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CHARACTERISTIC DIFFERENCES BETWEEN THE MALES AND THE FEMALES OF LEPIDOPTERA.

The intention of the writer is not to examine these differences in all the species of Lepidoptera, but only to expose some general laws which govern this matter. Although few are absolute, they are however interesting enough to deserve the attention of entomologists. This paper will be restricted to the differences which are apparent to the most casual observer and will leave out those which are beyond the reach of easy observation.

The most characteristic difference between the two sexes of Lepidoptera is the size; the females are generally larger than the males in the four stages through which Lepidoptera pass (egg, caterpillar, chrysalis, and perfect insect). This character, very remarkable in Satyrus Phædra, Thecla Betula, Bombyx quercus, etc. belongs to nearly all the species. Exceptions are scarce; we know only two butterflies, Nemeophila russula and Fidonia atomaria of which the females are smaller than the males.

Another general difference is to be found in the color of the wings, which is in the females paler than in the males. As examples we may mention the female of Colias Hyale, which is yellowish white, while the male is of a sulphur yellow color. We may also name *Argynnis Aglaia*, *Erbia Medea*, *Spilothyrus althea*, *Lasiocampa populifolia*, etc. in which the male is always darker than the female. When the males have some spots or markings on the wings, it is noticeable that the females have generally larger and more numerous spots. This character can be easily seen in *Pieris Briassicæ*, *Erebia Cassiope*, *Chionobas Olle*, etc. Sometimes even the male has no markings, while the wings of the female are more or less spotted. This occurs in *Polyomnatus Eurydice* and *Lycæna Argiolus*.

Besides these differences in size and in color, there is a marked

dissimilarity in the form, the wings of the female being always less angular than those of the males, as it is very apparent in *Vanessa polychloros*, *Satyrus Ogeria*, *Polyomnatus Phlœas* and *Argynnis paphia*.

The characteristics we have just enumerated are common to all the insects of the Order Lepidoptera. We will now speak of some others less general and peculiar only to a family, a tribe or a genus.

In the large groups called Heterocera (Sphinges and Bombyces), the two sexes often differ from one another in the antennæ, which are thicker in the males than in the females. As examples we may mention Liparis Dispar, Urapteryse sambucaria, Cymatophora flavicornis, Emydia grammica. Sometimes the antennæ of the females are simple while those of the males are pectinated or lamellated.

The Libytheidæ and Erycinidæ present another peculiarity. In these two families the females have six perfect legs, while the males have the forelegs aborted and useless for walking (examples: Libythea celtis, Nemeobius lucina). It is remarkable that the Nymphalide have also the front legs rudimentary or imperfectly developed, but in both sexes.

Some lepidoptera belonging to the family Hesperidæ (genera Spilothyrus, Syrichtus and Thanaos) have a fold on the superior border of the fore wings in the males. This fold is never seen in the females.

Finally we will mention the females of some well-known moths which differ still more widely from the males. Some, as the females of Nyssia Zonaria, Cheimatobia Brunata, Hybernia leuophæria, Orgya antiqua, have only rudimentary wings; others, as the females of Hybernia defoliaria, Anisopterix æscularia, Phygalia pilosaria are entirely wingless or have wings so short as to be imperceptible. It is worthy of note that nearly all these moths are winter insects and appear only towards November, February or March. No satisfactory explanation of this fact has ever been given, but numerous suggestions have been made. Mr. John E. Robson, editor of the *Young Naturalist*,, in a paper published in this magazine [December 1883] under the title, British Moths, gives the following reason based on the theory of natural selection:

"The season at which these species emerge is the stormiest "of the year. The trees are stripped of their leaves, and the shelt

"er afforded by woods or hedges, from severe winds, is less at this "period than at any other. Insects flitting about from tree to tree "would be more liable to destruction, and it may therefore be that "partly from disuse, and partly from the fact that those that could "not fly were more likely to escape during the prevalence of a "storm, their wings may gradually have become aborted as we find "them."

J. M. EMILE BONNET.

Montpellier, October 9, 1885.

