

PAPER VIII.—THE LOST ISLAND OF ATLANTIS.

BY E. T. FLETCHER, Esq.

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The Latin historian, Lucius Annæus Florus, in describing the progress of the Roman arms in Spain, speaks of the awe with which Decimus Brutus beheld, for the first time, the sun descend into the broad Atlantic, and its fires become quenched in the illimitable western ocean. The Roman leader would perhaps have been still more impressed with the solemnity of the scene, had he thought it possible that beneath those waves there lay a buried world, that a great island with all its tenants had sunk ages ago in its depths, and that a civilization, older than the lore of Egypt or the wisdom of Etruria, had found amid these waters a cradle and a grave. He might have philosophized mournfully on the uncertain tenure of all human greatness, on the evanescence of a national splendor whose very sepulchres had perished, and on the special destiny of a commonwealth so utterly destroyed as to leave to after ages its very existence a matter of debatable inquiry.

From all time the finger of tradition has pointed to the West as the peculiar abode of a happier and more favored race. The gardens of the Hesperides, the islands of the Blest, the bourne of the Atlantides, the Western Ethiopians, the Atlantis of Plato, these are legends familiar to all. Not only has Euripides, in one of the choral songs of his *Hippolytus*, celebrated the happy isles where the winds blow ever softly, and the ambrosial streams flow fast by the palaces of Jove; but Pindar himself, whose birth preceded that of Herodotus by nearly a century, speaks in his second *Olympiac* of the island of the Blest—for with him there is but one island—fanned by ocean breezes and adorned by every blessing of fruit and flower. Thus, also, a modern poet, Tennyson, in those

fine lines of the Morte d'Arthur, suggested possibly by a well-known passage in the fourth Odyssey, sings of

"The island-valley of Avilion,
Where falls not hail, or rain, or any snow,
Nor ever wind blows loudly, but it lies
Deep meadowed, happy, fair with orchard lawns
And bowery hollows crowned with summer sea."

Even beyond the limits of classic story, everywhere and always, has this oldest of legends held an abiding place in the hearts and memories of all men. Still do the inhabitants of the Arran isles, on the edge of the great western main, believe that from time to time they see the shores of a happy island rise above the waves. Still, in the time of Marco Polo, a similar tradition prevailed among the Cinghalese. The sagas of the North yet speak of the island of Atle: and even the Japanese Ainos of the farthest East retain the memory of a time when there was no land but islands, and when the first of the race, after drifting long on the ocean, landed at one of these, and lived in a garden of delights for many years. Nor is this all; these western seats were claimed as the well-spring and fountain-head of intellectual culture. Doubtless much of what we call mythic fable is but symbolism or allegory, divine influences clad in anthropomorphic robes, or philosophic sequence given in the form of narrative. But sharply and clearly from the mists of mythos and legend stands forth the story of Atlantis. Its pragmatic truthfulness is evinced by the choice of Solon, who selected it as the subject of an epopee, as well as by the solemnity and earnestness with which the story is brought forward by Plato as an ancient and family heir-loom. Even so grave a writer as Strabo, is of opinion that what Plato relates of the Atlantis is no mere invention: and the priests of Sais themselves confessed that the antiquity of Egypt paled before that of the Atlantids, who invaded Egypt in arms and sowed the seeds of its earliest cultivation. Atlantis was the daughter of Atlas. But Atlas had also a daughter named Merope, whence the "meropes," or speaking men, looking on language or articulate speech as the

sign and token of civilized humanity. Mercury himself, the god of eloquence and persuasion, appears in the theogony of old Rome as the grandson of Atlas. With Ovid he is "Atlantiades," and "Atlantis Pleionesque nepos": so also Horace, as witness his ode commencing

Mercuri, facunde nepos Atlantis
Qui feros cultus hominum recentum
Voce formasti catus;—

Compare also in this connection λόγος with λέγω. "In the beginning was the Word." Thus also Dante, "non ragionam di lor," and Hamlet speaks of the "brute that wants discourse of reason." Circe appears in the *Odyssey* as δαινη θειος, a sacred divinity, but with the special attribute αὐδηεσσα, or gifted with articulate speech. Our word "dumb" is the analogue of the Teutonic "dumm," which signifies witless: and in the same spirit the Slaves superciliously denote their German neighbours by a term signifying "voiceless," or without words. A similar meaning is attached to the Greek νῆπιος, whose analysis presents the same results. Later writers place the Meropes on the Nile, but the old home of the Atlantids was the Atlas Range in Western Africa. Even in Pliny's time they had not advanced farther eastward than Libya.

The story of Atlantis appears, in the *Timæus* of Plato, in the following shape:—

Listen now then, Socrates, to a story very strange indeed, yet in every respect true, as it was once related, by Solon, the wisest of the seven sages. He was the kinsman and intimate friend of our great grandfather Dropides as he himself often tells us in his poems: and he informed our grandfather Critias, as the old man himself in turn told us, that this state (Athens) had formerly achieved great and admirable actions, the knowledge of which had nevertheless been lost through lapse of time and the decay of mankind—one act in particular being more illustrious than the rest—in remembrance of which it were fitting that we should not only return you thanks, but also in full assembly hymn forth to the goddess our true and just acclaim of praise.

I will acquaint you with that ancient story which I indeed received from no mere youth; for at that time Critias, as he himself said, was almost ninety years old, and I myself about ten.

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In Egypt, said he, in the Delta, about the summit of which the streams of the Nile are divided, is the district (νομός) surnamed Saitic; the chief city of which is Sais, whence also came the king Amasis; and it had a presiding divinity, whose name is in the Egyptian tongue Neith, which they say corresponds with the Greek Athena; and the people profess to be great friends of the Athenians, and united with them in a sort of close alliance. Solon said that on his arrival thither, he was very honorably received, and especially, on his inquiring about ancient affairs of those priests who possessed superior knowledge in such matters, he perceived that neither himself nor any one of the Greeks (so to speak) had any antiquarian knowledge at all. And once on a time desirous of inducing them to narrate their ancient stories, he undertook to describe those events which had formerly happened among us in days of yore—those about the first Phoroneus and Niobe; and again after the deluge of Deucalion and Pyrrha, how they survived together with their posterity, paying due attention to the different ages in which these events are said to have occurred:—on which one of their extremely ancient priests exclaimed: “Solon, you Greeks are always children, and aged Greek there is none.” * * * * You are all youths in intelligence; for you hold no ancient opinions derived from remote tradition, nor any system of discipline that can boast of a hoary old age: and the cause of this, is the multitude and variety of destructions that have been and will be undergone by the human race, the greater indeed arising from fire and water, others of less importance from ten thousand other contingencies. * * * * The truth is, however, that in all places where there is neither intense cold nor immoderate heat, the race of man is always found to exist, sometimes in less, sometimes in greater number. And all the noble, great or otherwise distinguished achievements, performed either by ourselves, or by you, or elsewhere, of which we have heard the report—all these have been engraven in our temples in very remote times, and preserved to the present day; while on the contrary, with you and all other nations, they are only just committed to writing, and all other modes of transmission which states require—when again, at the usual period, a current from heaven rushes on them like a pestilence, and leaves the survivors among you both destitute of literary attainments and unacquainted with music;—and thus you become young again, as at first, knowing nothing of the events of ancient times, either in our country or yours. As to the things, Solon, which you have just related from your antiquities, they differ indeed but little from puerile fables—for in the first place you mention only one deluge of the earth, whereas there had been many before; and in the next place you are unacquainted with that most noble and excellent race of men who once inhabited your country, from whom you and your whole present state are descended, though only a small remnant of this admirable people is now remaining—your ignorance in this matter resulting from the fact that their posterity for many generations died without speaking to posterity by writing; for long before the chief deluge, a city of Athenians existed, regulated by the best laws, both in military and all other matters, whose noble deeds and civil institutions are said to have been the most excellent of all that we have heard to exist under heaven.

