bands, spotted in the middle with black, the last one furcate from about the middle towards the costa; hind margin with a row of black spots.

Secondaries bright red, sometimes paler; with the hind margin bordered with a black-white edged indented band, which is furcate at the apex of the wing.

Under surface very bright red; primaries with the costal margin yellow; three elongated black spots extending from the costa inwards; a subterminal imperfect black band and a row of spots on the hind margin. Secondaries with the same markings as above, with two white bordered black spots on the costal margin.

Abdomen greyish-white, with two rows of black spots on the under side. Legs whitish, spotted with black.

Length of body 6 lines. Wings expand 13 lines.

Larva undescribed.

Var. Primaries with the white stripes from the base to beyond the middle intersecting the orange bands, dividing them into two or three portions.

Hab —London. Rare. St. Catherines, (Mr. Beadle). Keswick, Lake Simcoe, both type and var., (Mr. Bethune.) Port Stanley, (Mr. Edwards.)

Hypercompa Hubn. Callimorpha Latr.

Palpi somewhat exceeding the clypeus, pilose towards the base, the middle and basal joints nearly equal, terminal joint short and ovate. Tongue about the length of the thorax beneath. Eyes large and prominent. Antennæ simple in both sexes, ciliated with two strong seta at each joint. Thorax smooth. Body slender. Secondaries broader than primaries. Legs rather slender, anterior tibiæ much shorter than the femora; hind tibiæ with four moderate spurs. Flight diurnal.

Table of species:

A.	Secondaries white.	
B.	Primaries white with a transverse dark brown band beyond the middle.	*contigua.*
BB.	" " with the costal edge yellow orange ..	*fulvicosta.*
BBB.	" " with a brown band from the inner margin to the tip	*militaris.*
C.	Primaries brown with white spots ..	*Lecontei.*
CC.	" " with an oblique subapical white band	*confinis.*
AA.	Secondaries yellow.	
D.	Primaries dark brown, with whitish spots; secondaries pale yellow	*clymene.*
DD.	" pale buff, bordered with brownish-black; secondaries, deep yellow	*interrupto-marginata.*

H. contigua !—Walker. C. B. M., 650.

Palpi orange-yellow, tipped with black. Antennæ brownish-black, somewhat lighter below. Head and front edge ot thorax deep yellow. Thorax brownish-black, with the sides and shoulder covers white.

Primaries white with blackish-brown stripes; one along the costa to near the tip; one on the inner margin, joined at its extremity with an oblique transverse band, extending to the costa; from the centre of this latter a stripe extends to the hind margin, somewhat enlarged at its termination, where it is centered with white. Hind margin partially edged with brownish-black.

Secondaries white, immaculate.

Abdomen white, with a blackish dorsal stripe extending nearly to the tip. Fore femora yellow; legs whitish, fore and middle pairs edged anteriorly with black.

Length of body 6–7 lines. Wings expand 17–18 lines.

Larva undescribed.

Var. Secondaries with two or three brownish spots near the anal angle.

Hab.—London, not common; Grafton, Co. Northumberland (Mr. Bethune); United States.

**H. fulvicosta*.—Clemens. Clemens Contributions to Amer. Lepidopterology. Proc. Acad. Nat. Sci.

"Palpi yellow-orange, tips blackish. Head and prothorax yellow-orange. Thorax white.

Primaries white with the costal edge, especially beneath, yellow-orange, sometimes brownish.

Secondaries white.

Abdomen white, tipped with yellowish. Breast and legs yellow-orange, the middle and fore tibiæ and tarsi blackish."

Larva undescribed.

Hab.—Illinois.

**H. militaris*.—Harris. Figured in Harris' Insects, new edition, fig. 165.

"Head and collar buff-yellow. Thorax and abdomen with a dorsal brown stripe.

Primaries almost entirely bordered with brown, with an oblique band of the same color from the inner margin to the tip; and the brown border on the front margin has two short irregular projections extending backwards on the surface of the wing.

Secondaries white without spots.

Thighs buff-yellow.

Wings expand 18–20 lines."

Larva undescribed.

Hab.—Massachusetts.

H. Lecontei!—Boisd. (C. militaris? Var. Lecontei.)

Palpi deep orange-yellow, tipped with black. Antennæ black. Head orange-yellow. Thorax whitish with a wide central brown stripe.

Primaries vary in color from very light to dark brown, with from four to six large irregular white spots and two or three smaller ones.

Secondaries white, sometimes with one or two brown or blackish dots towards the anal angle.

Under surface of primaries with the costal edge, and brown markings towards the apex orange-yellow.

Abdomen yellowish-white tipped with yellow. Legs ochre-yellow, striped and spotted with black.

Length of body 6–7 lines. Wings expand 16–17 lines.

Larva undescribed.

Hab.—London, common; St. Catherines (Mr. Beadle); West Flamboro' (Mr. Bethune); Port Stanley (Mr. Edwards.)

This moth, which is usually regarded as a variety of the preceding species, has been described separately under Boisduval's name "Lecontei" for the following reason: That while this so-called variety is common in many localities throughout the Province, I have never yet met with a single specimen at all approaching the description and figure given of "*militaris*" in "Harris' Insects;" a fact exceedingly remarkable if the former is merely a variety of the latter.

**H. confinis.*—Walker. C. B. M., 661.

"Proboscis tawny. Palpi with black tips. Antennæ black. Head, prothorax, fore coxæ, and abdomen at the base luteous. Thorax and abdomen white with a brown stripe.

Primaries brown, with a discal slightly angular white stripe, and an elongate, triangular, oblique, subapical white band.

Secondaries white.

Length of body 6 lines. Wings expand 18 lines."

Larva undescribed.

Hab.—United States.

H. clymene!—Esper. Colona Hubner.

Palpi ochre-yellow tipped with brown. Antennæ brownish-black. Head and prothorax orange-yellow. Thorax yellowish-white with two small spots in front, and a wide central band black.

Primaries brownish-black, with four or five large white or yellowi sh-white spots, and one or two small ones.

Secondaries light yellow with a brown spot near the anal angle.

Under surface of primaries with markings as above but much paler and overcast with yellow. Secondaries deeper in color than above.

Abdomen pale yellow with the tip of a deeper color, and a dorsal line of black. Legs yellow, the fore and middle pairs edged with black.

Length of body 6 lines. Wings expand 17–18.

Larva undescribed.

Hab.—Near West Flamboro'. Captured at midday in August. (Mr. Bethune.)

H. interrupto-marginata!—Beauv. Carolina, Harris. C. comma, Walker, C. B. M., 652. Bornlix interrupto-marginata. De Beauvois, Ins. Afriq. et Amer., p. 265, pl. 24.

Palpi deep ochre-yellow with black tips. Antennæ brown. Head pale orange-yellow. Thorax yellowish or pale buff, with a wide central black stripe, and a black spot on each side at base of primaries.

Primaries pale buff, with a black stripe along the costa not reaching the apex; a broad stripe of the same color along the inner margin, widening near the tip and sending from near the inner angle towards the hind end of the disk a hooked demi-band; hind margin with an incomplete black band, widest in the middle.

Secondaries bright orange-yellow with a black spot not far from the anal angle.

Under surface deep yellow througbout, with the markings on primaries excepting the demi-band scarcely perceptible.

Abdomen orange-yellow, with a dorsal band black. Legs deep yellow; the fore and middle pairs edged anteriorly with black.

Length of body 6–8 lines. Wings expand 16–20 lines.

Larva undescribed.

Hab.—London, rare; St. Catherines (Mr. Beadle); Port Stanley (Mr. Edwards); Wisconsin, and Virginia.

REVIEWS.

The Geological Evidences of the Antiquity of Man, with Remarks on Theories of Species by Variation. By Sir Charles Lyell, F.R.S. London: John Murray, 1863.

There are certain questions and debatable points of inquiry, belonging to the domain of Science, which awaken, from their very nature, an almost equal amount of interest on the part of the general public, and on that also of the anti-scientific world—using this latter term, in default of a better, to designate a class, at one time numerous, though now reduced in parliamentary phrase, to a small but active minority, which regards (without actually confessing it) the revelations of Natural Science as directly or indirectly antagonistic to the authority of Biblical acceptations. Amongst these questions, the date of Man's origin occupies a prominent place. The usual belief fixes the creation of Human Life at about six thousand years before the present era; but theologians differ amongst themselves with regard to the precise date. The gathered records of Geology have long been tending towards another conclusion: one that attributes to our race a far higher or more remote antiquity; and the principal aim of Sir Charles Lyell's book is to present a clear and forcible exposition of this view, based on the results of recent discovery and research. The book, however, has, apparently, a two-fold aim: one to maintain the high antiquity of Man; and the other, to make this antiquity subservient to the support of the so-called Darwinian theory with regard to Man's origin. Postponing, for the present, the discussion of this latter view, let us briefly examine the more important facts, thus brought together, in support of the assumed presence of Man upon the earth at a period incalculably remote as compared with the known points of human history. In order to exhibit these facts to the general reader, in their true bearings on the question under review, it will be necessary to carry our retrospective glance still farther into the depths of Time, and to trace up the course of geological history, from the remote epochs which preceded the dawn of life, to the period of Man's advent, when the geology of the Past blends with and gradually merges into the geology of the Present.

Speculation, supported by many facts that point in the same direction, pictures the primary condition of the earth—equally with that of other cosmical bodies—as one of nebulosity, gradually condensing towards the solid state, and eventually passing into this, as regards the surface of the earth-mass. Although the rock-matters resulting from the first consolidation, must long have disappeared, or have lost altogether their original characters, a period would finally arrive when a certain degree of stability—or rather a more equal balance between destructive and formative forces—would be approached. This would arise, when by the continued radiation of heat into space, the earth's crust became sufficiently thick to admit of the condensation of water upon its surface. Then a new set of phenomena would appear. The exposed rock-surfaces would be slowly worn down by aqueous and atmospheric agencies, and the materials, thus obtained, would form over the sea-bed a gradually increasing thickness of stratified deposits. Many of these rocks, though mostly in an altered or metamorphic condition, have been preserved to us. They contain no vestiges of organic forms, vegetable or animal. Life, as yet, held no place upon the earth; and as these strata, even as now seen, present a thickness of many thousands of feet, it is evident that this first or Azoic period of the Earth's history was one of almost immeasurable length.

The busy agents of Decay and Renovation, these old but yet unreconciled antagonists that have made Nature their battle-field from all time, still continued their active and unceasing strife. The older rock-masses furnished the sediments for the formation of newer strata; but in these latter, we find the records of a wonderful change, witnessed by the Earth at the close of its azoic day. To the strange mystery of the Earth's presence, the still stranger mystery of *Life* had now been added. The organic remains enclosed within these earliest fossiliferous rocks, are of comparatively low types. Fucoids, brachiopods, trilobites, constitute the more characteristic forms: the vertebrated life-structure is entirely absent. A little higher in the series, a little later in the course of time, plants of terrestial growth, fishes, and obscure reptilian types, make their appearance, together with powerful tetrabranchiate cephalopods and other forms of an extinct or rare organization, as compared with the life-forms of existing seas. Strata still succeed strata, as newer sediments are spread along shore-lines, in bays, and over the sea-bed. Many of the earlier types, or those enclosed in the lower rocks—graptolites, trilobites, and others—die out, not gradually as it were, as though the organic pattern were changed by gradual modification, but abruptly, at fixed stages in the rock series, before the close even of this first life-period, the great Palæozoic Age. To this, and some related points, we shall have occasion to allude again, in the sequel. At present, we may observe, that, with the exception of a few reptiles of comparatively low station, fishes appear to have been the most highly organized vertebrates or leading forms of palæozoic development. These fishes, even those with bony skeleton, had, throughout, unequally-lobed tail-fins; and their scales (when present) were of a solid osseous character: a peculiarity of structure now all but unknown.