LETTER FROM A WESTERN CORRESPONDENT.

Here comes the little CANADIAN SCIENCE MONTHLY again, always welcome and interesting. It is pleasant to scan its pages and see what sort of learning and study now fill the minds of downeast youths, preparing for lives of usefulness and enjoyment. Thirty years ago, when I was spending years on Latin, Greek and Mathematics in a Vermont school, we used to cover the whole ground of the natural sciences by a term or two of Natural Philosophy, and a few sips of chemistry and botany. Farther than these "our souls proud science never taught to stray."

But behold the change. Now the boys and girls may study the living world around them, without fear of ridicule. Close, exhaustive study of natural objects is not only *fashionable*, but fortunately it is *sensible*, *practicable*, and valuable as mental and moral discipline. It inculcates the constant mental habit of search for truth; and the mind is thus constantly attempting to weigh facts and distinguish truth from error.

THE SCIENCE MONTHLY: Science is knowledge. It is not guess-work, or fancy, or opinion, or theory, or speculation or probability. It is *knowledge*—absolute, certain, demonstrable and systematic. Theology is not science in this sense, because its "doctors disagree" on many of its points, and the best of its exponents admit that it lies wholly outside the range of tangible proof. Phrenology and psychology and animal magnetism are not yet reduced or rather exalted to science. They have remarkable phenomina, but they baffle the student because they lack the important quality of certainty.

There was a time when the world of letters was ignorant of astronomy, but powerful in astrology; unacquainted with chemistry but insanely devoted to alchemy. In those days the wisdom of the world was usually a mass of egregious blunders, ciphered out by that falsest of methods, *logic*. The theology of that period was produced largely in the same way. By false logic (sophistry) any desired result could be reached. We all know how, in algebra, by using zero as a factor or divisor, we can prove that one equals five or fifteen. Just so those ancient noodles used to let some false step occur in their syllogisms, that not only misled themselves while they lived, but generation after generation of their unthinking followers. In some things our own people are still floundering in the meshes of error they wove.

Now, however, we think our science is all true, all sound and impregnable. Can it be that four hundred years hence the world will find our old books as ridiculous as we do those of ancient times? It seems impossible, because we think we can prove our science by tangible evidence and perfect demonstration in which logic bears a most unimportant part.

While some study the science of bugs, or of fishes or of mosses, or of rocks, there are others who have chosen a higher field and study the physical and hygienic life of man. Others again, disregarding the latter, observe with a critical eye the mental and moral life of our people, and enjoy social science keenly. The analysis of human life is "harder" than chemical analysis and its results less certain of truth.

A humble branch of that study of man is the comparison of various communities; the geographical and climatic influences on the life and pursuits of our fellow-men. In this line, I would like to discourse of what I see around my home on these boundless prairies of Dakota; then of what I noticed in a delightful sojourn in the flat, tropical, lacustrine regions of central Florida last winter; and lastly of my life as a U.S. deputy surveyor for four months recently among the cliffs, canyons and plains of western Colorado. But such extensive topics cannot be condensed into small bounds, and they are chiefly outside of the legitimate sphere of your paper. If a condensed paper of observations in Orange Co., Florida, would be acceptable, I may send one, when I reach that locality again next December.

Yankton, D. T., Oct. 19, '85. A. W. BARBER.

EXTINCTION OF AMERICAN ANIMALS.

Mr. Ernest Ingersoll, in a paper just published by the American Geographical Society, makes a startling record of the extinction of wild animals from this continent by the settlement of the country. Much of this lamentable decrease of animal life was unavoidable. But Mr. Ingersoll does well to descant upon the ruthless waste of one of our most valuable resources. Only twenty-five years ago the great plains were covered with buffaloes, and Mr. Ingersoll says: "I myself have seen steamboats halted on the Upper Missouri by swimming bands of the finest of wild cattle." But the extension of the Pacific railways has been made the occasion of a needless extermination of them. The elk, moose and deer have suffered a similar fate, until now it is said that the elk, which eight years ago were seen in thousands on the plains of the Sweetwater and in the Wind River Mountains, have practicaly been driven to their last refuge in the Southern Rocky Mountain plateau.