Many and mighty deeds of your state, then, are here recorded in writing (in our sacred records), and call forth our admiration; nevertheless there

is one in particular, which in magnitude and valour surpasses them all ; for these writings relate what a prodigious force your city once overcame, when a mighty warlike power, rushing from the Atlantic sea, spread itself with hostile fury over all Europe and Asia. That sea indeed was then navigable, and had an island fronting that mouth which you in your tongue call the pillars of Hercules ; and this island was larger than Libya and Asia put together ; and there was a passage hence for travellers of that day to the rest of the islands, as well as from those islands to the whole opposite continent which surrounds that, the real sea. For as respects what is within the mouth here mentioned, it appears to be a bay with a kind of narrow entrance ; and that sea is indeed a true sea, and the land that entirely surrounds it may truly and most correctly be called a continent. In this Atlantic island, then, was formed a powerful league of kings, who subdued the entire island, together with many others, and parts also of the continent ; besides which they subjected to their rule the inland parts of Libya, as far as Egypt, and Europe also, as far as Tyrrhenia. The whole of this force, then, being collected in a powerful league, undertook at one blow to enslave both your country and ours, and all the land besides that lies within the mouth. This was the period, Solon, when the power of your state was universally celebrated for its virtue and strength ;—for, surpassing all others both in magnanimity and military skill, sometimes taking the lead of the Greek nation, at others, left to itself by the defection of the rest, and brought into the most extreme danger, it still prevailed, raised the trophy over its assailants, kept from slavery those not as yet enslaved, ensured likewise the most ample liberty for all of us without exception who dwell within the pillars of Hercules. Subsequently, however, through violent earthquakes and deluges which brought desolation in a single day and night, the whole of your warlike race was at once merged under the earth ; and the Atlantic island itself was plunged beneath the sea, and entirely disappeared ;—whence even now that sea is neither navigable nor to be traced out, being blocked up by the great depth of mud which the subsiding island produced.

The above, O Socrates, is the sum of what the elder Critias repeated from the narration of Solon.

Thus far the Timæus. In the Critias, Plato enters upon a more minute description of the island. The speaker here is a Greek : in the Timæus it was an Egyptian. It is Critias himself who thus discourses :

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First of all, then, let us recollect that it is about nine thousand years since war was proclaimed between those dwelling outside the pillars of Hercules and all those within them—which war we must now describe. Of the latter party then, this city was the leader and conducted the whole war ; and of the former the kings of the Atlantic island, which we said was once larger than Libya and Asia, but now, sunk by earthquakes, a mass of impervious mud, which hinders all those sailing on the vast sea from effecting a passage hither :

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As we remarked at first concerning the allotment of the gods, that they

distributed the whole earth here into larger, and there into smaller portions, procuring for themselves temples and public sacrifices—so Poseidon in particular, taking as his lot the Atlantic island, begat children by a mortal woman, and settled in some such spot of the island, as we are about to describe. Towards the sea, but in the centre of the whole island, was a plain, which is said to have been the fairest of all plains, and distinguished for the excellence of its soil. Near this plain, and at its centre, about fifty stadia distant, was a mountain with short acclivities. On this, dwelt one of these men who in primitive times sprang from the earth, by name Evenor, who lived with a wife, Leucippe; and they had an only daughter, Clito. Now, when this girl arrived at marriageable age, and her father and mother were dead, Poseidon becoming enamoured made her his mistress and circularly enclosed the hill on which she dwelt, forming the sea and land into alternate zones, greater and less, turning as it were two out of land and three out of sea, from the centre of the island, all equally distant, so as to be inaccessible to men; for at that time ships and navigation were not known. And he himself, with his divine power agreeably adorned the centre of the island, causing two fountains of water to shoot upwards from beneath the earth, one cold and the other hot, and making every variety of food to spring abundantly from the earth. He also begat and brought up five twin male children; and after distributing all the Atlantic island into ten parts, he bestowed on the first-born of the eldest pair his mother's dwelling and the allotment about it—this being the largest and best; and he appointed him king of all the rest, making the others governors, and giving to each the dominion over many people and an extensive territory. He likewise gave all of them names—to the eldest, who was the king, the name of Atlas, from whom, as the first sovereign, both the island and sea were termed Atlantic; and to the twin born after him, who had received for his share the extreme parts of the island towards the pillars of Hercules, as far as the region which now in that country is called Gadeirica, he gave the name which in Greek is called Eumelus, but in the language of that country Gadeirus.

All these then and their descendants dwelt for many generations, as rulers in the sea of islands, and as we before said, yet further extended their empire to all the country as far as Egypt and Tyrrhenia. By far the most distinguished however was the race of Atlas; and among these the oldest king in succession, always handed down the power to his eldest son.

Many possessions indeed accrued to them, through their power, from foreign countries; but the greatest part of what they stood in need was provided for them by the island itself—first, such ores as are dug out of mines in a solid state, or require smelting;—and especially that metal 'orichalcum' which is now known only by name, but formerly of high celebrity, was dug out of the earth in many parts of the island, being considered the most valuable of all the metals then known, except gold: and it produced an abundance of wood for builders, and furnished food also for tame and wild animals. Moreover, there were comprised within it vast numbers of elephants:—for there were abundant means of support for all animals that feed in marshes and lakes, on mountains and plains, and so likewise for this animal, which by nature is the largest and most

voracious of all. Besides these, whatever odorous plants the earth now bears, whether roots or grass, or woods or distilling gums, or flowers or fruits—these it bore and produced them to perfection. And yet, further it bore cultivated fruits, and dry edible fruits such as we use for food:—all these kinds of food we call vegetables—together with all that trees bear, as drinks, meats, and ointments; and those also, whose fruits, such as acorns, being used in sport and pleasure, are with difficulty hoarded up, together with certain dainty fruits for dessert that might provoke the satiated palate, or please the sick;—all these that once existing and warmly acclimated island bore, sacred, beautiful, wonderful, and infinite in quantity. Receiving all these, then, from the earth, the inhabitants employed themselves also in erecting temples, royal habitations, ports and docks over the whole region.

The temple of Poseidon himself was a stadium in length, three plethra in breadth, and of a height to correspond, having something of a barbaric appearance. All the outside of the temple, except the pinnacles, they lined with silver, but the pinnacles with gold:—and as to the interior, the roof was formed wholly of ivory variegated with gold and orichalcum. They also placed in it golden statues, the god himself being represented as standing on a chariot holding the reins of six winged horses, of such a size as to touch the roof with his head. and round him a hundred nereids on dolphins; * * and it contained also many other statues dedicated to private individuals. Round the outside of the temple likewise golden images were placed of all the men and women that were descended from the ten kings, and many other large statues, both of kings and private people, both from the city itself, and the foreign countries over which they had dominion. There was an altar too, of corresponding size and workmanship with these ornaments; and the excellence of the palace was proportioned to the magnitude of the government and also to the order observed in the sacred ceremonies.

Next, they used fountains both from the cold and hot springs, of which there was a great abundance, either of which was wonderfully well adapted for use from its sweetness and excellence; and round them they fixed their habitations and excellently watered plantations, together with their water tanks, some open to the heaven, but other for winter use roofed over for warm baths.

On crossing the three exterior harbours, one was met by a wall which went completely round, * * and enclosed in one the entrance to the canal and the entrance to the sea. The whole of this part indeed was covered with many and densely-crowded dwellings;—and the canal and largest harbour were full of vessels and merchants coming from all parts, causing from their multitude all kinds of shouting, tumult, and din all day long and the night through.