A third epoch of the Earth's history, the second of its great life-periods, is characterized by a remarkable development of reptilian forms of varied and high organization. Some of these belong to marine, natatory types: frequenters of the open ocean: representatives, not in structure, but in character, of the great predatory sharks of modern seas. Another presents a winged, bat-like structure, and its species are amongst the most curious of extinct forms; whilst carnivorous and herbivorous mammals, as now existing, were represented in their functions by other reptilian types of this Mesozoic Age. Combined with these, and equally characteristic of the period, are numerous Ammonites, and other related cephalopods with foliated or highly complicated shell-partitions. All of these, and other peculiar types—reptilian, molluscous, &c.—became extinct with the closing of the geological age in which they had their being. But in addition to these modifications, foreshadowing, as it were, the advent of a higher time, a few rare and more or less obscure indications of mammalia occur amongst the organic remains preserved in Mesozoic rocks. The best known appear to present characters most nearly allied to marsupial or didelphian mammals, the lower of the two great parallel series into which the mammalian class admits of being sub-divided. In this age also, a remarkable change occurs in the representatives of fish-life. Homocercal forms appear; and a little later, the rapidly diminishing ganoids are all but replaced by teleosteans of modern type.*

Then another scene appears, and the new geological period heralds the dawn of that condition of Nature which we now see around us.—Reptiles form no longer the great leading types of the animal world. The strange creations of the Mesozoic day have all disappeared, and the Earth is now abundantly tenanted by representatives of a higher class, typifying all existing orders of Mammalia save that to which

* It may be observed, for the information of the general reader, that amongst the few remaining ganoids now in existence, the *Lepidosteus* or 'gar pike' of the lakes and rivers of North America, is one of the most characteristic examples. Specimens, easily distinguished from other fishes by their enamelled and rhombic scales, may be seen in any museum.

Man alone belongs. Many of these forms, not only as species, but as genera, are quite extinct: but none appear to have belonged to absolutely extinct orders. In its vegetation also, the Earth of the Cainozoic Age presents much that is common, in its general features, with the arborescent vegetation of existing Nature. A general similarity indeed, between that period and our own, is visible throughout all the sub-divisions of the organic world; but the physical and climatical relations of the earlier time differed in many marked respects from those which now prevail. Up to a comparatively late interval, the Cainozoic earth appears to have possessed a more or less uniform and warm climate, without those broad distinctions, derived from geographical position, which are now experienced. This view is amply sustained by fossil evidence. In the comparatively high latitude of England and Northern Europe generally, not only do we find the shells of *conulariæ*, *nautili*, and similar warm-sea mollusca; but the Cainozoic rocks of these districts contain also palm-fruits, together with the remains of large ophidians and skeletons of mammals allied to the modern tapir, hippopotamus, giraffe, and other forms—including even the quadrumanous type—now limited, or nearly so, to intertropical habitation. As time passed on, however, a great climatic change crept slowly over all the northern lands of both the eastern and western continents, and was apparently experienced also, in the extreme southern regions of the latter. Under its influence, the once warm climate gave gradually place to all the rigors of an Arctic winter.—This remarkable change was evidently accompanied, and perhaps in chief part produced, by enormous alterations in the previously-existing levels of land and sea. A general elevation of northern districts, and a corresponding depression (with subsequent elevation) of the adjacent and more southward-lying country, must have taken place at one epoch of this period of cold, during which, the drift and boulder deposits, with their accompanying glacial phenomena, were slowly elaborated. All the high lands were covered by broadly-extended glaciers; and the seas were filled with floating icebergs, bearing southwards the gneissoid and other boulders of the north. This condition of things probably continued throughout a long interval of time.—During its continuance, nearly all the animal and vegetable species of the preceding epoch became extinct, but some few survived its changes. Between its close, and the commencement of the present state of things no strict line of demarcation can be drawn. The one merged slowly into the other: the glacial manifestations being gradually beaten back, as it were, to within their present arctic and alpine boundaries.

Above the clay, gravel, and boulder deposits accumulated during this interval of cold, lie various other beds of clay, loam, sand, and gravel, accompanied locally by bog-iron-ores, calcareous tufa, peat, and sundry related matters of comparatively modern origin—many of these beds, indeed, being still under process of formation. Great changes of level have been continually going on during the accumulation of these different materials; and portions of the original sea-bed have been raised high above the water-line, at various localities. Gravel deposits containing marine shells of existing species occur, for example, at considerable heights on the coasts of Norway and Sweden, in Eastern Canada, Maine, and numerous other places. On the south coast of the Island of Sardinia, an ancient sea-bed, containing shells of the modern oyster and mussel, with fragments of pottery and other wrought objects, occurs at a height of between two and three hundred feet above the present sea-level These deposits in many places, moreover, exhibit in themselves a thickness of over a hundred or even two hundred feet. It is evident, therefore, that although recent in a geological sense, many ages must have rolled away since the commencement of their accumulation. Sir Charles Lyell, in the work before us, basing his calculation on the known rate of uprise of the Scandinavian coast, computes a period of at least 12,000 years for the elevation alone of the Sardinian sea-beach; and the unknown interval before the commencement of the upward movement, and that which has elapsed since its close, must be added to this, in attempting to fix the date of the imbedded pottery. Based on a similar calculation, the shell-beds of the Norwegian coast are assumed to have occupied in their upward passage from their original place of deposition, an interval of no less than 24,000 years. And yet these are amongst the latest geological records of the Earth's history: even subsequent in some instances, as proved by the Sardinian pottery, to the actual appearance of Man.

The shells of marine and fresh-water mollusca, enclosed in these recent geological deposits, belong, as already stated, to existing species, although some are no longer met with in the localities at which the deposits in question occur. The mammalian remains preserved in these accumulations are likewise referrible in great part to existing forms; but some are altogether extinct. The more remarkable of the latter, in the eastern continent, comprise: the *mammoth* and some other species of the elephant, the *Rhinoceros tichorinus, Hippopotamus major, Equus fossilis, Cave-Lion* (*Felis spelæa*), *Cave-Hyena* (*Hyena spelœa*), *Cavern-Bear* (*Ursus spelœus*), *Irish Elk*, &c.; and on this continent, the *mammoth, mastodon, megatherium, mylodon, megalonyx, glyptodon*, and others. In some parts of Europe, more especially in the valleys of the Somme and Oise in north-western France, and in parts of Suffolk, Bedford, Essex, Kent, and Surrey, in England, remains of these extinct elephantine and other species have been discovered in gravel, or similar deposits, associated with knife-blades and other flint implements of rude form. This of itself would not absolutely prove the contemporaneity of the extinct mammals, and Man; but the flint weapons in many cases lie deeper in the earth than some of the animal bones; and these latter are occasionally seen to have been cut (when in a fresh state) by instruments of a comparatively rude construction. The weight of evidence, therefore, is strongly in favour of the view, that Man was actually a denizen of the earth long before the mammoth and its congeners became extinct. A link, and that an important one, in this train of evidence, it is true, is yet wanting. No human bones have hitherto been discovered with these flint implements and extinct remains in the gravel deposits of the above localities.* Several causes have been assigned to account for this apparent discrepancy, but none are of a very satisfactory character. Nevertheless, under other, though at the same time closely related conditions, human remains have been met with somewhat abundantly in intimate association with the bones of extinct mammals. This occurs, for example, in numerous caverns, in which the organic matters have been preserved from final decomposition by a protecting layer of stalagmite. But here, again, it might be urged that the bones, with which these caverns are filled, are not of contemporaneous origin. In some instances this is undoubtedly the fact. The caverns often formed the lairs of wild animals, the bones of which, with those of their prey, are imbedded in the stalagmitic matters of the floor. But in many localities the human bones are so mixed with those of *felidæ* and other animals, as to leave but little doubt of the contemporaneous origin of the whole. If an accidental tooth of the mammoth, a solitary skull of the cavern bear, or scattered bones, only, of the cave-hyena or lion, were mingled with the human relics, we might

* Since the above was written, the discovery of a human jaw-bone in the gravel pit of Moulin-Quignon, near Abbeville, has been announced: but the assumed antiquity of this bone is exceedingly doubtful.

conceive the former to have been swept into these receptacles by floods acting on loosely-consolidated sediments in which the animal remains were previously contained; but these remains are far too abundant to admit of such a conclusion. The question, moreover, has to a great extent been set at rest, by some comparatively recent discoveries in the south of France, made known, during the course of last year, by M. Lartet. Near Aurignac, in the department of the Haute Garonne, a small cavern occurs on the sloping side of a hill, in which many human and extinct animal remains, mixed with some of existing species, were discovered in a remarkable state of preservation. The mouth of the cavern was concealed beneath a talus of detrital matter, washed down from the top of the hill; and on this being removed, a large slab of rock was found to have been placed vertically before it so as to defend the entrance. It was clear, consequently, that the cavern had been filled by human agency; and further explorations shewed it to have been a place of sepulture. The human bones are thought to have belonged to no less than seventeen individuals of different ages and of both sexes. A great number of flint knives, pieces of perforated shell, and other wrought articles, were also found within the cave; and on the outside of the vertical slab of rock, partially burnt and broken bones of various animals, mixed with ashes and other matters, were discovered in some abundance, but without any intermixture of human bones. Hence it is conceived that the animal remains within the cavern were derived from beasts, slaughtered and placed there, after the custom of most savage nations, during the sepulchral ceremonies; whilst those without the cavern entrance are thought to have resulted from the accompanying funeral feasts. The human skulls of this cavern were buried in the cemetery at Aurignac, some time before M. Lartet's visit to the spot, and the exact place of their interment could not be afterwards ascertained. They were examined, however, by a surgeon, the mayor of Aurignac, when first obtained, and they do not appear to have offered any exceptional characters. This is also the case with regard to most of the skulls obtained from various other caverns in which human remains have been found; but in some, an occasional skull of a more than ordinarily low type has been met with. The most remarkable of these is the now celebrated cranium from a cave near the Neuderthal, not far from Düsseldorf. This presents, according to Huxley and other competent observers, a very ape-like character: a fact which has been seized upon by the supporters of the Darwinian theory, as strongly confirmatory of their views regarding the assumed relationship of progression between the Quadrumana and Man. An interpretation of this kind, however, based on the examination of a single skull, or other equally imperfect data, is, at least, premature. To substantiate the theory, a much larger amount of evidence is assuredly required: and even if the majority of cavern skulls exhibited a simian aspect, the question would still remain unproved, since the existence of a *structural relationship* between the ape and man, as between all forms of the same general type, is necessarily and universally admitted. But on this subject we shall have more to say as we proceed.

Keeping, at present, to the first question, we have no hesitation in regarding the extinction of the mammoth and other departed forms of the Post-Tertiary period, as long subsequent to the appearance of Man. This alone would prove the high antiquity of our race: since the extinction of these types cannot be supposed to have taken place in any sudden manner; more especially when we consider the great abundance of their remains, as those of the mammoth for example, in so many localities. Their extinction, though aided to some extent by the agency of man, was undoubtedly the work of slow physical changes, going on continuously throughout a long series of ages. This conclusion, as bearing on the antiquity of our species, is in harmony with that drawn from the uprise of the ancient sea-beach (containing relics of man's industry) on the Sardinian coast.