Mr. Ingersoll shows that this baleful disturbance in the natural order of animal life is not limited to the land alone. Seals, which once disported in the Atlantic surf along this coast southward to Cape May, have retired to the Newfoundland or Labrador coast. The habitat of the oyster on our Atlantic coast has seriously decreased. The feathered tribes, especially the prairie chicken, the wild turkey, ducks and all game birds, have been sadly depleted, and still the slaughter goes on almost unchecked.

Mr. Ingersoll suggests that an arrest might be put upon this uncalled for destruction by making and enforcing "a law which should permit so-called sport to be indulged in only by a selected few who had proved their capacity for common sense and self-restraint.—*N. Y. Herald.*

THE NICARAGUAN FOOTPRINTS.

Geological students will remember, says the London Times, that last year much interest was caused by the announcement that human footprints had been discovered in the solid rock in a quarry over Lake Managua, in the territory of Nicaragua. The interest was increased by the statement that those footprints had been overlaid by eleven different layers of stone, extending to a depth of four meters. This seemed to indicate an antiquity for our race quite transcending all conjectures hitherto hazarded. An Austrian gentleman, Herr H. E. Low, has obtained and forwarded to the Imperial Museum in Vienna, twelve large stone slabs bearing those footprints. They are about three-quarters of a meter square, and weigh alto-

gether thirty-five centners. They can now be inspected by European geologists. The footprints are sunk into the stone to a depth of from eight to ten centimeters. The stone itself is a porous volcanic tufa, and the superincumbent layers, which had been removed for building purposes, were all of a more or less solid volcanic conglomerate. The footprints are very conspicuous, and seem to be those of three distinct persons, one of whom was a child. It is stated that in one of the overlaying strata impressions of leaves were very numerous and conspicuous. Unfortunately, no specimens of this have been forwarded to Vienna. But it may be safely said it would be rash to infer an extraordinary antiquity for those footprints from the fact that they have been covered over by several layers of stone to a considerable depth, which might have been deposited by a succession of volcanic eruptions.

THE MICMAC LANGUAGE.

The Micmac language, like that of other Indian tribes, is both agglutinate and polysynthetic. The former term denotes that there are syllables that have no meaning by themselves, or when separated from other syllables or words, but which are significant when thus united. The latter term denotes that the language abounds in compounds, in which each term is significant, whether combined or not with other words. In the preceding list I have given a specimen of what is expressed by the former term, which of course, embraces more particularly all the terminations that are merely grammatical variations, denoting gender, number, person, mood, and tense, &c. Every syllable united to the principal word, which means dog, has indeed a distinct meaning, but that meaning depends on its union with the principal word, for it is not a word, nor does it mean anything when used alone. The process might be extended, and it applies to every beast, and also to some extent to every bird, fish and reptile known to the Indians.

Every noun in the language becomes an adjective by adding a syllable to it. This syllable is either *a* or *awa*, according to the termination of the noun. Then every noun and adjective becomes a verb by the addition of a verbal termination, to denote gender, number, and person, &c. From these verbs, new nouns, adjec-

tives, and verbs may be formed, and from these again new nouns, adjectives, and verbs, and so on, not quite ad infinitum.

An important question arises here respecting a dictionary of the language. According to all precedent, a dictionary that omits numbers of words that have a distinct meaning by themselves, and form an integral portion of the language, is deemed defective. Should not all these niceties of the language, be fully explained in the grammar, but exhibited to the eye in the dictionary? I find twenty words in Liddell & Scott's Greek Dictionary under the word *lagos* a hare, and forty or fifty under the word for a mountain, *oros*, and about sixty under *anthropos*, a man; and hundreds are repeated under the inseparable prepositions, and larger dictionaries give every noun, adjective, adverb, &c., and repeat the long lists of words when *mis*, *un*, &c., are to be prefixed, even when the prefix does not, as in Greek and Micmac, change the form of either the principal word, or the affix. Because the affix is glued or soldered to the word (if I may use English instead of Greek and Latin), and the two parts form but a single word, it seems more necessary to put them all in.