The whole region was said to be exceedingly lofty and precipitous towards the sea; and the plain about the city, which encircles it, is itself surrounded by mountains sloping down to the sea, being level and smooth, all much extended, three thousand stadia in one direction, and the central part from the sea above two thousand. And this district of the whole island was turned towards the South: * * The mountains around it too

were at that time celebrated, as exceeding in number, size and beauty all those of the present time—having in them many hamlets enriched with villages, as well as rivers, lakes and marshes, furnishing ample supplies of food for all cattle both tame and wild, with timber of various descriptions, and in abundant quantity for every individual purpose. The plain then being thus by nature, was improved as follows by many kings in a long course of time. It was of square shape mostly straight and oblong; and where it ended, they bounded it by a trench dug round it, the depth, breadth and length of which, for a work of man's making, besides the other connected undertakings, we can scarcely believe, though still we must report that we heard. It was excavated to the depth of a plethrum, and the breadth was a stadium in every part, the whole excavation round the plain being ten thousand stadia in length. This receiving the streams coming down from the mountains, and conducted all round the plain, approached the city in some parts and in this way was allowed to flow out to the bay. From above, likewise, straight canals were cut about a hundred feet broad along the plain, back into the ditch near the sea, distant from another about one hundred stadia:—and it was by this that they brought down the timber from the mountains to the city, and carried on the rest of their shipping traffic, cutting transverse canals of communication into each other and towards the city. Their harvest also they gathered twice in the year; in winter availing themselves of the rains, and in summer introducing on the land the streams from the trenches.

As to the quantity of land, it was ordered, that of the men on the plain fit for service, each individual leader should have his allotment, each allotment amounting in extent to a hundred stadia, and the total of the lots being sixty thousand; and of those from the mountains and the rest of the country there was said to be an incalculable number of men, to all of whom, according to their dwelling and villages, were assigned certain lots by their respective leaders. To each leader, likewise, the task was appointed of furnishing for war the sixth portion of a war chariot (to make up a total of ten thousand), two riding horses, and a two-horse car without a driver's seat, having a mounted charioteer to direct the horses, with another to dismount and fight at the side—also two heavy-armed soldiers, two archers, two slingers, three each of light-armed men, stone-shooters, and javelin-men, with four sailors to make up a complement of one thousand two hundred ships. Thus were the military affairs of this city arranged. And as respects the nine others, there were different other arrangements, which it would be tedious to narrate.

And as respects official situations and honors, the following were the arrangements made from the commencement:—Of the ten kings, each individually in his own district and over his own city ruled supreme over the people and the laws, constraining and punishing whomsoever he pleased: and the government and commonwealth in each was regulated by the injunctions of Poseidon, as the law handed them down: and inscriptions were made by the first kings on a column of orichalcum, which was deposited in the centre of the island in the temple of Poseidon, where they assembled every fifth year (which they afterwards changed to every sixth year), taking an equal part both for the entire state and its supernumeraries; and thus collected they consulted concerning the common weal and inquired what transgressions each had committed, judging them accordingly.

Such then and so great being the power at that time in these places,

the Deity transferred it these regions, as report goes, on the following pretexts:—For many generations, as long as the natural power of the god sufficed them, they remained obedient to the laws and kindly affected towards the divine nature to which they were allied.

But when the divine portion within them became extinct through much and frequent admixture of the mortal nature, and the manners of men began to hold sway, then through inability to bear present events, they began to exhibit unbecoming conduct and to the intelligent beholder appeared base, destroying the fairest among their most valuable possessions. • • Zeus, however, the god of gods, who rules according to the laws, and is able to see into such things, perceiving an honorable race in a condition of wretchedness, and wishing to inflict punishment on them that they might become more diligent in the practice of temperance, collected all the gods into their own most ancient habitation, which indeed being situate in the centre of the whole world beholds all things • • and having assembled them, he said,

Thus abruptly ends the Critias. If completed, the termination has been lost. The extracts from this dialogue and from the Timæus will sufficiently show the form which the mythus had then assumed.*

Such is the narrative which has served as a text for the learned labours of Bailly, Rudbeck, Kircher, Beckman, Buffon, Whitehurst and others. It might seem superfluous to revive the discussion of this *vexata quæstio*, already handled by writers of acknowledged eminence. But the ever-widening circle of human knowledge permits to all to supplement, or illustrate, however imperfectly, the speculations of those who have gone before; and the recent investigations in relation to the Basques and their language, the deep-sea soundings of the Atlantic, and the amber-fauna of central Europe, seemed to present in this connection some points of interest worthy of consideration.

The island of which Plato discoursed and Pindar sang, has indeed, long since passed away, and its memory has become enshrouded in the mists of poetry and fable. The very echoes of its story have well nigh died into silence. Scarcely can we realize the remoteness of its existence. The scale of our own chronology shrinks to a point; and the effort to scan with any certainty the secrets of that

* In these extracts the translation of Davis, based on the text of Stallbaum, has been generally followed. Compare also Diodor, Sic. iii. 207, and Amm. Marcell. i. 17.

abyss of time seems, in its futile presumption, alike profitless and vain.

Yet, if traces are anywhere left of the sacred isle and its tenants, it would appear reasonable to expect them on the borders of the North Atlantic, on the edge of that sea of marvels and mysteries (still called by the Arabs "the sea of darkness"), whose surges once broke upon their shores.

There yet remains, on the Eastern strand of the Atlantic, a people isolated from all others, standing ethnologically alone, and having no affinity with the existing families of nations; strange and solitary as some old-world denizen of the Saurian age that had lived on through many geological cycles, outliving its fellows and congeners, to confront at last the widely dissimilar types of contemporary being. Such is the Euskarian people, the Escaldunac or Basques, the lineal descendants of the ancient Iberians, who, in their turn, standing similarly apart from the rest of Europe, and possessing a literature which was already old in the days of Strabo, seem to represent some more ancient stock, whose existence stretches far back into the grey dawn of time.

The ethnologic isolation of the Basques rests mainly on linguistic grounds. Their language, the Euskara, differs widely from all others both in structure and vocabulary. Attempts have been made to connect it with the Hungarian or Madjari, with the less conspicuous Ugrian dialects of the Baltic, with the agglutinative tongues of central Asia, and even with the surrounding romance languages or daughters of the old Latin, but alike in vain. Like the mutable genie of the Arab tale, it eludes at every turn the grasp that would retain it. It remains an unsolvable enigma, a perpetual puzzle, a *pièce de résistance* for laborious continental professors. Elsewhere and with other tongues there is influence and interchange, connection and derivation; this one alone rises unconformably amidst them all like the product of an earlier formation or the mountain-peak of a drowned world.

There are many things which suggest its great antiquity as a language. The pronouns, which elsewhere are for the most part

irregular in declension, are here regular throughout. In all that great family of languages which has been called the Indo-European, as comprising the European congeners of the Sanscrit, the pronominal inflections have a broken and disjointed aspect, as if made up of the fragments of earlier and dissimilar forms. Thus the classical *ego* is as different from the genitive *mei* as is the Russo-Slavonic *ja* from its possessive *menju*. Something of an analogy is presented to the conglomerates and breccias of the geologist, the cemented gravels and shell-mosaics, made up of portions of older rocks. Again, the peculiar phonesis of the Euskara points to a remote era; its mute consonants being hard and pure, unlike the aspirate and sibilant phonesis of later growths. It delights in K, T, and P sounds, and in its vocalization the pure sounds A, I, and U, are largely predominant. Farther, as might be expected in a language that has come down to us from primeval times, the few lexical affinities which can be traced are shared among widely dissimilar tongues now lying far apart on the earth's surface. A few of its words are Coptic. Rask saw a likeness to the Finnish. William von Humboldt traced a resemblance to Attic Greek. Old in years, its vitality, as well as the extent of its original area, must have been great, to enable it to resist influences which would have been fatal to a dialect less old, less widely spoken, or less firmly implanted. During the entire middle ages it was never a written language. Less deeply rooted, it would have disappeared altogether. Receding everywhere, it still lives. Within the last thirty years it has lost eight leagues of territory in Spanish Navarre alone. Yet it still endures, an ancient oak with little but the stem remaining. The old forms are still preserved. Among these are some which seem analogous to those of Eastern lands, to the Kharma-dharaya compounds of the Sanscrit, where two words, a noun and its attribute for instance, are so closely united that the latter only is subject to change or inflection, the former remaining in its crude form, and both together being fused into one inseparable compound. In the Sanscrit, this fusing together of words is carried to a startling extent, particularly in the class of descriptives or epithetics known as Ba-

huvrihi compounds. Thus in speaking of a certain river an epithet is applied to it consisting of one compound word, which word signifies, "Whose waters were sanctified by the bathing of the daughter of Janaka."