And other proofs of this antiquity are still forthcoming. Amongst the more interesting, we may refer to the curious facts gleaned from the so-called "refuse-heaps" or "shell-mounds" of Denmark, and from the great peat-deposits of the same country, as described in one of the earlier chapters of the work before us. At certain points along the coast of Denmark, writes Sir Charles Lyell "mounds may be seen consisting chiefly of thousands of cast-away shells of the oyster, cockle, and other mollusks of the same species as those which are now eaten by man. These shells are plentifully mixed up with the bones of various quadrupeds, birds, and fish, which served as the food of the rude hunters and fishers by whom the mounds were accumulated. Such accumulations are called by the Danes, *Kjökkenmödding* or "kitchen-refuse heaps." Scattered all through them are flint knives, hatchets and other instruments of stone, horn, wood and bone, with fragments of coarse pottery, mixed with charcoal and cinders, but never any instruments of bronze, still less of iron. The stone knives are sharpened by rubbing, and in this respect are one degree less rude than those of an older date, associated in France [and in England] with the bones of extinct mammalia. The mounds vary in height from three to ten feet ; and in area, some of them are 1,000 feet long, and from 150 to 200 wide. They are rarely placed more than ten feet above the level of the sea, and are confined to its immediate neighbourhood, or if not (and there are cases where there are several miles from the shore), the distance is ascribable to the entrance of a small stream, which has deposited sediment, or to the growth of a peaty swamp, by which the land has been made to advance on the Baltic, as it is still doing in many places, aided, according to M. Puggard, by a very slow upheaval of the whole country, amounting to two or three inches in a century. There is also another geographical fact equally in favour of the antiquity of the mounds, viz., that they are wanting on those parts of the coasts which border the Western Ocean, or exactly where the waves are now slowly eating away the land. There is every reason to presume that originally there were stations along the coast of the German Ocean as well as that of the Baltic, but by the gradual undermining of the cliffs they have all been swept away. Another striking proof, perhaps the most conclusive of all, that the "refuse-heaps" are very old, is derived from the character of their embedded shells. These consist entirely of living species; but, in the first place, the common eatable oyster is among them, attaining its full size, whereas the same *Ostrea edulis* cannot live at present in the brackish waters of the Baltic except near its entrance, where, whenever a north-westerly gale prevails, a current setting in from the ocean pours in a great body of salt water. Yet it seems that during the whole time of the accumulation of the shell-mounds the oyster flourished in places from which it is now excluded. In like manner, the eatable cockle, mussel, and periwinkle, which are met with in great numbers in the "refuse-heaps," are of the ordinary dimensions which they acquire in the ocean; whereas the same species now living in the adjoining parts of the Baltic, only attain a third of their natural size, being stunted and dwarfed in their growth by the quantity of fresh-water poured by rivers into that inland sea. Hence, we may confidently infer that in the days of the aboriginal hunters and fishers, the ocean had freer access to the Baltic than at present."

The bones of mammalia enclosed in these refuse-heaps belong entirely to existing forms, with the exception of one species, the *Bos*

Urus: and the latter, it is well known, survived to within a comparatively recent epoch. Although of ancient date, therefore, as proved by the changes in the surrounding physical conditions which must have taken place since their accumulation, they belong to a less remote period than the gravel beds of Amiens and other localities alluded to in an earlier part of this notice. In the peat-bogs of Denmark, we find evidences of a still more recent origin, coupled, however, with facts which shew how vast must have been the lapse of time between even these latest records, and the earliest known days of northern history. The three successive periods of stone, bronze, and iron, are clearly revealed in these peat accumulations as in those of many other countries. But each of these periods in Denmark was accompanied by a special forest-vegetation of its own: and in this lies the chief interest of the Danish peat-bogs—the physical changes which these so clearly indicate, being in themselves an undeniable record of the long periods which must have elapsed since the first stone implement became imbedded in the peat-morass. The lower beds, a few feet in thickness, rest in hollows on the surface of Drift deposits, and contain, with flint knives and other implements of stone, numerous trunks of trees, some three feet in diameter, belonging chiefly to the *Pinus sylvestris* or Scotch Fir. This tree has never been seen in Denmark within historical times, except here and there as an introduced species; and the climate at present is quite unsuited to its growth. The succeeding peat-beds contain two varieties of the oak, now almost extinct within the Danish Isles; and mixed with these, more especially towards the upper part of the deposit, hatchets and other implements of copper and bronze have been found. Finally, in the highest stratum of the peat, the oak trunks are replaced by stems of the common beech, the tree of which the present forests of Denmark are chiefly composed.—"In the time of the Romans"—writes Sir Charles Lyell—"the Danish Isles were covered, as now, with magnificent beech forests. Nowhere in the world does this tree flourish more luxuriantly than in Denmark; and eighteen centuries seem to have done little or nothing towards modifying the character of the forest vegetation. Yet in the antecedent bronze period there were no beech trees, or at most but a few stragglers, the country being then covered with oak. In the age of stone, again, the Scotch fir prevailed, and already there were human inhabitants in those old pine forests. How many generations of each species of tree flourished in succession before the pine was supplanted by the oak, and the oak by the beech, can be but vaguely conjectured; but the minimum of time required for the formation of so much peat must, according to the estimate of Steenstrup and other good authorities, have amounted to at least 4,000 years; and there is nothing in the observed rate of the growth of peat opposed to the conclusion that the number of centuries may not have been four times as great, even though the signs of man's existence have not yet been traced down to the lowest or amorphous stratum."

With regard to the Lamarckian or Darwinian hypothesis, of which a general sketch is given in the latter part of his book, and to the bearings of Man's antiquity on this theory, the author expresses himself in somewhat indefinite terms, but with a manifest bearing towards an acceptation of Darwin's views. There is a good deal of book-making, however, in this part of the volume; merely a general resumé of the subject being given, without the elaboration of any important facts or deductions of a novel character. Having already discussed the leading points connected with this theory, in a recent volume of the Journal,* we need not extend the present notice by any lengthened repetition of the argument. The theory essentially supposes this: that our so-called species, in place of being original creations, are really derivative forms—developed from types of earlier existence by slow accumulative changes, brought about, in themselves, chiefly by a gradual alteration of physical conditions in surrounding Nature.—In other words—an organic form of any kind, is supposed to be subject to indefinite variation: and thus, it is maintained, all existing species have sprung during a long series of ages from a few original life-forms, or even from a single parent-organism. Startling as this view must at first appear, it has nevertheless some strong claims to consideration. The principal of these, confining ourselves to the animal world, are as follows:—First, the structural and functional homologies which obtain, not only amongst nearly related types, but even, to some extent, throughout the whole animal series. Secondly, the resemblance between the progressive phases of fœtal development in higher forms, and the permanent condition of inferior types. And thirdly, the presence of rudimentary or imperfect organs in various species. These facts, which are in perfect harmony with the development theory, constitute grave difficulties when we strive to explain them in connexion with the usually received or "special creation".

* Vol. v. pp. 367-387

view. The two first might be met, it is true, by assuming these structural and functional relations to belong to the general plan of creation, conceived and carried out by the Almighty, for some, to us, unfathomable purpose; but the third, if closely considered, cannot be made amenable to any explanation of this kind. It is useless to urge, moreover, that these imperfect organs may have become so by disuse, in consequence of a change of life produced by accidental conditions, since there are numerous cases to which this cannot be applied. On the other hand, the so-called development theory is beset by equal difficulties. One of the more striking, is the apparent absence, both in existing Nature and amongst the fossil relics of the Past, of any transitional forms, linking together the more strongly marked groups or special types. At present, for example, the reptile and the mammal are quite distinct in all their leading characters, and they appear (zoologically) to have been equally distinct in earlier geological periods.—In other words, the required *parent-types* of this theory, are universally wanting. In our very lowest fossiliferous rocks, again, we find various distinct genera, as strongly separated from each other as these now existing, appearing at one and the same time; and when a great change in any type takes place, the new forms appear, for the greater part, quite suddenly or abruptly, as instanced amongst other examples, by the nearly total replacement of the Ganoid fishes by true Teleosteans in the Cretaceous epoch. The assumed imperfection of the geological record is brought forward in reply to this; but granting to a certain extent, the incompleteness of this record, it is at least a damaging fact for the Darwinian theory that the imperfection tells always on one side. Another obstacle to the reception of this theory, is found in the strong sexual antagonism, if such a term may be used, existing between all but the most closely allied forms; and the *general* sterility of crossed species beyond the first generation. The possession of instinct in certain types; an unimprovable and unchangeable quality, as pointed out by Darwin himself, is also opposed to the theory; and we may extend this argument, and urge that the absence of special instincts in other types, is also an objection. Taking two genera, for example, not far removed from each other, as the Bee and the Fly, it is difficult to understand on the development hypothesis, how one comes to possess the hive-building and other accompanying instincts, so strikingly manifested, whilst the other is totally devoid of them.—But apart from all other considerations, the immensity of the break which stares us in the face when we attempt to compare one type with another, even within the limits of the same class—as the whale with the sheep, for instance, and this latter with the beaver or the tiger—is alone sufficient to prevent a present acceptance of the development theory. Between the highest apes and Man, it is true, much closer structural relations are shown to exist; and great weight is attached to this by the followers of Darwin's school. But admitting the full force of these relations, the gulf required to be bridged over is equally great: a dumb and stationary brute-intellect on the one side—speech, reason, and progress, on the other. We may yet say, in the words of Jean Paul, if not in the exact sense in which he used them, "Der Mensch ist der grosse Gedankenstrich im Buche der Natur."

E. J. O.

On the Origin of Species, or the Causes of the Phenomena of Organic nature: A Course of Lectures to Working Men. By Thomas H. Huxley, F.R.S, F.L.S., Professor of Natural History in the Jermyn St. School of Mines. London: Published. New York: Reprinted; D. Appleton & Co., 443 & 445 Broadway—1863.

This is a publication from the notes of the Short-hand writer, the lectures having been delivered extemporaneously, and the author having had no leisure for their revision, beyond the correction of any important error in a matter of fact. The work has been much read, and h's attracted much attention, which is only natural and reasonable considering the varied and accurate knowledge, the high reputation and undoubted talents of its distinguished author, as well as the extraordinary interest excited by Darwin's book, in which the hypothesis was proposed, but although anything coming from Professor Huxley must deserve careful consideration, and is in fact only too likely to be hastily accepted on his authority, the present publication involves such grave questions affecting the very foundations of our scientific inquiries, that we are not disposed to content ourselves with saying that it is an able work deserving of candid examination, but feel bound to enter a little upon the argument, and to express our reasons for not assenting to the hypothesis defended.

There might at the outset be a question raised whether Professor Huxley exercised a wise discretion in the choice of a subject to bring before such an audience as he was to address. He selected a subject very interesting to himself; a controversial subject upon which he entertained a very strong opinion, which he was glad of any opportunity of defending; a subject which is at this time engaging much of the attention of the scientific world, and exciting the curiosity of the public, so as to promise as much popularity as any which could be chosen; but a subject involving the most obscure and difficult questions connected with natural science, and therefore least adapted for those whose ordinary employments prevent their giving much time to such pursuits, and who cannot be presumed to possess the preliminary knowledge requisite for any useful judgment on the points at issue. It may be that Professor Huxley calculated on an audience very different in character from that which he was nominally addressing; it may be that he relied on his clear and forcible style of address to remove the difficulties in his way, and that himself, holding his views to be true and useful, he slighted the uneasiness or alarm which it creates in the minds of many, but there are numbers to whom it will appear very questionable whether he would not better have fulfilled his official duty by offering instruction respecting the established principles and interesting facts of natural science, rather than speculative views on the most recondite question his science afforded.