Now, if this be proper in English, where no change is made in either the principal word or the prefix or suffix, nor any union vowel required, it would certainly seem to be much more necessary where all the portions of the compound have to be adjusted for the sake of euphony, and a union vowel, not always one and the same, continually inserted between the parts, so that they may fit harmoniously. The advice and suggestions of the learned are earnestly solicited on this point. If the work is done at all, should it not be done well, though a trifle be added to the cost thereby?

One more remark. When people are told that the number of words in an Indian language mounts up to forty thousand or so, they sometimes open their eyes with astonishment, and enquire if all these words are really in use? Now that would be a difficult point to determine, but probably they are not used often, many of them, and some of them never by any one Indian. But what then? Are there not scores of words in every dictionary of every language that scores of people never use, and cannot understand? A few hundred words answer for all the common purposes of life: a few thou-

sands satisfy the poet and the historian. Still, you find them on every page of the Dictionary, and I may say on every page of the Almanac, and they form an integral part of the language. An Indian may never have had occasion to say, "The bone of a bumble-bee," nor "The fat of a pismire." But you just join the suffix that means bone and fat when united to the name of a living thing, but does not mean bone or fat nor anything else in any other situation, and see if he does not understand the word instantly. He might not admire your ideas of entomology, but he would not deny that you had used correct Indian, so far as words are concerned.

But I mention this as an extreme case. There is no need of pushing etymology and peculiar idioms to excess. Every word should be thoroughly tested by actual use or diligent enquiry before it takes its place in the dictionary, and that, with the means now afforded, can be easily done, an opportunity which, if now neglected, may never return.

A FEW instances may be given illustrating the poly-synthetic character of the language. Oo-kuse-mowe-bejele-negan-ikchije-teg-awenoo-adakadimk-awaumoo-ogul. This word contains "only" fifty-sever letters, and twenty-seven syllables, and is made up of nine different words, and these are pared and trimmed so as to fit together in proper order, each one retaining its essential part, so that the meaning of each is exhibited, and the word means, "Their very superlatively excellent prophesyings." It was said of the celebrated Cotton Mather, that on looking at some of the long words in Elliot's Indian Bible, he exclaimed that "they must have been growing ever since the confusion of Babel." But a slight analysis will show that they have grown very artistically, as all natural, or rather supernatural, objects grow. For neither the plants that grow, the languages of the world, nor the human beings that use those languages, are the invention of chance, or of any wisdom, less than divine. Says a celebrated philologist, of the Greek language: When in other languages irregularities of style occur, we see at once that they result from inaccuracy or want of skill; while among the Attics, who are distinguished for address and skill, we perceive that they did not wish to make the correction. Indeed, they felt that by removing anomalies, they would deprive their

language of the stamp of production of nature, which every language really is, and thus give it the appearance of a work of art, which a language never can become."—*(Buttmann's Larger Greek Grammar, Introduction.)* Unquestionably the rude Indians never made it their business to polish their language, or perfect it in any way, and the lexicographer, the grammarian, or the translator soon finds out that do this for them is no part or portion of *his* business. His work is just to take it as it is, and not attempt to criticise it, or mend it. He may leave that to the philologists and philosophers.