Again, the Euskarian radices or roots themselves are of a confessedly antique type:—monosyllabic, aerial, untranslatable in themselves, fulfilling no specific grammatical function, but conveying the central abstract idea, whence, as from a vitalizing germ, radiate the forms of all inflectional and conjugational bases. It is scarce necessary to revert to the fact that all language has three determinate stages: first, the monosyllabic, represented by the Chinese, where, as Bunsen has expressed it, "every word is a magnetised mineral, forming itself without any outward change into polarity (the nominal and the verbal pole), and thus having for its centre, as the indifferential point between the two, the adjective participle quality. Position assisted by accent elicits the polarity required or reduces the word to its indifferential point. The Chinese expresses 'daylight' by two words signifying in exactly the same order *dáy-light*: but he cannot condescend to subordinate the second to the first by saying, with one accent, *dáy-light*. If he could, the spell of monosyllabism would be broken." The slowness of mutation here approaches that of the great cosmical changes of the universe. It is only after a literature of four thousand years, that some of these unchangeable Chinese roots are beginning to be used as signs of grammatical relations. In the second or agglutinative stage something of a chrystallization has taken place among these isolated centres of thought, and polysyllabic words have been formed, the tone-syllable constituting the axis, as it were, around which the others are built up, thus forming one organism out of many syllables. In the final or inflectional stage, comprising the Semitic and Aryan groups, the material and formative parts of a word are fused together so intimately as to be not always distinguishable. Speaking in general terms, the second division may be said to be represented by the great Turanian family of languages, holding the main land of the great Asiatic conti-

nent; while the peninsulas of Europe and India are Aryan, and that of Arabia is Semitic. The first or isolating class, with its many centres of life, and its polype like diffused vitality, may be not inaptly compared to the radiate division of the animal world, while the Articulata may afford an analogue to the Turanian class, where syllable is agglutinated to syllable by an almost vegetative process of development.

At the head of the sporadic Turanian dialects of Europe has been provisionally placed the Euskarian or Basque. But the Turanianism of the Basque differs widely from that of its supposed nearest congeners, the Finnish and Hungarian. These latter have a peculiar euphonic system, in virtue of which hard and soft vowels cannot stand together in the same word; and when a vocalized affix is added to a stem-word having a vowel or vowels of an opposite class, a species of "umlaut" takes place, and the vowel of the affix is conformed to the vocalization of the stem-word. The same principle appears abundantly elsewhere, as, *e.g.*, in the plural of Icelandic verbs and nouns, and throughout the *Maeso-Gothic* of Ulphilas. Nothing of this kind is to be found in the Basque, either in the modern improvisations of the Escaldunac peasant, or in those venerable war-songs which, bridging the gulf of many centuries, relate the struggles of their ancestors, the "indomiti Cantabri" of Horace, with the armed legionaries of Rome.

Nor is it altogether unworthy of observation, that there is, in the character of the Basque literature, that which hints at the effete civilization of a most ancient people. Literatures, like men, grow old. Old in an irrepressible sadness, in something of bitterness and sarcasm, in that keen appreciation of men and things which is derived from commerce, from crowded intercourse, from long experience alone. The oldest utterance is lyrical: and from the Vedic hymns to the sententiousness of wordly-wise proverbs is a transition from infancy to declining years. To revert from the contortions and rose-tinted sentimentalism which stamp the anility of a people to the *Heimskringla* or the fresh sagas of the North, is to exchange the unwholesome air of a theatre for the clear beauty

of the morning. Even below the throbbing life-pulse and muscular vitality of Homer himself we detect a despondency not unnatural in one who, receiving the last echoes of Lydian song, and wielding a language already perfect with the growth of centuries, may be said to stand at the close of a cycle rather than at the beginning. Such in its main attributes is the literature of the Basques. Such in particular is that of the Labourdan branch, as collected by Francoisque Michel : sententious, artistic, sombre in tone, and rich in proverbs and apothegms of a most shrewd and practical wisdom.

Whence then did this people originate? Thus old, thus different from all others, and cut off on the East by an impassable chasm of unrelated dialects, whence did they come, or by what path did they reach their present home? May we believe that they came from the West, from some insular tract in the North Atlantic? Were there at first two opposing centres of civilization? And was the shock of their meeting dimly shadowed forth in the story of the Timæus; and commemorated by the panathenaic procession, wherein the peplus of the goddess depicted the defeat of the Titans, and the people returned thanks for their preservation from Western invaders? The Saturnian dynasty opposed to that of Jove, the war of the giants and the gods, Odin destroying Ymer and his offspring, have these a historic basis? Were it in our power to look back from some Pisgah-height on the long march of those who have preceded us, we might perhaps see how successive races, as waves of the sea, have swept over and renewed the face of the civilized world. Could our vision penetrate the mists of the morning, we might see how progress has alternated with retrogression, and how each ebbing wave has left the depopulated earth to return to the silence and desolation of its primeval forests. For decay is rapid as growth, and the traces of civilization are soon lost when the foot of the civilizer is withdrawn. It was thus that in Italy during the days of Belisarius and Narses, in France under the early Valois, and in Belgium—after the return of the Spanish provinces to the sway of the second Philip, the farms and orchards and palatial buildings, the busy roadways and all signs and tokens of content

and prosperity, disappeared altogether, in many districts, to be replaced by the dank vegetation of fen and forest, where the bittern brooded and the wild beast made his lair.

Do these various mythi, then, all converging to one point, receive additional confirmation from other and independent sources? Are there physical grounds to corroborate Strabo's opinion that the Island of Atlantis had an actual existence, and that the narrative of Plato is not all a dream?

Let us advert for a moment to the fossil flora of the brown coal formation of Germany, and the Molasse of Switzerland, both tertiary formations belonging to the Miocene age, as investigated by Professor Unger of Vienna.

The professor remarks on the amazing number of analogues which these fossils present to those of the flora of the Northern States of America, and shows that many of these strikingly resemble the trees and shrubs of the cis-Atlantic continent. Thus the magnificent North-American Tulip-tree, the "*Liriodendron tulipiferum*" of Linnæus, finds a representative in the Swiss Molasse, as also in Iceland, where both the leaves and fruit of the *Liriodendron* of Unger have been discovered. So the fruits and seeds of "*Pavia*" and "*Robinia*," found here and there in the brown coal, shew that these genera, now limited in America to a very inconsiderable area, formerly lived and flourished in Europe, where they are now looked on as exotics and, being introduced as such into gardens, are again naturalized in their primal home. Again, the nut is notoriously wanting in Europe: for the almost naturalized wall-nut is from the forest ridges of the Southern Caucasus: but the nut-fruit is found most abundantly in the brown-coal, and if these specimens be compared with the numerous American species, the resemblance will be found most striking, in particular if the so-called grey nut of America, the "*Juglans cinerea*" of Linnæus, be compared with the fossil "*Juglans tephrodes*" of Unger, it will be found difficult if not impossible to detect any difference.