It would be useless, however, to press this objection now, and although there are undoubtedly fitnesses of things, in respect to times and places for propounding opinions, the mischief which it is possible to do by their violation is temporary and transient whilst we may rely on the great general law that, whatever may appear at the moment or to the partial view of individuals, discussion must ultimately promote the cause of truth.

Another preliminary observation is, we think, called for before we endeavour to estimate the force of Prof. Huxley's argument. He has more than once insisted on the origin of species being an inquiry essential to their scientific study, and there being before the public no hypothesis on the subject, entitled to the least attention, except the Darwinian, and he takes this to be a presumption in its favour, entitling it, at least for the present, to guide the course of inquiry on the subject. Now it appears to us that the preliminary inquiry is, whether there exist in nature any forms of fixed character, varying only within certain limits, and through an indefinite succession of generations remaining continually the same; or whether organic structures are subject to gradual modification, so as after a certain succession of generations to be found very materially different from their original condition, and to be accounted different species. If our inquiries lead us to the former conclusion, every species in nature has come into existence at some time and place, and it is an important inquiry how long each can be proved by good evidence to have existed, and within what geographical limits it has been confined; but there is scarcely any place for inquiry respecting the act of creation since it is not easy to perceive how it could be effected by the operation of second causes, and if we can conceive of such causes they are out of the field of natural science, and if ever determined it must be by other means than the observation of nature and the study of the relations between differing structures. If, on the other hand, we conclude that such distinctions, as properly mark species, are liable to change with the progress of time, and can produce good evidence that even any one distinct species has been derived from any other in the course of ages, then it may be reasonable to admit the possibility of all varying forms having been derived from one primitive germ, and the manner in which such changes have been effected, the causes upon which they depend, become subjects of intense interest, and furnish the most important inquiries in which a naturalist can be engaged. But it seems to us most unreasonable, to expect that the believer in the immutability of species should want a theory as to their origin. He sees throughout nature the abundant evidence of the operation of an intelligent designing mind, the great first cause of all things. He sees every species adapted to its condition and enabled to supply its wants, and the conception of a creative act, as the expression of an almighty volition, is sufficient to account to him for the existing order of things—objects may have been created simultaneously or successively, ; all in one place on the earth's surface, or in various localities; but as long as they are acknowledged to be essentially distinct objects, and to have no natural tendency to intermix and modify each other, they admit of no inquiry into the nature of the modifying causes, and consequently of no theory of the formation of species. It is quite true that we recognise a common plan of structure in a variety of objects; on examination this plan is found to consist in a certain arrangement of elementary organs, which, in some form, are always present, whilst the characteristics of species seem to be really found in the tendencies to comparative development of certain parts, which, in all of the same genus tribe or sub-kingdom, are at least rudimentally present, bearing to each other certain common relations. The truest notion of a species may perhaps be that of a group of developmental tendencies, fixed in the nature of things and only liable to modification by external causes within certain limits. Since those differences of plan or degree of development wh... mark genera, tribes and sub-kingdoms are without doubt at least as constant as those which distinguish species, it follows that these larger groups are natural and real associations of objects as much as species themselves, and that in determining them we find out, and invent names to express, something existing, and it is a great mistake to represent classification as a mere human contrivance of which there may be many varieties equally well founded. A classification which may serve some purposes may be founded upon any observed resemblances and differences amongst objects; but a true natural classification is the interpretation of the great plan of the Creator, expressing real affinities amongst organised beings, and pointing out their natural relationships whether direct or analogical, that is, whether consisting in conformity to a common type, or in a correspondent position as to mode of development and plan of life in respect to different types.

The believers in the transmutation of species will naturally enough regard the case of different organisms, resembling each other in many important particulars, and approaching each other more or less nearly, as favouring their notion of a common origin of all organic structures, and as illustrating different stages of progress or the influence of different circumstances, but the facts are equally accounted for by admitting a certain plan of creation. They are in truth much better accounted for, since the regularity with which we may generally observe each type to display an equal number of analogous variations, affords proof of a great plan running throughout nature, and excludes the idea of the differences of species depending on such influences as incidental special development in one of the offspring of a creature, giving that one advantages in the struggle for existence which are transmitted to its descendants.

We deduce from these considerations that it is not the business of the philosophical inquirer to form some theory respecting the origin of the various species of organised beings, unless he has first observed in them such signs of fluctuation and of being modified by causes, of which he can estimate the operation, as to turn his thoughts in that direction. So long as species are regarded by him as fixed and constant forms, he is not as a naturalist concerned with their origin, but only with their mutual relations as parts of the great system of the universe.

But us now turn to Mr. Huxley's mode of dealing with the subject before us, and we shall first quote a passage containing his statement of the principles upon which such inquiries as that proposed must be conducted (Lecture VI., p. 130, American edition.)

"I stated to you in substance, if not in words, that wherever there are complex masses of phenomena to be inquired into, whether they be phenomena of the affairs of daily life, or whether they belong to the more abstruse and difficult problems laid before the philosopher, our course of proceeding in unravelling that complex chain of phenomena with a view to get at its cause, is always the same; in all cases we must invent a hypothesis; we must place before ourselves some more or less likely supposition respecting that cause; and then, having assumed a hypothesis, having supposed a cause for the phenomena in question, we must endeavour, on the one hand, to demonstrate our hypothesis, or, on the other, to upset and reject it altogether by testing it in three ways. We must, in the first place, be prepared to prove that the supposed causes of the phenomena exist in nature; that they are what the logicians call *veræ causæ*—true causes;—in the next place, we should be prepared to show that the assumed causes of the phenomena are competent to produce such phenomena as those which we wish to explain by them; and in the last place, we ought to be able to show that no other known causes are competent to produce these phenomena. If we can succeed in satisfying these three conditions, we shall have demonstrated our hypothesis; or rather I ought to say, we shall have proved it as far as certainty is possible for us; for, after all, there is no one of our surest convictions which may not be upset, or at any rate modified by a further accession of knowledge."

We make no objection to these principles, but, as already indicated, we consider it as requiring proof that the phenomena of species are such as demand any investigation of their cause, or easily admit the supposition of any second cause. We pass on to Professor Huxley's concise statement of the Darwinian hypothesis (Lect. VI., p. 131, Am. Ed.)

"What is Mr. Darwin's hypothesis? As I apprehend it—for I have put it into a shape more convenient for common purposes than I could find *verbatim* in his book—as I apprehend it, I say, it is, that all the phenomena of organic nature, past and present, result from, or are caused by, the inter-action of those properties of organic matter, which we have called ATAVISM and VARIABILITY, with the CONDITIONS OF EXISTENCE; or in other words,—given the existence of organic matter, its tendency to transmit its properties, and its tendency occasionally to vary; and, lastly, given the conditions of existence by which organic matter is surrounded—that these put together are the causes of the Present and of the Past conditions of ORGANIC NATURE."

Accepting this as a clear and accurate summary, we shall find that the points requiring to be carefully examined are the proper meaning and natural limits of Atavism and Variability, and we must recollect that the existence of these tendencies is equally admitted by both parties. The question is whether, in connection with the external conditions of existence, they are fully sufficient to account for all the phenomena of species genera and higher groups amongst organized bodies, or whether the modifications they produce are subservient to certain determinate inherent tendencies of development, descending from the first created organisms and constituting the great plan of creation which, as we learn to interpret it, we express by the kingdoms, sub-kingdoms, classes, tribes, genera, and species. Now this question is identical with that of the permanence or mutability of species, which is therefore, we apprehend, the real subject of controversy. Granting their mutability, we do not pretend to adduce more probable influences for their modification than those assigned by Mr. Darwin, and all who maintain their permanence believe the cases of variation brought forward to be confined to varieties and races, and to affect characters which are not essential to the species. It is easy to assume that the existence of certain structural resemblances implies a common origin, but such resemblances form an essential part of the notion of a plan of creation in which every position is occupied and in which the utmost variety is produced by special adaptations of various types. They are as well accounted for on the one scheme as on the other—unless indeed we recognise in the regularity of corresponding variations of different types, the impossibility of what may be termed accidental causes of variation, such as are supposed in Darwin's hypothesis, having any place.

It seems to us beyond all reasonable question that what is absolutely required before we can admit the possibility of the transmutation theory, is the production of at least one clear instance of descendants of a common parent, having by the joint action of variability and atavism become so distinct in structure as to be fairly accounted separate species. This we do not believe to have been done. We know, however, that the want of any definition of a species in which both parties can agree, and the power of requiring indefinite periods of time to accomplish the supposed changes, will prevent this test being of much value for convincing opponents. We must therefore be content with enquiring what we really know of atavism and variability, and what proof can be brought forward of the tendency of long periods of time, to change the characters of species.

Atavism is but a name for the general law that the offspring resemble the parents. The resemblance is not a complete and exact one, but it is real and certain, and we believe it to include all the particulars which characterise the species. There is a certain amount of variation arising partly from assignable, partly from unknown causes, the nature and extent of which is learned by experience. In cases of a sexual reproduction, whether naturally occurring by gemmation or fissure, or artificially produced by section with replacement of parts, the variation is almost nothing. In reproduction by the fertilised ovum a regular series of changes is passed through before reaching the complete condition of the organism, and this condition is not an exact copy in every particular of the parents, for they themselves differ in some points; there are variations in the influence of each parent upon the offspring; there are effects of such causes as temperature, food, atmospheric conditions, and superinduced habits on the development of the germ; and there are internal causes not to be estimated by us which, within seemingly narrow limits, affect development so as to produce slight deviations from a precise pattern. Again it is observed that existing varieties in parents are most commonly transmitted to the offspring, if found alike in both parents very generally; if only occurring in one parent, much less uniformly, yet the peculiarity frequently occurring. When by selective breeding a variety is kept up through successive generations, it becomes a permanent variety or race which may either have become insulated by its position or may be studiously kept up on account of its beauty or utility, but if the causes which maintain the variety are removed the offspring gradually return to the more normal specific types. The advocate of the Darwinian hypothesis believes that no real difference can be recognised between species and varieties; that there are no determinate inherent tendencies of development limiting the action of causes of variation, and that new species are produced, as some also become extinct, in the ordinary course of nature. We ask, has he proved by sufficient examples that varieties tend to recede more and more from the specific type and do not tend to return to it; that species are capable of mixing by the production of *fertile* intermediate forms which thus in reality become new species, or that palæontological facts encourage the idea, that species are transmuted, of course very gradually, through a lengthened period of time? The transmission through several generations of the monstrosity of a sixth finger, has no more to do with specific distinctions than the transmission of a particular cast of features, complexion, tendency to certain diseases or any similar instance of atavism acting in subserviencc to the more marked tendencies which constitute species. The history of the otter breed of sheep exemplifies the formation and preservation of races, but affords no argument for their breaking through the natural boundaries of species. The case of the varieties of pigeons is a very interesting one, and the more so because the leading varieties seem to exhibit the same tendencies of development which distinguish the larger really distinct groups and prevail throughout nature; but so long as it is generally agreed that all the varieties have sprung from *columba livia*, and it is reasonably supposed that if not under the care of man they would gradually fall back into that species, instances of partial return being frequent; and so long as the difficulty remains, which is candidly acknowledged by Prof. Huxley, respecting the general if not universal infertility of hybrids between species, we cannot admit that the phenomena of the races of domestic pigeons afford any evidence whatever against the natural and real separation of species. Races which are habitually under the care of man, being cherished and kept in favourable circumstances to suit his purpose, may well illustrate the extent to which variations may be carried, but are least of all to be alleged as examples of the formation of distinct types of structure, the very fact of the peculiarities occurring in such circumstances being a warning to us against attributing to them any specific importance.