But to return to our long Indian word. It springs from a very small root, and, like the tree to which we thus compare it, grows at both ends. The root is *kej*, the stem of many words denoting knowledge. Thus, kej-edega, I know. Kej-edoo, I know it. Ke-jeek, I know him. The adverb neganu, beforehand, prefixed to kej-edoo, with the changes required to form the union, gives neganik-chijedoo, I know it beforehand: in other words, I am a prophet. A syllable denoting the agent of the action denoted by the verb, added on to the end, the two parts being again pared and fitted so that the union may be affected smoothly, and you have, neganik-chije-teg-awenoo. Lit., "a man who knows things beforehand," that is, a prophet. One more addition, adega, and the special action of the prophet is denoted. Neganik-chije-tega-wenoo-adega—I prophesy. A further addition to this forms a noun which means the peculiar work of the prophet—prophesy or prophesying. Three words prefixed, denoting very, superlatively, and good or excellent, with a part of the possessive adjective pronoun their, (oo), placed before them, and the remaining portion of this pronoun, with the plural ending (umoool), put at the end, and your word is formed. You may still bend on, to use a sea phrase, as many more adjectives at the beginning as you like, and add several more syllables at the end; but the word is long enough in all conscience as it is for our present use.

In many instances these "word-phrases," holophrases, as they are termed, while appearing to the eye so long and unwieldy, are in reality "labor-saving machines," for the thoughts are often expressed much more briefly than in English, as well as more forcibly. Thus:—

Wech-kwow-oolejik, They are bringing loads on their backs.
Wech-kwintok, He comes singing along as he comes.
Elmintok, He goes away singing.
Yale-agwesun-aak, He is walking about with his hat on.
Yalipukikaak, He is walking about with his spectacles (literally *eye-things*) on.
Pem-chajega, I walk along the shore.

The Micmac Indians who, up to a very late date, knew little or nothing of written language, never seem to have had any idea of anything formidable in the length of their compound words. The pronunciation presents no difficulty, as every letter is pronounced, and always sounded one way, and there is no sound in the language which is not in English.

To conclude. A field of wonderful extent, variety, and interest is here opened up to the philologist and ethnologist, and to every learned man, aye, and to every *Christian* man.

SILAS T. RAND.

HANTSPORT, NOVA SCOTIA,
November, 1885.

THE STUDY OF PLANTS IN WINTER.

The old fashioned text-books tell us to begin the study of plants in the spring, and the custom still in most colleges is to confine the study to the spring and early autumn months. Winter usually stops all work except in the laboratories where "pickled" specimens are dried and examined microscopically. Perhaps in a few cases the greenhouse may supply unseasonable specimens for class or laboratory study; but this is not the study of plants in winter that we refer to. All our perennials have winter states which are full of interest to the student.

The writer of this note has taken classes of young people, who knew nothing of botany, and set them at work in mid-winter studying the out-of-door vegetation with nothing but their eyes, pocket-knives, pencils and note-books in the way of apparatus and helps. The structure, position, and functions of buds, the structure of twigs

and branches, including wood, bark and pith, the structure of the fruits and seeds of various trees and shrubs, were taken up in succession, with constantly increasing interest. No text-book was used, the pupil depending on his own resources entirely. By the time that spring came with its bursting buds, its leaves and its flowers, their trained young eyes were eager for this study.

—*Prof, C. E. Bessey in American Naturalist.*

THE BLUE HERON.

Where water-grass grows evergreen,
On damp, cool flats by gentle streams,
Still as a ghost and sad of mien,
With half-closed eyes, the heron dreams.

Above him, in the sycamore,
The flicker beats a dull tattoo;
Through papaw groves the soft airs pour
Gold dust of blooms and fragrance new.

And, from the thorn it loves so well,
The oriole flings out its strong,
Sharp lay, wrought in the crucible
Of its flame-circled soul of song.

The heron nods. The charming runes
Of nature's music thrill his dreams;
The joys of many Mays and Junes
Wash past him like cool summer streams.

What tranquil life, what joyful rest,
To feel the touch of fragrant grass,
And doze like him, while tenderest
Dream-waves across my sleep would pass!

MAURICE THOMPSON.

UTILIZING PETRIFIED WOOD.

The petrified wood that is so abundant in the United States Territories of Arizona and Wyoming and the Rocky Mountain regions, is rapidly becoming utilized. In San Francisco there is now a factory for cutting and polishing these petrifications into mantel pieces, tiles, tablets, and other architectural parts for which marble or slate is commonly used. Petrified wood is said to be susceptible of a finer polish than marble, or even onyx, the latter of which it is driving from the market. The raw material employed comes mostly from the forests of petrified wood along the line of the Atlantic and Pacific Railway. Several other companies have also been formed to obtain concessions of different portions of these forests. Geologists will regret the destruction of such interesting primeval remains, and some steps ought to to be taken to preserve certain tracts in their original state.