It is remarkable too that while this connection exists with the

flora of the Western world, the plants of the neighboring Eastern continent are very sparingly represented in Europe.

Besides the instances of close remembrance already given, the professor has appended a lengthy list of other analogues, from which the following are extracted :—

In the European tertiaries, the fossil *Nyssa Ornithobroma* agrees with the American *Nyssa aquatica*.

The *Taxodium dubium*, with the *Taxodium distichum* ;

The *Platanus aceroides*, with the *Platanus occidentalis* ;

The *Ostrya Atlantidis*, with the *Ostrya Virginica* ;

The *Acer trilobatum*, with the *Acer rubrum* and the *Acer dasy-carpum* ;

The *Cercis radobojana*, with the *Cercis Canadensis* ;

The *Laurus primigenia*, with the *Laurus Canariensis* ;

The *Rhododendron megiston* (Ung.), with the *Rhododendron maximum* (Lin.) ;

The *Bumelia plejadum*, with the *Bumelia tenax* ;

The genus *Quercus* presents no less than eight fossil species, the *Tephrodes*, *Chlorophylla*, *Elaena*, *Myrtilloides*, *Apollinis*, *Drymeia*, *Lonchitis*, and *Daphnes*, which answer respectively to the species *Cinerea*, *Virens*, *Oleoides*, *Myrtifolia*, *Laurifolia*, *Xalapensis*, *Lancifolia*, and *Aquatica* of the American continent. In the same way the fossil *prunus* has two species, the *ilex* two, the *rhus* three, and the *pinus* fourteen, all possessing exact analogues in Northern America.

Farther, Professor Heer's examination of the fossil plants of the island of Madeira, shew the following parallelism with the fossils of the European tertiaries ;

In the tertiary Flora of Europe.

Woodwardia Rossneriana,
Pteris Göpperti,
Aspidium elongatum,
Cheilanthes Jaharpilii,
Myrica Salicina,
Persea Braunii,
Laurus princeps,
Clethra Teutonica,
Olea Osiris,
Salix varians,

Atlantic Flora of Madeira.

Woodwardia radicans,
Pteris arguta,
Aspidium affine,
Chilanthes fragrans,
Myrica Faya (Linn),
Persea Indica,
Laurus Canariensis,
Clethra alnifolia,
Olea excelsa,
Salix Canariensis.

Thus an interesting link of connection is supplied to the two great floras first considered.

On looking at the permanent character of the North American vegetation which seems to have changed but little since the Molasse period, whereas that of the Brown-coal has a character of exoticism and isolation, Professor Unger is led to the opinion that the "Bildung-centrum" the creative centre of the latter is the Southern part of the North American free States.

From this centre has America distributed to Europe its descendant Robinia, its Amber and Tulip-trees, its nuts, its maples, and so forth. As to the mode of transmission there are but two cases possible. Either the winged and wingless seeds and scions have been transported through the air, or by the ocean, to the Western shores of Europe, or a bridge of connection then existed which has been since destroyed. As to the air-travelling seeds, it is well known that these, either from their winged type or by the intervention of birds, frequently attain a considerable range of dispersion, but in no case a distance equal to the breadth of the Atlantic. Travelling by water, it has been no uncommon thing for plants to migrate from one continent to another. There are cosmopolites which the gulf-stream has brought from the coast of Mexico to Norway. It is to the ocean that the cocoa-nut palm owes its great range of extension. Not only does it travel well, but when thrown upon shoal or rock, if it find only a little poor white sand, which would support nothing else, the cocoa-nut contents itself there, finds brackish water not a jot less agreeable than the freshest, germinates, thrives, grows into a robust cocoa-tree. A tree being thus planted, fresh water comes, falling leaves create earth, other trees follow, and at length we see the noble palm-grove, which arrests the vapors: these eventually form a rivulet or river, which flowing from the centre of the isle make an opening of fresh water in the cincture of white sand, and thus keep the polypes, inhabitants only of salt water, at a respectful distance.* Thus an island has grown up amid the ocean.

* Michelet "La Mer."

But in reference to these modes of transmission it may be observed that the plants so diffused are few in number, and the range of operation is for the most part limited. In fact how little the sea is adapted for a medium of transportation, has been shown by the researches of Darwin, Berkley, Salter, and Alphonse de Candolle. According to the latter, of ninety-eight species which were submitted to the experiment, only nineteen retained the faculty of germination after a six weeks' immersion in sea-water, and after being immersed for three months, all with the exception of seven had either sunk, and so become incapable of further migration or had lost the power of reproduction. But the richness and variety of the Brown-coal and Molasse-flora are adverse to the supposition of any such mode of migration as those above indicated. In that insular period when Europe itself existed only as a group of islands, the outlines of the water-basins and arms of the sea being indicated pretty accurately by the configuration of the brown-coal deposits, and when the Eastern coast of the North American States, judging from the deep-sea soundings, and the wearing effect of the gulf-stream, extended in all probability much farther eastward into the Atlantic; if we look at the peculiar vegetation of Madeira, and bear in mind the fossil plants of Iceland, which though now bare and treeless, was then thickly wooded with a flora analogous to that of the brown-coal, we cannot doubt that some vast insular tract existed at this time in the North Atlantic, extending probably from Iceland in the North to Madeira in the South, and forming a bridge of connection between the two worlds.

At a meeting of German Naturalists at Kœnigsberg, in 1861, a lecture was delivered by Director Lœw, on the Diptera of the Amber-fauna. In this fauna the perfect preservation of even the smaller and more delicate animal organisms allows of a minute comparison with their existing analogues. After shewing their agreement with various North American species, and expressing a decided opinion that the existing intercourse between the two continents is not sufficient to account for the large number of

species common to both, the Director concludes,—“ The European and the American Dipterous-faunæ always appear to me like two branches of the same stock, each having had a development of its own, very similar, however, to the development of the other. But if there really was such a common stock for both, it is to be sought among the Diptera of a former geological period, and if the European and the North American Dipterous-faunæ are to be considered as branches of this stock, the necessary inference would be that at a former period Europe and America had a continental connection.

“ Are the Amber-Diptera preserved fragments of this common stock ? Did a continental connection between Europe and America really exist at the time when they lived ? Did the submersion of an Atlantis tear asunder the branches of this stock ? Was this catastrophe accompanied by changes which modified the general laws of development of the common stock in such a manner as to produce a difference between the further development of the stronger American branch, and of the weaker European one, a difference not excluding at the same time a great deal of analogy ? ”

It is possible that, when investigations now going on are completed, a still stronger argument may be drawn from the European and American Hymenoptera, a family less capable of dispersion or migration, and to which the sea would be an almost insuperable barrier.

The operations of Dr. Maury, in the North Atlantic Ocean, afford a remarkable confirmation of the hypothesis adduced. His deep-sea soundings shew that a raised tract, suggestive of a submerged island, which he calls the middle ground, lies midway in the Atlantic basin, extending from the latitude of Cuba to beyond Newfoundland, and having a breadth of from twenty to thirty degrees of longitude. The soundings on this plateau, which is of clay and sand, are from one thousand to eighteen hundred fathoms. All round, immediately beyond its outline, the sea goes plumb down another thousand fathoms, and beyond this lower terrace

there is another descent, where the Atlantic attains its greatest depth of about five thousand fathoms.