We have such clear evidence of the antiquity of various existing species both of animals and plants, which plainly appear to be now what they were many centuries ago, that the presumption is against the influence of time in modifying organised structures. Direct evidence on the subject can only be derived from palaeontological studies, and the defenders of the Darwinian hypothesis have been forward to claim the facts of the palæontology as favouring their views. The following passage from Mr. Huxley shows how they proceed: (Lect. VI., p. 136—140, Am. Ed.)

"If you regard the whole series of stratified rocks—that enormous thickness of sixty or seventy thousand feet that I have mentioned before, constituting the only record we have of a most prodigious lapse of time, that time being, in all probability, but a fraction of that of which we have no record:—if you observe in these successive strata of rocks successive groups of animals arising and dying out, a constant succession, giving you the same kind of impression, as you travel from one group of strata to another, as you would have in travelling from one country to another;—when you find this constant succession of forms, their traces obliterated except to the man of science,—when you look at this wonderful history, and ask what it means, it is only a paltering with words if you are offered the reply,—"They were so created."

But if, on the other hand, you look on all forms of organized beings as the results of the gradual modification of a primitive type, the facts receive a meaning, and you see that these older conditions are the necessary predecessors of the present. Viewed in this light the facts of palæontology receive a meaning—upon any other hypothesis, I am unable to see, in the slightest degree, what knowledge or signification we are to draw out of them. Again, note as bearing upon the same point, the singular likeness which obtains between the successive Faunæ and Floræ, whose remains are preserved on the rocks: you never find any great and enormous difference between the immediately successive Faunæ and Floræ, unless you have reason to believe there has also been a great lapse of time or a great change of conditions. The animals, for instance, of the newest tertiary rocks, in any part of the world, are always, and without exception, found to be closely allied with those which now live in that part of the world. For example, in Europe, Asia, and Africa, the large mammals are at present rhinoceroses, hippopotamuses, elephants, lions, tigers, oxen, horses, &c.; and if you examine the newest tertiary deposits, which contain the animals and plants which immediately preceded those which now exist in the same country, you do not find gigantic specimens of ant-eaters and kangaroos, but you find rhinoceroses, elephants, lions, tigers, &c.,—of different species to those now living,—but still their close allies. If you turn to South America, where, at the present day, we have great sloths and armadillioes and creatures of that kind, what do you find in the newest tertiaries? You find the great sloth-like creature, the *Megatherium*, and the great armadillo, the *Glyptodon*, and so on. And if you go to Australia you find the same law holds good, namely, that that condition of organic nature which has preceded the one which now exists, presents differences perhaps of species, and of genera, but that the great types of organic structure are the same as those which now flourish.

What meaning has this fact upon any other hypothesis or supposition than one of successive modification? But if the population of the world, in any age, is the result of the gradual modification of the forms which peopled it in the preceding age,—if that has been the case it is intelligible enough; because we may expect that the creature that results from the modification of an elephantine mammal shall be something like an elephant, and the creature which is produced by the modification of an armadillo-like mammal shall be like an armadillo. Upon that supposition, I say, the facts are intelligible; upon any other, that I am aware of, they are not.

So far, the facts of palæontology are consistent with almost any form of the doctrine of progressive modification, they would not be absolutely inconsistent with the wild speculations of De Maillet, or with the less objectionable hypothesis of Lamarck. But Mr. Darwin's views have one peculiar merit; and that is, that they are perfectly consistent with an array of facts which are utterly inconsistent with and fatal to, any other hypothesis of progressive modification, which has yet been advanced. It is one remarkable peculiarity of Mr. Darwin's hypothesis that it involves no necessary progression or incessant modification, and that it is perfectly consistent with the persistence for any length of time of a given primitive stock, contemporaneously with its modifications. To return to the case of the domestic breeds of pigeons, for example; you have the Dovecot pigeon, which closely resembles the Rock pigeon, from which they all started, existing at the same time with the others. And if species are developed in the same way in nature, a primitive stock and its modifications may, occasionally, all find the conditions fitted for their existence; and though they come into competition, to a certain extent, with one another, the derivative species may not necessarily extirpate the primitive one, or *vice versâ*.

Now palæontology shows us many facts which are perfectly harmonious with these observed effects of the process by which Mr. Darwin supposes species to have originated, but which appear to me to be totally inconsistent with any other hypothesis which has been proposed. There are some groups of animals and plants, in the fossil world, which have been said to belong to "persistent types," because they have persisted, with very little change indeed, through a very great range of time, while everything about them has changed largely. There are families of fishes whose type of construction has persisted all the way from the carboniferous rock right up to the cretaceous; and others which have lasted through almost the whole range of the secondary rocks, and from the lias to the older tertiaries. It is something stupendous this—to consider a genus lasting without essential modifications through all this enormous lapse of time while almost everything else was changed and modified."

Mr. Huxley calls it paltering with words to say of the succession of organisms revealed by an examination of the earth's strata, that they were so created, meaning that this is all we know of their origin. We confess to a different feeling. There may be a grand scheme of successive creations, suited to changes, taking place in the physical condition of the globe, as well as a scheme of successive changes in mode and degree of development of organs derived from the primitive living element. Which of these schemes is most conformable to known facts must be determined by observation, but if the origin of life be at all referred to a direct exertion of the will of a supreme intelligence, we cannot see that the former scheme is less antecedently probable than the latter; and even if it be referred to the operation of chemical laws, laws of nature do not imply any powers inherent in matter, but are only our expressions of the observed uniformity of a class of results from causes—and really only direct our attention to the mode of operation of the great first cause of all things. Mr. Huxley thus describes an objection to Darwin's hypothesis which we think he hardly treats fairly: "Well, after all," he supposes the objector to say, "you see Mr. Darwin's explanation of the 'origin of species' is not good for much, because, in the long run, he admits that he does not know how organic matter began to exist. But if you admit any special creation for the first particle of organic matter, you may just as well admit it for all the rest; five hundred or five thousand distinct creations are just as intelligible, and just as little difficult to understand, as one." Now, if such an objection were ever used as an argument against learning as much as we can of the order of Nature and mutual derivation of organized beings, it is as little worth as Mr. Huxley represents it; but if, as we apprehend, it was only meant to show that the Darwinian hypothesis relieves us from no fancied difficulty about the idea of creation, and that there is in truth no rational presumption in favour of the creation only of the first and simplest organisms, rather than the creation of numerous forms of living beings, and as often as a wise regard to other changes might require, then we must think the objection a sound one leaving us open to draw whatever truths we can from the study of nature, but convincing us that we are not driven to seek an origin of species in second causes, and that there is no strong reasonable presumption that such might be found.

We cannot at all perceive why, the prevalence of certain sections of the animal kingdom in particular regions of the globe being an admitted fact in respect to the present state of things, it should not be admitted as equally suitable in any former state—or why the present existence of the armadillo where an armadillo-like animal formerly existed should be admitted as any proof that the one is descended from the other without distinct evidence of gradual changes. But perhaps the best thing we can do with this palæontological argument will be to bring under the reader's notice, in immediate connection with Prof. Huxley's reasoning, the sentiments on the same subject of one of the greatest living authorities, and who cannot possibly, from his known opinions on the subject, be supposed to be prejudiced in favour of old-fashioned doctrines. We shall quote from a note to the second chapter of the first part of Agassiz's treatise on the Acalephae in his contributions to the Natural History of the United Sates, (Vol. III., p. 90, Note 1,) the sentiments of this eminent palæontologist respecting Darwin's geological arguments.

•"It seems generally admitted, that the work of Darwin is particularly remarkable for the fairness with which he presents the facts adverse to his views. It may be so; but I confess that it has made a very different impression upon me. I have been more forcibly struck with his inability to perceive when the facts are fatal to his argument, than with anything else in the whole work. His chapter on the Geological Record, in particular, appears to me to be, from beginning to end, a series of illogical deductions and misrepresentations of the modern results of Geology and Palæontology. I do not intend to argue here, one by one, the questions he has discussed. Such arguments end too often in special pleading; and any one familiar with the subject may readily perceive where the truth lies, by confronting his assertions with the geological record itself. But, since the question at issue is chiefly to be settled by palæontological evidence, and I have devoted the greater part of my life to the special study of the fossils, I wish to record my protest against his mode of treating this part of the subject. Not only does Darwin never perceive when the facts are fatal to his views, but, when he has succeeded by an ingenious circumlocution in overleaping the facts, he would have us believe that he has lessened their importance, or changed their meaning. He would thus have us believe that there have been periods during which all that had taken place during other periods were destroyed; and this solely to explain the absence of intermediate forms between the fossils found in successive deposits, for the origin of which he looks to those missing links, whilst every recent progress in Geology shows more and more fully how gradual and successive all the deposits have been which form the crust of our earth.—He would have us believe that entire faunæ have disappeared before those were preserved, the remains of which are found in the lowest fossiliferous strata; when we find everywhere non-fossiliferous strata below those that contain the oldest fossils now known. It is true, he explains their absence by the supposition that they were too delicate to be preserved; but any animals from which Crinoids, Brachiopods, Cephalopods, and Trilobites could arise, must have been similar enough to them to have left, at least, traces of their presence in the lowest non-fossiliferous rocks, had they ever existed at all.—He would have us believe that the oldest organisms that existed were simple cells, or something like the lowest living beings now in existence: when such highly organized animals as Trilobites and Orthoceratites are amongst the oldest known.—He would have us believe that these lowest first-born became extinct, in consequence of the gradual advantage some of their more favored descendants gained over the majority of their predecessors; when there exist now, and have existed at all periods in past times, as large a proportion of more simply organized beings, as of more favored types; and when such types as Lingula were among the lowest Silurian fossils, and are alive at the present day.—He would have us believe that each new species originated in consequence of some slight change in those that preceded; when every geological formation teems with types that did not exist before.—He would have us believe that animals and plants became gradually more and more numerous; when most species appear in myriads of individuals, in the first bed in which they are found.—He would have us believe that animals disappear gradually; when they are as common in the uppermost bed in which they occur, as in the lowest, or any intermediate bed. Species appear suddenly and disappear suddenly in successive strata. That is the fact proclaimed by Palæontology;

they neither increase successively in number, nor do they gradually dwindle down; none of the fossil remains thus far observed show signs of a gradual improvement or of a slow decay.—He would have us believe that geological deposits took place during periods of subsidence; when it can be proved that the whole continent of North America is formed of beds which were deposited during a series of successive upheavals. I quote North America in preference to any other part of the world, because the evidence is so complete here that it can be overlooked only by those who may mistake subsidence for the general shrinking of the earth's surface, in consequence of the cooling of its mass. In this part of the globe, fossils are as common along the successive shores of the rising deposits of the Silurian system, as anywhere along our beaches: and each of these successive shores extends from the Atlantic States to the foot of the Rocky Mountains. The evidence goes even further, each of these successive sets of beds of the Silurian system contains peculiar fossils, neither found in the beds above nor in the beds below, and between them there are no intermediate forms. And yet Darwin affirms that "the littoral and sub-littoral deposits are continually worn away, as soon as they are brought up by the slow and gradual rising of the land within the grinding action of the coast waves."—(Origin of Species, p. 290.)—He would also have us believe that the most perfect organs of the body of animals are the product of gradual improvement; when eyes as perfect as those of the Trilobites are preserved with the remains of these oldest animals.—He would have us believe that it required millions of years to effect any one of these changes; when far more extraordinary transformations are daily going on, under our eyes, in the shortest periods of time, during the growth of animals.—He would have us believe that animals acquire their instincts gradually; when even those that never see their parents, perform at birth the same acts, in the same way, as their progenitors.—He would have us believe that the geographical distribution of animals is the result of accidental transfers; when most species are so narrowly confined within the limits of their natural range, that even slight changes in their external relations may cause their death. And all these, and many other calls upon our credulity, are coolly made in the face of an amount of precise information, readily accessible, which would overwhelm any one who does not place his opinions above the records of an age eminently characterized for its industry: and during which, that information was laboriously accumulated by crowds of faithful laborers.