THE STAR FISH.

No animal is more common on the rocky coasts than the star fish, and for this reason visitors to the seashore are very apt to pass it by, and search for the more attractive and rare sea anemones. But in doing this they pass by one of the most interesting animals, and one which has very curious habits. Drop a star fish into a glass dish filled with sea water, and watch it for a few moments. If it happens to drop on its back, one of the five arms which seems so rigid when taken from the water will begin to bend, scores of small suckers fasten themselves to the bottom of the tank, and soon the star will be right side up.

He is a restless creature when in an aquarium, and will continually rove about in search of something to eat. He moves about with a slow, regular motion, which at first seems mysterious. There is no irregular motion, as in walking, but simply a slow propulsion along the bottom or up the sides of the tank, as if pushed on by some continual pressure from behind. In a moment he mounts the perpendicular side, and through the transparent glass we have an opportunity to see how he moves. In the center of each

arm there is a depression, and in each depression there are several rows of pure white suckers extending from the base to the tip of the arm. These are his locomotive organs,and well do they serve the purpose. There are hundreds of them, elastic, yet muscular,all working at the same time to propel the creature along. One loosens its hold, stretches itself out, and takes hold an eighth of an inch further up. Others follow, and the creature moves. It is held firmly,yet at the same time is continually moving.

But see, it is approaching a mussel hanging by its finely woven byssus to the side of the tank. Can it have designs upon this shell fish? Straight toward it the star moves, it nears the mussel, the forward suckers touch the shell, the star hesitates a moment, then moves on faster than before. One arm has passed over the mussel, and the mouth of the star fish is just over the center of the shell. Surely it can do no harm to this well defended shell fish. Its mouth is so small that it cannot swallow the mussel, and surely it cannot bore into the hard shell.

The star fish has stopped, the five arms are curled around the mussel, and it is held in a strong embrace. We watch the star fish with renewed interest, but all we see is the same motionless attitude, no change in position, nothing to indicate change. The star seems satisfied to remain as it is, as if at rest. Soon a thin membrane encircles the mussel, but nothing further is seen. We revisit the aquarium at the end of an hour, and the star is in the same position; at the end of two hours there is no change; but in three hours we return to see the star fish nestled in the darkest corner of the aquarium, while the unfortunate mussel hangs in its old position quite dead, the shell gaping open, and numerous little shrimp feeding on the half digested parts left by the destructive star fish.

What has been done? Simply this—the star fish, unable to take the shell into its stomach, has accommodated itself to circumstances, and extended its stomach out of its mouth, and digested the shell fish with its stomach entirely outside of its body. In this silent manner hordes of star fish invade the oyster beds, and in a single night destroy thousands. The oystermen, recognizing their destructive power, formerly had the stupid habit of cutting every star fish they caught into three or four pieces and returning them to the water, not knowing that each piece had the power of reproducing itself, and that for each star thus torn into three or four pieces, two or three new individuals were formed.—R. S. T. in Scientific American.

BOUNDING THE TRIAS.

"Are ye after biggins stanes? inquired a weather-beaten pioneer as I was examining some fragments of rocks one afternoon among the hills of Lot Thirty.

There appears to be very good building stone about here, I replied.

"Och mon, these are but puir stanes," said my friend, "At Muckleroy's quarry is the place for rockies."

But the quality of the "stanes" was not troubling me. It was those casts and impressions of plants drawn in lines of vivid red on the rude fragments before me which excited my deepest interest. It struck me that I had seen these all before. Yes, in the solid rock beds at the surf-beaten feet of giant Turner I had seen the very same plant impressions which are here buried in the heart of these hills; and the recollection was awakening in my mind a vision of deep geological interest, namely, the determination of the distribution of the Triassic rocks in P. E. Island. These casts of plants, fragmented and broken, were clearly distinct from those of the Permian, and would serve as an index to point out the boundaries of the two formations, which, though so similar in general appearance, were distinct in geological time.