Neither is it necessary, if the existence of such an island be conceded, that the age of the human race be carried back to the period of the miocene. The island, possibly, did not sink beneath the waters before the close of the pleistocene or drift period. The various terraces round the highest level plainly point to an area of subsidence. There were sinkings at distant intervals, with long ages of rest between. It was not probably till the end of the pleiocene, that the island was reduced to its most limited extent, and subsequently became the abode of man. The old legends, retained by Plato, speak of terrible convulsions of nature, amid which Atlantis sank : can we suppose these narratives to retain a far distant echo of the throes and disturbances which preceded the modern geologic period ? Without doubt, if we review in thought the many ages that must have rolled away since the period of the pleistocene, it may appear startling to conceive of man as then existing ; and to compute the duration of our species on earth by thousands of centuries instead of the few thousand years usually assigned to it ; but there are many considerations which would incline to the belief that the antiquity of our race has been greatly underrated. The whole tendency of contemporary scientific inquiry sets in that direction : and year by year, as book after book appears, and discovery after discovery is made, the genesis of man recedes, and the date of his appearance seems farther and farther withdrawn.

Worthy of note, too, is the great number of recorded changes and convulsions of the earth's surface, too numerous and too considerable to be comprised within the received historic period. Nor are these given as mere myths by authors little deserving of credit, but as historic events handed down by tradition and placed on record by writers not wholly devoid of critical acumen, as Strabo, Herodotus and others. Strong and indelible must have been the memory of the disturbances, wherein the agencies of water-floods, earthquakes, and subterraneous upheaving seem to have been alter-

nately employed. It has been the parent of many myths, wherein superhuman beings have been represented in deadly warfare. The Samothracian priests had a tradition that the Pontus was originally a closed crater, and that afterwards, overflowing, it formed the Hellespont as its outlet, and separated Europe from Africa. That these two were at first one continent seems supported by the great similarity of the floras on the northern and southern shores of the Mediterranean. Crete is said to have formerly been part of the mainland, and in no other way does it seem possible to account for the presence on its mountain peaks of the *Capra Sinaica*, whose special habitat is between Sinai and Nubia. The island of Rhodes arose from the sea, and was subsequently inundated. Cos and Nisyros, originally one, were rent asunder and formed two islands. The valleys of the Thessalian Peneus, and the Laconian Eurotas were dried up. Cyprus, Eubœa, and Sicily, were violently separated from the main land. Mountain tops were cast down, as that of Taygetus. Earthquakes overthrew cities, as Sparta and Sicyon, or covered them with the waves, as the Bœotian Arne and Midea, and the Achaian Helice and Bura. Islands were torn asunder, as Therasia and Thera, or wholly submerged, as Chryse, near Lemnos. Capes, as Atalanta, were changed into islands, while others again were thrown up from the depths of the sea, as Hiera and Thia. Rivers were dried up, as the Bœotian Helios : or volcanoes suddenly blazed forth, as on Lemnos, the Arcadian Lycœum, and Methone in Argolis. The changes of the Caspian have given rise to the learned monograph of Kephallides, "*de Historia Maris Caspii*," scarcely two ancient writers agreeing as to its extent, form, or position, or as to the names, number and course of the rivers which it receives. Nor are oriental authorities wanting. The Chevalier Von Noroff, in a treatise published at Saint Petersburg, in 1854, has collected on this subject some curious extracts from Arab writers of the tenth century. One of these (Mas'ûdi, A.D., 943, 944), speaks of an old tradition that a bridge formerly existed at the strait between Spain and Africa, constructed of stones and bricks, over which passed camels and

beasts of burden. Under this bridge flowed the ocean tide, divided into small canals. The water of the Mediterranean, however, rose gradually, and in course of time submerged one tract after another. Finally, the water flowed over the bridge, which, however, could be seen below the surface, long after, by sea-faring men. Another similar tradition, preserved by El-Birûni, is that, in old time, a damp, brackish soil, covered with rank vegetation, extended between Egypt and Constantinople.

Neither, again, according to the ordinary chronology, would there seem to be space enough for the evolution of all the multitudinous mythi of antiquity. These mythi are the deposit of long ages of a people's history. It can be only after a great lapse of time that the suspended matter of a mythus, be it historic, religious, or physical, becomes at length precipitated, or rather slowly deposited, and assumes a concrete and palpable form.

There may be those who think that the fossils, the cave-relics, and other signs and evidences of man's primeval occupancy, should be yet more numerous to warrant any certain conclusion. To these it may be replied that the ocean-bed is beyond the grasp of the geologist, that scarcely a tenth of the whole dry land has been surveyed, and of that tenth but a small part belongs to the tertiary or post-tertiary age.

And what, indeed, can be more reasonable than to suppose that when the earth was prepared for his reception, man should appear? In those primal azoic ages, when as yet the dry land was not, and our planet rolled onward through the void, covered with a boiling sea, and shrouded in vapours, so that emphatically, "Darkness was on the face of the deep," then, of course, his existence would have been an impossibility. So, also, during the time when those strange ganoids and placoids held their solitary sway; or later, when the dynasty of fishes was succeeded by that of reptiles, and the lias and oolite displayed their wondrous reptilian fauna. But at the close of the secondary period, there was a pause, a pause of expectancy. The crowning glory of creation, the centre of the mute prophesying of innumerable ages, man, the latest born and

highest of terrestrial creatures, was about to appear. With the tertiary a new order of things arises : it has been said that it possesses scarcely a species in common with the preceding age,—that two planets could hardly differ more in their natural productions ; and this break in the law of continuity is the more remarkable, as hitherto some of the newly-created animals were always introduced before the older was extinguished. It was a period of rest and tranquility ; an exultant and abounding age. Creatures of a high order, the largest of the land mammalia, moved through the luxuriant herbage, or enjoyed the shady coolness of the riverside. And still, with the ever-widening dawn, the resemblance to our own world increased. The stately ruminants of the forest—the elk, the stag, and the bison appeared. The horse waited for his rider, and the steer for the yoke of the husbandman : flowers, like our own, enamelled a thousand fields, and the lark, as now, filling the air with song, soared upward to the gates of heaven.

And thus, the conditions of vitality being there, it is difficult to conceive of life itself being absent. Everything around us, the blade of grass, the drop of dew, teems with living beings. Life is enjoyed everywhere to the uttermost. There is no space lost. And not only is life present, but life advanced to the farthest degree of perfection which the supplied conditions will allow. The elements being given, the organism is the unfailing product, and the Promethean spark kindles at once into being. If human life then was possible during this period, we may rest assured that human life was there.

And they, the dwellers in their island-home, how lived they ? What was their history ? May we believe with Plato, that they became prosperous, rich, powerful,—were ruled by wise kings, received tribute from the neighbouring islands, and had long years vouchsafed to them of peace and plenty ? And, finally, after sending out migratory swarms eastward, and perhaps westward, how did their island disappear ? Was it submerged slowly ? Or did it sink suddenly in ruin ? We cannot tell. All is dark and uncertain. Yet, with the onward march of science, the day

may perhaps come when its historic actuality will be made plain as the fact of its geological existence. Whatever the power and greatness of the old Atlantis, all now is vanished as a dream, lost and engulfed in a barren wilderness of waters. Festivals, processions, the meetings in the market-place, and uproar of congregated thousands, all is silent now. The ocean keeps its secret : summer and winter, sleet and sunshine, pass over its surface, but no sound or echo comes to tell of the sleepers below. Yet here, haply, were human affections and friendships, and all the incidents and realities of life. And when the suddenness of desolation fell upon them, it must have been with no ordinary pang that these children of the morning resigned the rich blessings they enjoyed, and descended into that darkness where as yet no Teacher had gone before. Buried thus in the lava and scorïæ of volcanic action, who can tell what subtle agencies of nature have since been at work ? Who can say whether the infiltrated fluid, charged with calcareous or silicious earth in solution, may not, in the interval preceding the final submersion, have lapidified these sleepers, have turned them into stone, like the fossils and reliquiæ which form the study of the curious ? If so, it may be that when, in the oscillations of the earth's crust, the Island of Atlantis, covered with its subsequent deposits, again rises to the surface, some future geologist may lay bare the secrets of that last convulsion, may gaze with reverence on the first-born of our race, and again expose to air and sunshine the reveller with his rose-wreath, the hierarch with his staff, and the mailed monarch with his sceptre and his crown.