Professor Huxley argues from the existence of rudimentary organs, such as "the splint-like bones in the leg of the horse, which correspond with bones which belong to certain toes and fingers in the human hand and foot;" the rudimentary cutting teeth on the upper jaw of the young calf; the teeth of the foetal whale which are never used and come to nothing, and other similar instances; contending that such facts are entirely unaccountable and inexplicable except on Mr. Darwin's hypothesis, according to which the whalebone whale descended from a whale with teeth, the horse from an animal with several toes, the ruminant from an animal furnished with cutting teeth in its upper jaw. We have already referred to this subject, and we need only say now that the facts can be generalised in at least two distinct ways, the one followed by Darwin, in which imperfectly developed organs are regarded as indicating their partial suppressions by accidental variety, and the view previously taken that in forming a perfect creation in which every position should be suitably filled, and the greatest possible amount of life and enjoyment be produced; the almighty and all-wise intelligence used a plan, according to which the required variety depended not on so many altogether different types of structure, but on changes in the comparative development of parts in structures belonging to one type, the common relationship giving unity to the whole, and harmonising the various parts into one grand system. According to this view certain elements of structure belonging to one organic type would receive their fullest development in one form, and in others would be gradually reduced until they existed only imperfectly or rudimentally, so as in many instances not to be observable without investigation or only to become observable under peculiar circumstances. We account the latter view the most antecedently probable because it best explains the analogies as well as affinities observable in nature; because it is most consistent with the uniformity and completeness of the design which seems to us to pervade creation, and is more readily conceived as the result of ordinary intelligence. But it would be enough, as an answer to Prof. Huxley's argument, merely to shew that there is a way of viewing the occurrence of imperfectly developed organs, which is reasonable and consistent in itself, and by no means requires or favours the Darwinian hypothesis.

On the whole, it must be acknowledged that the cases of the phenomena exhibited by species, suggested by Darwin, have a real existence in Nature. Proceeding to the second test, we deny that they are, so far as we yet know, competent to give rise to all the phenomena; since, besides the admitted difficulty about sterility of hybrids, it has not been proved that the tendency to variation ever passes the boundaries imposed by predominating developmental tendencies which constitute species, and it is not proved that any degrees of variation entitled to be called specific have arisen within our knowledge, or that time, however long the period attained, tends to increase the extent of variation. We cannot affirm that the contradictory of these propositions is absolutely proved, but it seems to us in each case to be more probable. As to the third test, the hypothesis being the only one which can explain the phenomena, we cannot understand upon what ground Prof. Huxley believes that "the alternative is Darwinian or nothing." The opponents of the new hypothesis may not profess to explain the origin ot species by tracing them to second causes, but they insist that they are not called upon to do so. They find, as they think, organised nature made up of permanently distinct structures, amidst their differences bearing numerous and striking relations to each other, and together forming a connected whole displaying one grand plan, and presenting an inconceivable variety of different combinations of organs, all working out, by varying means, a common end and together filling creation with order, harmony, beauty, forming one grand and beneficent system.

If it were a legitimate aim of philosophy to prevent the thought of Deity from arising from the contemplation of his works, we should have made a step in advance in adopting Darwin's hypothesis which makes all the variety in nature the result of fixed physical laws, and limits the direct operation of the Divine volition to the production of the first organised element. Even so however a creative act is required, and if for one creature why not for a million? If for one condition of external nature, why not for any number of such conditions which may succeed one another on the earth's surface? The scheme of a creation of numerous species which may reproduce themselves with a certain limited variation is not essentially unphilosophical, and so long as we believe in the real distinctness of species is the most probable explanation of what we see. If the transmutation of species can be definitely established the case will be altered, and we may apply ourselves with advantage to the study of the law of modification. Our limited space forbids, at present, the fuller expression of our views on this interesting subject, but differing as we do from Messrs. Darwin and Huxley and other eminent naturalists, we readily receive the speculations which have engaged their minds as worthy of candid consideration, and only desire that they may be so considered as to promote sound knowledge, just views, and practical utility.

W. H.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—JUNE, 1868.

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

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Result't. Direc-tion.	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.	Re-sul't.	ME'N		
					°	°	°	°	°												°							
1	28.982	29.038	29.101	29.0492	58.0	61.2	50.8	57.08	+ 0.13	.428	.264	.281	.326	.89	.47	.76	.69	S W	W b N	W S W	S 78 W	5.3	21 0	6.8	13.78	14 11	0.065	...
2	29.183	.311	.458	.3343	51.1	57.3	50.8	52.85	— 4 42	.290	.336	.272	.290	.76	.71	.73	.72	W b S	W N W	N W b N	N 77 W	11.0	15.2	8.8	10.56	11.05	Inp	...
3	.547	.556	.583	.5577	47 2	55.8	47.9	50 95	— 6.60	.258	.280	.259	.267	.79	.62	.77	.72	N N W	S b W	Calm.	N 49 W	5.5	6.7	0.0	1.89	3.45	...	...
4	.614	.541	.534	.5577	45.0	61.2	52.6	53.47	— 4 38	.239	.340	.300	.303	.80	63	.75	.74	Calm.	S b E	S W	S 16 W	0.0	9 0	2.5	2.67	2.96	0.125	...
5	.532	.534	.658	.5913	52.2	57.2	49.3	52.55	— 3.60	.315	337	.313	.325	.80	.71	.89	.82	N	S b E	N W b N	N 26 W	0 5	2.2	0.5	2.30	3.29	0.625	...
6	.718	.753	.800	.7678	48.6	58.0	46.8	51.42	— 7.03	.292	.217	.216	.240	.85	.44	.67	.64	N W	N N W	N N W	N 23 W	10.0	11.6	7.0	10.22	10 28	...	...
7	.817	.760	—	—	46 8	59.8	—	—	—	.245	.247	—	—	.76	.47	—	—	N	N b E	N W b N	N 30 W	10.3	13.4	11.0	12.13	12.23	Inp.	...
8	.710	.669	.645	.6638	51.8	65 5	58.0	58.45	— 0.62	.310	.316	326	.305	.80	.50	.67	.63	N N W	N W b N	N W	N 30 W	9.6	14.8	8.5	10.90	11.25	Inp.	...
9	.592	.549	.556	.5678	56.9	74.9	61.6	65.38	+ 5.90	.244	.230	.290	.255	.53	.26	.53	.42	N W b N	N W b N	N W b N	N 36 W	15 5	19.5	6.5	12 61	12 68	...	...
10	.564	.549	.494	.5295	57.6	75.3	60.5	64.52	+ 4.73	.299	.337	.349	.333	.62	.38	.66	.55	N W	S W b S	S W b S	S 35 W	0.5	11.0	0.5	3.41	3.69	...	...
11	.503	.480	.536	.5063	54.2	63.7	58.7	59 28	— 0.70	.360	.401	.396	.393	.80	.68	.80	.78	S	Calm	Calm.	N 47 W	0.2	0.0	0.0	0 54	1 31	0.075	...
12	.518	.584	.646	.5970	60.5	63.0	62.7	62.48	+ 2.22	.418	.487	.441	.451	.79	.84	77	.80	N b W	N W b W	N W	N 28 W	1.5	10.8	3.5	6.62	7.33	0.077	...
13	.667	.705	.737	.7032	62.7	71.7	63.0	66.80	+ 6.22	.402	531	.450	.467	.70	.68	.78	.71	N b E	S S W	Calm	S 14 W	7.5	2.5	0 0	0.78	1 69	...	...
14	.722	.669	—	—	61.2	77 5	—	—	—	.422	.539	—	—	.78	.57	—	—	Calm.	S S W	S W b W	S 64 W	0.0	5.0	2.0	3.45	3.99	...	...
15	.502	.518	.681	.5767	70.6	79.3	60.5	69.47	+ 8.33	.452	.336	.372	.382	.60	.33	.70	.55	W N W	N N W	N	N 27 W	13.4	17.0	9.5	10 94	11 51	...	...
16	.803	.739	.584	.7015	53.3	61.2	50.8	56.00	— 5.35	.217	.250	.241	.243	.53	.46	.64	.54	N E b N	S b W	Calm.	S 6 E	6.0	2.5	0.0	1.09	2.52	...	..
17	.369	.314	.333	.3300	55.4	60.5	50.8	55.87	— 5.78	.371	.294	.313	.320	.85	.55	.84	.72	E N E	E b S	Calm.	N 78 E	2.5	9.0	0.0	1 90	2.24	...	..
18	.326	.370	.305	.3212	53.3	70.2	58.3	62.00	+ 0.05	.332	.365	.368	.369	.82	.49	.75	.67	N W b N	S b W	Calm.	S 22 W	1.5	2.5	0.0	0.80	1.71	...	...
19	315	.348	.424	.3833	55.1	68.4	59.8	62 12	— 0.02	.364	.468	.417	.432	.84	.67	.81	.78	S S W	S S E	N	S 58 E	0 8	1.8	1.5	1 25	1.84	..	...
20	.439	.432	.454	.4433	54.7	63.7	53.3	56.58	— 5.87	.370	.452	.377	.399	.86	.76	.92	.87	N E b E	S E	Calm	N 79 E	1.6	4 5	0.0	1.73	2.56	0.475	...
21	.497	.499	—	—	51.8	59.0	—	—	—	.363	.439	—	—	.94	.88	—	—	Calm.	S W b S	S W b S	S 25 W	0.0	7.0	1.5	2.28	2 53	0.030	...
22	.473	.439	.516	.4827	51.0	60.9	53.6	56.42	— 6.53	.367	.414	.362	.382	.88	.78	.87	.84	Calm.	S W b S	W S W	S 60 W	0.0	11.4	2.8	3.09	4.39	0.185	...
23	.599	.651	.729	.6703	52.2	62.7	57.2	57.73	— 5.44	.337	.366	405	.365	.86	.64	.86	.77	W N W	W N W	N N W	N 61 W	1.0	10 5	7.8	6 18	6.36	...	...
24	.795	.788	.785	.7867	53.6	62.3	53.3	57.73	— 5.62	.351	.410	.344	.370	.85	.73	.84	.78	N W	S	Calm.	S 14 W	4.8	2 8	0 0	0.80	1.71	...	...
25	.823	.776	.754	.7835	55.8	69.9	56.9	61.53	— 2.02	.365	.371	.396	.372	.82	.49	.85	.70	Calm.	S S E	Calm.	S 88 E	0.0	5.0	0.0	1.19	2 33	...	...
26	.759	.752	.723	.7387	59.8	71.0	62.3	65.32	+ 1.43	.381	.485	.471	.432	.74	.64	.84	.70	N N E	S E b E	N E b E	S 88 E	0.5	4.8	2.6	2.90	3.07	...	...
27	.773	.755	.677	.7283	62.3	71.3	62.3	65.30	+ 1.23	.497	.523	.459	495	.88	.68	82	.80	Calm.	E S E	Calm.	S 74 E	0.0	4.4	0.0	2.67	2.74	..	...
28	.662	.630	—	—	66.6	74 2	—	—	—	.531	.511	—	—	.82	.60	—	—	E S E	E S E	Calm.	S 75 E	2.5	10.0	0 0	3.91	4 08	...	...
29	.567	.515	.477	.5110	66.6	73.5	70.2	70.23	+ 5.78	.479	.550	.565	.534	.73	.68	.76	.72	E b S	E b N	S E b S	S 81 E	4.5	10.5	4 8	5.42	5.89	Inp	...
30	.480	.498	.493	.4900	68.4	75.7	68.4	71.80	+ 7.22	.596	.752	.604	.653	.86	.84	.87	.83	E	S W b S	E N E	S 24 E	1.0	6.2	0.5	1.76	2.43	0.005	...
31	.....	......	......	......	......	......	......	......	....	.....	......	....	......	...	...		...	....	....	....	....	......	....	.....	....	...	....	...
M	29.5457	29 5448	29.5640	29.5523	56.27	65 98	56 94	60.13	— 0.90	.359	.389	.369	.373	.73	.60	.77	.71	......	....	....	....	3.77	8 25	2.86	...	5.24	1.682	......

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JUNE, 1863.

Highest Barometer . . . . 29.844 at 8 a.m. on 16th. } Monthly range=
Lowest Barometer . . . . 28.932 at 6 a.m. on 1st. } 0.862 inches.

Self-registering Ther.:
- Maximum temperature . . . . 84°8 on p.m. of 15th } Monthly range=
- Minimum temperature . . . . 37°4 on a.m. of 4th } 47°4
- Mean maximum temperature . . 69°23 } Mean daily range=17°24
- Mean minimum temperature . . 51°99 }
- Greatest daily range . . . . . . 27°2 from a. m. to p. m. of 10th.
- Least daily range . . . . 9°5 from a. m. to p. m. of 1st.

Warmest day . . . 30th...Mean Temperature . . . 71°80 } Difference=20°85.
Coldest day . . . . 3rd ...Mean Temperature . . . 50°95 }
Maximum Radiation { Solar . . . . 96°4 on p.m. of 15th } Monthly range=
{ Terrestrial . . . . 29°2 on a. m. of 4th } 67°.2

Aurora observed on 4 nights, viz., 9th, 10th, 13th, 22nd. Possible to see Aurora on 19 nights; impossible on 11 nights.

Raining on 13 days; depth, 1.662 inches; duration of fall, 26.9 hours.

Mean of cloudiness=0.54; above average, 0.01. Most cloudy hour observed, 2 p.m.; mean=0.70; least cloudy hour observed, midnight; mean=0.34.

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

North.	South.	East.	West.
1745.46	704.54	567.42	1814.65

Resultant direction, N. 50° W.; Resultant Velocity, 2.26 miles per hour.
Mean velocity 5.24 miles per hour.
Maximum velocity 25.8 miles, from 1 to 2 p.m. on 1st.
Most windy day 1st—Mean velocity 14.11 miles per hour. } Difference 12.80.
Least windy day 11th—Mean velocity 1.31 miles per hour. }
Most windy hour, 1 to 2 p.m.—Mean velocity, 9.23 miles per hour. } Difference
Least windy hour, 9 to 10 p.m.—Mean velocity, 2.70 miles per hour. } 6.53 miles.

4th. Slight hoar frost at 5 a.m.; thunderstorm and heavy rain 2.50 to 3.30 p.m.; faint auroral light at 9.15 p.m.—9th. Brilliant aurora 10 p.m. to 1 a.m. of 10th exhibiting arches, patches, pulsations, and streamers, and forming a corona at 1 a.m. about 10° S.S.W. of Zenith.—10th. Faint aurora at 10 p.m. and midnight.—11th. Distant thunder in West during the forenoon; fire flies numerous at night. —12th. Fire flies numerous at 10 p.m.; sheet lightning at midnight.—13th. Faint auroral light at midnight.—14th. Sheet lightning in West at 10 p.m.—20th. Thunderstorm, lightning, and rain, 7.40 to 8.15 a.m., and again from 4 to 8 p.m.—22nd. Thunderstorm 1.30 to 3.20 p.m.; auroral arch and streamers, 10 to 10.30 p.m.—30th. Sheet lightning in W. and S.W. at 9 p.m.

A considerable quantity of Pollen fell with the rain during the thunderstorm on 4th.
Heavy Dew recored on 11 mornings during this month.

June, 1863, was comparatively cold, calm, cloudy, and very dry.

COMPARATIVE TABLE FOR JUNE.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average, (61°4).	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity
	°		°	°	°							
1840	59.8	— 1.6	78.5	37.1	41.4	11	4.860	...	...	...	...	...
1841	65.6	+ 4.2	92.8	45.7	47.1	9	1.560	...	...	...	...	0.36 lbs
1842	55.6	— 5.8	73.9	28.0	45.9	15	5.755	...	...	...	...	0.31 "
1843	58.4	— 3.0	81.3	28.5	52.8	12	4.595	...	...	...	...	0.27 "
1844	59.9	— 1.5	82.8	33.1	49.7	9	3.535	...	...	...	...	0.19 "
1845	61.0	— 0.4	83.6	40.9	42.7	11	3.715	...	...	...	...	0.27 "
1846	63.3	+ 1.9	83.3	41.5	41.8	10	1.920	...	...	...	...	0.32 "
1847	58.4	— 3.0	78.3	36.7	41.6	14	2.625	...	...	...	...	0.30 "
1848	62.9	+ 1.5	92.5	38.3	54.2	8	1.810	...	...	N 61 W	1.90	4.51 ms
1849	63.2	+ 1.8	84.9	45.2	39.7	7	2.020	...	...	S 71 E	0.49	3.32 "
1850	64.3	+ 2.9	83.2	49.0	34.2	10	3.345	...	...	S 60 W	0.38	4.54 "
1851	59.2	— 2.2	79.2	41.2	38.0	11	2.695	...	...	S 2 W	1.26	4.42 "
1852	60.8	— 0.6	86.1	43.6	42.5	10	3.160	...	...	S 76 W	1.49	4.09 "
1853	65.5	+ 4.1	86.3	43.3	43.0	9	1.550	...	...	N 1 W	0.10	3.73 "
1854	64.1	+ 2.7	88.7	47.4	41.3	9	1.460	...	...	N 24 E	0.71	4.15 "
1855	59.9	— 1.5	90.7	40.6	50.1	17	4.070	...	...	N 69 W	1.33	5.70 "
1856	62.1	+ 0.7	82.6	48.3	34.3	13	3.200	...	...	S 21 W	0.90	5.30 "
1857	56.9	— 4.5	75.1	40.9	34.2	21	5.060	...	...	N 49 W	1.15	7.60 "
1858	66.2	+ 4.8	86.3	48.7	37.6	12	2.943	...	...	S 20 E	0.25	5.53 "
1859	58.3	— 3.1	85.2	33.9	51.3	16	4.085	2	Inp.	N 77 W	1.95	7.19 "
1860	63.2	+ 1.8	81.1	50.0	31.1	14	2.136	...	...	N 44 W	3.13	7.61 "
1861	61.3	— 0.1	86.5	48.2	38.3	13	2.329	...	...	N 39 W	2.29	6.11 "
1862	60.5	— 0.9	83.2	44.3	38.9	10	1.007	...	...	N 26 W	1.77	5.98 "
1863	60.1	— 1.3	79.3	45.0	34.3	13	1.662	...	...	N 50 W	2.26	5.24 "
Results to 1861.	61.36	...	83.77	41.37	42.40	11.9	3.100	...	...	N 69 W	0.81	5.27
Exc. for 1863.	—1.23	...	— 4.47	+ 3.63	— 8.10	+ 1.1	— 1.438	...	...	...	...	—0.03

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST.—JULY, 1863.