PAPER IX.—ON THE SECULAR CHANGE OF MAGNETIC DECLINATION IN CANADA, FROM 1790 TO 1850.

FROM THE RECORDS OF THE DEPARTMENT OF CROWN LANDS.

By E. T. FLETCHER, Esq.

(*Read before the Society, 17th May, 1865.*)

It has occurred to me that an examination of the various Returns of Survey of record in the Department of Crown Lands might be, to some extent, useful in furnishing additional data for the solution of that interesting problem in magnetic science which proposes to determine the limits, causes, and elements of the secular deflections of the magnetised needle. It is obvious that reliable observations in different parts of Canada, if obtainable, would be of great value, from the immense extent of the colony from north-east to south-west, nearly at right angles to the presumed direction of the magnetic isogonal lines. The records of the Department I have mentioned, comprising, as it does, the old Surveyor General's Offices for Upper and Lower Canada, and constituting, with its other formerly independent branches, rather a federation of offices than one Department alone, reach back for a full century; nay, even further, if we include the ancient seigniorial concessions and various special land descriptions of a date anterior to the conquest. As a surveyor attached to the Department for the last four and twenty years, I could not be blind to the possibility of some good from this source, though a closer examination of the older records has, it is true, somewhat lowered the expectations I originally entertained by shewing me how little, comparatively, of substantial and reliable fact was obtainable from these voluminous files, and that for these reasons:—In the first place, by far the greater part of the older surveys were performed by the needle alone, without

reference to the true or astronomical bearing ; in these, therefore, there was no mention of magnetic variation or declension ; the only exception was where the side-lines of seignories were concerned, which, by the old French arrêts or réglemens, were required to have a fixed astronomical bearing—that is, due north-west and south-east on the St. Lawrence, and *nord-quart de nord-est*, or north $12\frac{1}{4}^{\circ}$ east, on the Ottawa. In these cases the surveyors were compelled to lay off a true meridian, and thus the variation was not unfrequently noted. In the second place, some surveyors seem to have carried the variation with them from one part of the country to another, and, having compared their circumferentor with the meridian stones set up at Quebec and elsewhere, to have travelled off with the variation thus obtained as a fixed and unchangeable element, good for all parts of the district. Thus the surveyor intrusted, some seventy years ago, with the survey of the Yamaska, the Richelieu, or the Chateauguay rivers, might possibly start from Quebec by batteau (for as yet steamers were not) for Three Rivers, and, having spent perhaps a week or ten days in the voyage, if the wind was unfavorable, would, on landing at the latter town, compare with every possible minuteness and care the magnetic bearing shewn by his circumferentor with the true north and south line given by the meridian stones. This done, he formally notes in his field-book or journal: “ je trouve donc que la variation de mon instrument est de dix degrés trente minutes;” and this ten degrees thirty minutes goes with him throughout an operation of perhaps many miles in extent as a constant and unalterable companion. Yet far be it from me to deery the merits of these patriarchs of the profession. Though sometimes a little shaky in theory, in practice they were frequently admirable: I have myself had frequent occasion to verify the accuracy of their work, and the journal of their operations shows a wonderful dexterity, quick-wittedness, and fertility of resource under difficulties. At times on the verge of starvation, or annoyed by the wild animals which at that time swarmed everywhere, or running dangerous rapids on small rafts, and losing perhaps some

one of the party, they seem to have been always prompt, fearless, and uncomplaining, knowing their duty, and striving, like honest men, to perform it faithfully and well. Other causes of unsatisfactory observations are to be found in the entire ignoring the diurnal and annual variation, and in the imperfectness of the instruments themselves. Local attraction and disturbances have also been a frequent cause of error. As a proof of the liability to error from observed declination, where the diurnal or annual variation is not taken into account, I would only instance the annual variation, greatest, as is known, in June and July, and least in December and January. From the records of the Toronto observatory it appears that in January, 1841, the observed declination was $1^{\circ} 11' 1''$; in June and July of the same year it was $1^{\circ} 17'$; while in the following year, 1842, the declination was in January $1^{\circ} 14'$, and in June and July $1^{\circ} 20'$. Thus the declination at Toronto, though increasing from year to year, is yet greater in June and July, 1841, than in January, 1842.

The observations of later days are free from many of these errors. The instruments now in use are of improved make and more accurate construction. The causes which influence the local and periodic disturbances of the needle are better understood and more clearly appreciated. The course of study, also, now required from candidates for the profession, is of wider scope than formerly. A reference to the 77th chapter of the Consolidated Statutes will shew the various branches of physical and exact science which form part of the course. Each candidate is subjected to two examinations: one on mathematical subjects alone, before being indentured; and a second, embracing all subjects, at the expiration of his term, and before receiving his diploma. There appears, therefore, reason to believe that in future, as now, magnetic observations of this kind may be received as, in general, reliable.

Towards the close of the last century, fixed meridian stones were laid down at Quebec, Three Rivers and Montreal. They are frequently referred to in the old returns of survey, and must have been of great use in determining the secular change of declination in those several localities.

On eliminating with care from the observations of record, giving priority of place to those which were obtained by direct observation of Polaris or of the Sun, or by comparison with the meridian stones, the following facts appear to be established:—

There has been a fluctuation or oscillation in Canada, as elsewhere, of the amount of magnetic declination. At Quebec, this horizontal deflection, which in 1649 is said to have been 16° W., and in 1686, $15^{\circ} 30'$, was in 1785, $12^{\circ} 35'$, and in 1793, $12^{\circ} 5'$ according to Major Holland, Surveyor General at the time. In 1805 it appears to have reached its minimum, being then only $11^{\circ} 35'$ in the same locality. In 1810 it had increased to $12^{\circ} 30'$, and since then it has either been stationary or slowly increasing up to the present day, when it is over 16 degrees. From 1821 to 1831 it appears to have remained unchanged at 13° . In 1840 it had reached $13\frac{1}{2}^{\circ}$; in 1845 it was about $14\frac{1}{2}^{\circ}$; in 1850 it may be set down as $15\frac{1}{2}^{\circ}$, and at the present day it is stated to be $16^{\circ} 40'$.

In Toronto the rate of increase appears to be about three minutes annually since 1840.

These fluctuations are susceptible of explanation on the well-known hypothesis of Hansteen, the Norwegian professor, who found that the supposition of two northern and two southern magnetic poles would best accord with the observed phenomena of terrestrial magnetism. Of these two northern poles one is stronger than the other, the ratio of intensity being about as 17 to 10. There is also a stronger and a weaker southern pole. The place of the stronger north pole was in 1790, in W. longitude $95^{\circ} 37'$ and in N. latitude 70° . The weaker north pole was then in E. longitude $127^{\circ} 30'$ and in N. latitude $85^{\circ} 30'$. In 1820 the stronger north pole was six degrees farther east, or in W. longitude $89^{\circ} 24'$, while the weaker north pole had meanwhile moved nearly thirteen degrees further east, and was in E. longitude $140^{\circ} 6'$ and in N. latitude $85^{\circ} 12'$, and finally in 1850, the stronger north pole was in W. longitude $83^{\circ} 10'$ and latitude $69^{\circ} 14'$, while the weaker pole had moved forward to $150^{\circ} 40'$ of E. longitude and 85° of N. latitude.