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.				Excess of mean above Normal.	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.	Resul't.	ME'N		
1	29.555	29.581	29.599	29.5757	° 71.7	° 82.1	° 70.2	° 75.12	° +10.35	.661	.782	.580	.672	.86	.71	.78	.77	Calm.	S S E	N E	S 19° E	0.0	5.8	2.5	0.11	2.92	0.275	...
2	.610	.629	.619	.6220	68.1	75.3	69.5	71.27	+ 6.27	.637	.723	.661	.667	.93	.83	.92	.88	S b W	E b N	N	N 80 E	2.5	4.5	2.0	2.17	2.56	.005	...
3	.699	.695	.667	.6858	68.1	77.8	69.9	71.73	+ 6.58	.650	.723	.642	.661	.95	.75	.88	.85	Calm.	S E b S	S S E	S 67 E	0.0	2.2	0.5	0.93	1.43	...	...
4	.671	.620	.607	.6285	68.1	78.2	69.9	72.17	+ 6.87	.637	.635	.612	.648	.93	.71	.84	.82	Calm.	S b W	N	S 48 W	0.0	9.4	4.5	1.47	4.15	...	...
5	.601	.561	—	—	67.0	77.8	—	—	—	.566	.629	—	—	.86	.66	—	—	N N W	S	N b E	N 32 E	1.5	5.0	3.5	0.90	3.79	...	...
6	.565	.566	.554	.5645	67.3	75.7	70.6	71.80	+ 6.20	.562	.623	.589	.594	.84	.70	.79	.76	N	E b S	N E b E	N 83 E	9.5	9.0	1.8	3.01	3.62	...	..
7	.593	.552	.536	.5557	69.9	76.0	70.6	73.12	+ 7.42	.584	.664	.632	.629	.79	.74	.84	.77	N N E	E b S	Calm.	S 68 E	0.5	1.8	0.0	1.49	2.02	.290	...
8	.509	.438	.441	.4582	68.1	79.6	76.4	73.67	+ 7.88	.622	.732	.555	.637	.91	.72	.60	.77	S W b W	S W b S	N b W	S 74 W	2.0	5.8	2.2	0.90	3.22	.075	...
9	.411	.420	.418	.4367	67.7	77.1	68.4	71.08	+ 5.10	.585	.685	.507	.596	.87	.73	.74	.79	N b W	S S E	Calm.	S 55 E	4.5	3.0	0.0	0.31	1.34	...	...
10	.462	.446	.450	.4470	66.6	77.5	67.0	70.78	+ 4.70	.599	.663	.608	.630	.91	.70	.92	.84	N b E	Calm.	Calm.	S 51 E	1.0	0.0	0.0	0.10	0.18	...	...
11	.473	.464	.613	.5270	67.4	77.1	63.4	69.40	+ 3.22	.632	.685	.457	.591	.95	.73	.78	.82	Calm.	S W b S	N	N 33 W	0.0	9.5	14.2	4.86	7.80	Inp.	...
12	.769	.803	—	—	56.5	65.2	—	—	—	.363	.408	—	—	.80	.65	—	—	N N E	S E	S E b S	N 37 E	1.5	6.5	1.0	3.20	4.20	...	...
13	.683	.626	.584	.6217	60.5	64.8	61.6	62.05	— 4.33	.382	.503	.507	.468	.73	.81	.92	.83	N b E	E N E	N E	N 43 E	4.5	1.5	2.0	2.28	2.38	.645	...
14	.486	.471	.495	.4837	61.9	69.1	66.3	66.30	— 0.12	.512	.608	.590	.580	.98	.86	.91	.90	N b W	S S W	S E b S	S 87 W	3.0	2.4	3.0	1.09	2.33	.010	...
15	.538	.551	.650	.5848	63.0	74.6	60.1	66.73	+ 0.25	.450	.693	.425	.495	.78	.69	.81	.75	Calm.	S S E	W N W	S 79 W	0.0	9.0	7.6	2.89	6.48	.020	...
16	.722	.787	.867	.7975	53.3	62.7	52.9	58.55	—10.03	.344	.320	.306	.313	.84	.56	.76	.68	W N W	N N W	N N W	N 49 W	7.5	13.2	4.5	8.03	9.19	...	...
17	.890	.876	.871	.8807	49.3	64.1	54.4	56.52	—10.17	.260	.372	.308	.320	.74	.62	.73	.70	N	S b E	Calm.	N 89 E	5.5	5.5	0.0	1.07	2.87	...	...
18	.891	.865	.845	.8678	54.7	68.1	56.9	61.05	— 5.63	.358	.415	.341	.369	.84	.65	.73	.69	Calm.	S by W	Calm.	S 40 E	0.0	5.8	0.0	1.01	3.43	...	...
19	.859	.819	—	—	56.9	69.5	—	—	—	.310	.325	—	—	.68	.45	—	—	N b E	S E	Calm.	S 48 E	2.2	5.0	0.0	1.50	1.85	...	...
20	.640	.502	.460	.5297	62.3	94.8	61.9	62.83	— 3.93	.497	.476	.503	.501	.88	.77	.90	.87	E b N	E b N	N E b E	N 50 E	2.8	10.5	6.0	8.20	9.72	1.665	...
21	.526	.591	.638	.5902	61.0	68.8	57.6	62.77	— 4.00	.428	.436	.342	.399	.78	.62	.72	.70	N	N W b N	N b W	N 18 W	16.0	13.0	4.4	10.22	10.39	..	...
22	.684	.668	.665	.6605	57.6	71.3	61.9	64.53	— 2.33	.353	.410	.401	.390	.74	.55	.72	.65	N W b N	S S W	S S W	S 23 W	3.8	7.5	1.8	2.71	3.13	...	...
23	.662	.628	.599	.6273	60.5	71.7	62.3	66.03	— 0.85	.434	.476	.522	.478	.82	.61	.93	.76	N N E	S E b S	Calm.	S 73 E	3.5	5.6	0.0	1.71	2.21	.008	...
24	.580	.607	.622	.6015	64.1	76.0	71.3	71.48	+ 4.62	.538	.639	.536	.581	.90	.71	.70	.70	Calm.	S S W	N N E	N 77 W	0.0	3.0	3.5	0.31	2.01	.015	...
25	.613	.493	.418	.4935	65.2	66.6	65.2	65.60	— 1.37	.510	.572	.536	.540	.82	.88	.87	.86	N N E	N E b E	N E b E	N 61 E	4.5	9.0	1.0	3.58	4.18	.345	...
26	.390	.395	—	—	64.1	74.9	—	—	—	.524	.713	—	—	.87	.83	—	—	N W b N	S	W	S 53 W	2.2	3.2	1.5	2.39	3.11	.030	...
27	.413	.465	.581	.4909	65.2	73.5	60.5	66.52	— 0.47	.523	.375	.382	.424	.85	.45	.73	.67	W	W b S	N W b W	S 88 W	1.8	14.8	4.4	6.40	6.77	...	...
28	.639	.635	.637	.6403	58.3	74.6	64.8	66.75	— 0.22	.401	.563	.515	.502	.83	.65	.84	.77	Calm.	S S W	S W b S	S 10 W	0.0	10.8	1.5	3.93	4.51	...	...
29	.675	.602	.607	.6203	63.7	75.7	65.9	69.40	+ 2.43	.517	.548	.500	.535	.87	.62	.78	.75	N E	S E b S	Calm.	S 9 E	0.8	5.5	0.0	1.82	3.03	...	...
30	.578	.536	.555	.5590	64.1	70.8	65.9	67.62	+ 0.67	.512	.658	.593	.592	.85	.88	.93	.87	N N E	W S W	Calm.	S 59 E	0.5	1.5	0.0	0.66	0.91	.025	...
31	.570	.546	.499	.5413	66.6	78.0	70.6	71.55	+ 4.60	.572	.664	.616	.624	.88	.74	.83	.81	E b N	S S E	S S W	S 33 W	2.0	7.4	4.8	4.38	4.72	Inp.	...
M	29.6063	29.5881	29.5973	29.5983	63.51	72.95	65.04	67.57	+ 1.32	.511	.579	.610	.535	.85	.70	.81	.78	....	....	....	....	2.37	6.35	2.52	....	3.89	3.408	....

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JULY, 1863.

Highest Barometer............................29.912 at 8 a. m. on 18th } Monthly range =
Lowest Barometer ....29.390 at 6 a. m. on 26th } 0.522 inches.

Self-registering Thermom.
- Maximum Temperature .... 83°5 on p.m. of 1st } Monthly range=
- Minimum Temperature .... 48°0 on a.m. of 16th } 35°5
- Mean maximum Temperature .... 74°88 } Mean daily range=
- Mean minimum Temperature .... 59°69 } 15°19
- Greatest daily range ...... 23°5 from a.m. to p.m. of 28th.
- Least daily range............ 3°0 from a.m. to p.m. of 25th.

Warmest day .... 1st .. Mean temperature......... 75°12 } Difference = 18°60.
Coldest day .... 17th... Mean temperature......... 56°52 }

Maximum Radiation. { Solar................................. 102°5 on p.m. of 7th } Monthly range =
{ Terrestrial................................ 41°0 on a.m. of 19th } 61°5

Aurora observed on 6 nights, viz.,—8th, 15th, 17th, 18th, 19th, and 24th.
Possible to see Aurora on 14 nights; impossible on 17 nights.
Snowing on .. days, depth ... inches; duration of fall, ... hours.
Raining on 15 days, depth 3.403 inches; duration of fall 42.0 hours.
Mean of cloudiness = 0.64. Above average 0.19.
Most cloudy hour observed, 2 p.m.: mean = 0.71; least cloudy hour observed, 8 a.m.; mean, = 0.60.

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

North.	South.	East.	West.
1176.74	894.79	731.78	823.10

Resultant direction N. 18° W.; Resultant velocity 0.40 miles per hour.
Mean velocity ....3.89 miles per hour.
Maximum velocity .... 21.0 miles, from 8 to 9 a.m. on 21st.
Most windy day ......21st...............Mean velocity, 10.39 miles per hour. } Difference=
Least windy day ......10th ....Mean velocity, 0.18 ditto. } 10.21 miles.
Most windy hour .... noon to 1 p.m..........Mean velocity, 6.49 ditto. } Difference=
Least windy hour...9 p.m. to 10 p.m.........Mean velocity 2.22 ditto. } 4.27 miles.

1st. Imperfect lunar halo at midnight.—2nd Thunderstorm 5.30 to 6 a.m.; and again from 8 to 9.30 p.m.—3rd. Dense fog from 2 to 8 a.m.; sheet lightning at night.—4th. Distant thunder 3.30 p.m.; Sheet lightning at 8 and 10 p.m.—5th. Distant thunder in N.W. a.m., and fire-flies numerous.—7th Sheet lightning in N.W., 10 p.m. and midnight.—8th. Thunderstorm 4.30 to 7.15 a.m.; and again from 8 to 10.40 p.m.—10th. Ground fog, and fire-flies numerous at 10 p.m.—13th. Thunderstorm 4.30 to 10 p.m.—14th. Dense fog 6 to 8 a.m.—15th. Distant thunder 1.30 p.m.—23rd. Sheet lightning at 10 p.m. and midnight.—24th. Thunderstorm 2 to 3 a.m.—25th. Sheet lightning at midnight.—27th. Brilliant meteor at 8 p.m. in S.E.—28th. Lunar halo at 10 p.m.—30th. Thunderstorm 1 to 2 p.m.; ground fog at 8 p.m.—31st Thunderstorm between 10 and 11 p.m.

July, 1863, was comparatively mild, calm and cloudy.

COMPARATIVE TABLE FOR JULY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above aver'ge (66.8)	Max. ob-served	Min. ob-served.	Range.	No. of days.	Inches	No. of days.	Inches	Resultant. Direction.	Resultant. V'y	Mean Force or Velocity
1840	65.8	— 1.0	79.4	48.2	31.2	6	5.970	...	...	...	...	....
1841	65.0	— 1.8	88.3	43.2	43.1	10	8.150	...	...	...	...	0.27 lbs.
1842	64.7	— 2.1	90.5	42.0	48.5	4	3.050	...	...	...	...	0.33
1843	64.5	— 2.3	83.1	40.2	45.9	8	4.605	...	...	...	...	0.44
1844	66.0	— 0.8	85.1	40.5	45.6	12	2.815	...	...	...	...	0.19
1845	66.2	— 0.6	94.6	45.6	49.0	7	2.195	...	...	...	...	0.30
1846	68.0	+ 1.2	94.0	44.9	49.1	9	2.835	...	...	...	...	0.29
1847	68.0	+ 1.2	87.5	43.8	43.7	8	3.355	...	...	...	...	0.19
1848	65.5	— 1.3	82.7	46.7	36.0	10	1.890	..	...	N 14° W	0.18	4.94mls.
1849	68.4	+ 1.6	89.1	51.0	38.1	4	3.415	...	...	S 5° W	0.75	3.52
1850	68.9	+ 2.1	84.9	52.8	32.1	12	5.270	...	...	N 81° E	0.59	4.56
1851	65.0	— 1.8	82.7	52.1	30.6	12	3.625	...	...	N 60° W	0.88	4.13
1852	66.8	0.0	90.1	49.5	40.6	8	4.025	...	...	N 43° W	0.93	3.33
1853	65.6	— 1.2	85.4	49.4	36.0	10	0.915	..	...	S 58° E	0.24	3.69
1854	72.5	+ 5.7	93.6	53.0	40.6	9	4.81	...	...	S 49° W	0.37	4.03
1855	67.9	+ 1.1	88.4	53.1	35.3	13	3.245	...	...	S 19° W	0.73	6.47
1856	69.9	+ 3.1	92.0	51.4	40.6	8	1.120	...	...	N 79° W	1.57	5.84
1857	67.8	+ 1.0	85.4	52.4	33.0	15	3.475	...	...	S 68° E	0.81	4.74
1858	67.9	+ 1.1	83.4	55.9	27.5	13	3.072	...	...	N 15° E	1.13	5.76
1859	66.9	+ 0.1	87.7	50.5	37.2	12	2.611	...	...	N 56° W	1.48	5.81
1860	63.9	— 2.9	85.8	47.5	38.3	13	4.339	...	...	N 60° W	2.15	7.29
1861	65.4	— 1.4	82.9	49.4	33.5	16	2.615	...	...	N 74° W	1.43	4.66
1862	66.7	— 0.1	88.6	52.6	36.0	15	5.344	...	...	S 89° W	1.42	5.80
1863	67.6	+ 0.8	82.3	49.3	33.0	15	3.403	...	...	N 18° W	0.40	3.89
Results to 1862.	66.85	...	87.21	48.32	38.89	10.0	3.490	...	...	N 65° W	0.48	4.91
Exc for 1863.	+ 0.72	...	— 4.91	+ 0.98	— 5.89	+ 5.0	— 0.082	...	...	....	......	— 1.02