Thus both poles move towards the east, but the weaker much more rapidly. Having therefore given the position of these poles at any time, and their relative intensity, it is not difficult to compute, by the doctrine of the composition of forces, the precise place of the resultant pole or that resulting from the two forces combined, and to which may be referred, as the true and absolute magnetic pole, all the observed phenomena of deflection. It will then be seen that this resultant pole sometimes moves to the east, sometimes to the west, and at others appears to pause and remain stationary for several years in succession.

In connection with this subject, I submit also a table of the magnetic declination at Quebec for several years, from 1649 for two centuries onwards, and also a table of Lower Canada declinations towards the close of last century. These tables are compiled almost wholly from the field-books, plans and *procès-verbaux* of surveyors, and from other official records. Among the most valuable materials are the recorded amounts of declination which in old times each surveyor found his circumferentor or theodolite to shew when compared with the meridian stones already ad-verted to.

I have also consulted a list of Upper Canada declinations, obligingly communicated to me by Mr. Russell, the Assistant Commissioner of Crown Lands, to whom the profession is in many ways largely indebted; but of these, the older observations appear to be so much at variance, and so hard to reconcile, that I have thought it best to abstain for the present from any publication of its contents, until I could see a little more clearly into the matter.

THE DECLINATION OF THE MAGNETIC NEEDLE AT QUEBEC,
DURING SEVERAL YEARS.

DATE.	DECL'N WEST.		REMARKS.
	o	'	
1849	16	00	From Encyl. Brit.—Article "Magnetism."
1866	15	30	do do
1875	12	35	Surveyor General Holland.
30th June, 1789	11	45	Louis Perrault, P.L.S.
22nd June, 1791	13	00	Pierre Beaupré, P.L.S.
24th March, 1792	12	15	J. B. Demers, P.L.S.
9th May, 1792	13	09	A. Desery, P.L.S.
16th May, 1792	12	00	Ch. Turgeon, P.L.S.
do do 1793	12	15	Fr. Legendre, P.L.S.
19th November, 1793	12	05	Surveyor Gen. Holland.
— April, 1805	13	00	J. C. Antill, P.L.S.
5th June, 1810	11	35	Reg. A., fol. 117, Dept. of Crown Lands.
— June, 1811	12	15	do fol. 131, do
2nd October, 1820	12	15	do fol. 143, do
— November, 1820	12	30	P.L.S. Bourdages.
25th August, 1821	12	35	do Livingston.
— September, 1821	12	15	Jno. McNaughten, P.L.S.
— September, 1821	13	00	A. Cattanaoh, P.L.S.
28th November, 1821	13	00	W. Ware, P.L.S.
21st January, 1822	13	20	E. Tetu, P.L.S.
do do 1822	13	00	Jos. Hamel, P.L.S.
26th April, 1822	13	00	Ph. Verrault, P.L.S.
— May, 1822	13	00	P. J. Bureau, P.L.S.
26th March, 1823	13	00	Reg. A., fol. 162½.
12th May, 1823	13	00	N. La François, P.L.S.
3rd October, 1823	13	00	D. S. Ballantyre, P.L.S.
23rd October, 1823	13	00	Jos. Gamahe, P.L.S.
14th November, 1823	13	00	A. Bochet, P.L.S.
2nd March, 1824	13	00	L. Dorval, P.L.S.
20th July, 1831	12	40	A. Cattanaoh, P.L.S.
Autumn of 1831	13	10	Thos. Carrol, P.L.S.
6th September, 1831	13	00	Jos. Hamel, P.L.S.
10th December, 1831	14	00	H. Corey, P.L.S.
— May, 1832	13	12	John Newman, P.L.S.
— May, 1833	13	00	Reg. B., fol. 36.
— July, 1833	12	30	do fol. 43.
10th March, 1834	13	00	do fol. 43.
— July, 1834	13	00	Reg. A., fol. 197.
— December, 1835	13	00	Reg. B., fol. 61.
— May, 1839	13	00	do fol. 69.
— May, 1839	13	10	do fol. 85.
20th May, 1840	13	00	do fol. 66.
14th September, 1840	13	30	do fol. 144.
7th December, 1842	13	35	do fol. 154.
— December, 1846	13	50	R. M. Moore, P.L.S.
17th September, 1847	13	35	Procès-verbal by Jos. Bouchetta, D.S.G.
20th September, 1847	13	50	Reg. B., fol. 231.—Anse des Meres.
13th October, 1847	14	32	do fol. 318.—La Canardière.
	15	30	do fol. 316.
	14	45	do fol. 262.
	13	40	do fol. 269.

THE DECLINATION OF THE MAGNETIC NEEDLE AT QUEBEC,
DURING SEVERAL YEARS—(*Continued*).

DATE.	DECL'N WEST.	REMARKS.
	° ' "	
— February, 1848	15 15	Reg. B., fol. 277.
23th June, 1848	14 00	do fol. 299.
— October, 1848	14 30	N. LeFrançois, P.L.S.—Field-Book, C. 50.
3th March, 1849	15 30	Reg. B., fol. 316.
8th July, 1849	15 15	Reg. C., fol. 5.
— April, 1850	15 15	do fol. 13.
Autumn of 1851	15 00	do fol. 33.
19th January, 1853	15 30	Reg. B., fol. 320.
1865	16 40	

QUEBEC, 17th May, 1865.

TABLE SHEWING THE DECLINATION OF THE NEEDLE DURING THE LAST CENTURY, IN CANADA EAST.

LOCALITY.	Date.	Var.		Name of Surveyor.	REMARKS.
		o	' W.		
Line between Seigniories of Rigaud, Vaudreuil and St. Joseph, and on the River Chaudière.	18th Sept., 1782...	15	00	Hon. J. Collins.....	From <i>procès-verbal</i> .
Point Fortune, on the Ottawa.....	22nd Sept., 1791..	8	00	Louis Guy	From <i>procès-verbal</i> .
Line between Seigniories of Beaupré and Beauport, near Falls of Montmorency.....	12th July, 1792...	12	00	J. B. Bédard.....	Do.
Intersection of line between Seigniories of Ste. Marie and St. Joseph, with the Chaudière River	25th Sept., 1792...	11	30	F. Legendre.....	Do.
Fishing town of Percé (Gaspé).....	1792....	16	00	Wm. Vondenvelde	Plan of Percé, by W. V.
N. W. corner of the township of Shefford.....	31st Oct., 1792....	11	05	Jesse Penoyer	Field-Book of Survey.
Confluence of the Rivers Chibouette and the Yamaska (Seigniorly of DeRamsay).....	26th March, 1792.	8	30	Th. dePincier.....	Do. obtained by comparison of compass with stone boundaries having a due N.W. bearing.
Intersection of the line between Seigniorly of St. Charles and Seigniories of St. Austin and St. Denis, with the River Chambly.....	April, 1792..	10	50	S. Z. Watson.....	Do. obtained by comparison of compass with three large cider posts planted to shew a due N.W. bearing.
At two boundary stones between the Seigniories of Sorel and St. Ours, on the west bank of the River Chambly.....	Do	11	00	Id.....	Do. obtained by comparing compass with the stones which were planted to shew a due N.W. bearing.
Town of Three Rivers.....	26th July, 1792...	9	45	J. Macdonell.....	Do. taken from the meridian stones.
Intersection of the Province line and the River Richelieu	3rd Nov., 1792.....	7	00	W. Dibble.....	Do.
City of Montreal.....	26th July, 1793...	8	15	Jern. McCarthy....	Do. taken from the meridian stones.
South line of Stanstead, near Lake Memphrémagog.....	October, 1794.....	8	00	J. Kilborn.....	Do.
North line of Hereford, Lot No. 1.....	7th March, 1795...	9	00	Jos. Rankin.....	Do.