I left my practical friend and wandered far over the hills. The light of a glorious autumn sunset was spreading beauty on their billowy forms. Leafless birch and beech, and dark-spired fir-trees on their shaggy crests were lighted with golden flame, and the deep precipitous valleys between them looked deeper sunk in purple shadows. How different is this scenery from that presented by the Permian district! These last in surface configuration are like the gentle swelling of the summer sea, only robed in brighter green. But here the Triassic is like a sea torn by the wildest conflict of contending winds and currents.

You remember that the hills of North Rustico, of New Glasgow, Hunter's River, Strathalbin, Wiltshire, and the country south and west are of this character. Are these all Triassic, carved out of the same horizontal beds which meet the Gulf chargers on the rug-

ged coast about Cape Turner? This feature of the question now pressed itself forcibly on my attention as I wandered among the rude autumn scenes of hilly Thirty.

"Look well to the north side of the Island for the true Trias," wrote Sir Wm. Dawson to the writer, with his usual kindly interest in the labors of struggling students, and the next season when leafy June spread her beauties on the land, I took a long excursion to the rock-bound coast of western New London in pursuit of this matter. Arriving at Park Corner, I was surprised to find myself, not among the soft red sandstones of the upper formation, but among the hard conglomerates of the lower Permian. The little inlet of the coast, that breaks in here, is filled with whitened fragments of this firm material, and cliffs of dark red sandstone, an hundred feet in height, frowned over the surging breakers along the coast. Here is the centre of an anticlinal which brings up the Permian rocks in a great ridge, like a protecting sea wall, on the northern edge of the horizontal Trias. The great red foam-circled capes which guard the western entrance of New London harbor, belong to this Permian ridge, while the flat lands inside of the harbor are of horizontal Trias. And the same horizontal beds are found stretching eastward to beyond Rustico.

The almost undisturbed condition of the Trias frequently helps us to distinguish it from the Permian which is more or less affected by regular lines of upheaval. In the western part of the Island the Permian is slightly disturbed by two N. East and S. West anticlinals continued from the New Brunswick system. But in the central and eastern counties it is upheaved by three anticlinals running nearly East and West magnetic, or parallel with the Cobequid range of mountains. These anticlinal ridges are like vast stoney waves rolling in from the Gulf, increasing in elevation and propinquity as they approach the ancient plutonic nucleus of the Nova Scotian Hills. These anticlinals, when denuded, cause the districts where they prevail to have a surface configuration marked more or less with ridges running in an easterly and westerly direction. This feature is very marked in the Murry Harbor district and about the Hillsborough Bay. In the great flat synecline between the Hillsborough and Cape Tryon anticlinals it is much

less noticeable, but even here careful observation will detect it in many places.

The Triassic consists largely of thick-bedded sandstones, and where it rests on similar beds of the middle Permian it is difficult to distinguish between the two. But where it rests on the uppermost Permian beds of shales and fissile sandstones the distinction is quite marked, and especially in scenic effect. Every one will remember the sudden change in the appearance of the country in travelling on the main road from Bonshaw to De Sable, as we descend from the rough Triassic highlands to the level upper Permian district around De Sable harbor. A similar change occurs at the county line in travelling westward by the Anderson road. We emerge at once from a tumult of hills into a broad plain country varied only by shadowed groves and wide extending grain-fields.

The Triassic sandstones are distinguished from the Permian by having less dark carbonaceous markings in them. There are fewer shales and no calcarious conglomerates, although some of the sandstones are endurated with lime.

There are few well preserved fossils in the system so far as we have yet discovered. My field book contains drawings of remains of over thirty different varieties of plants, but so indifferently preserved that not more than three or four of them could with certainty be referred to their proper species. Yet the group is readily recognised as distinct from similar remains in the Permian strata below. So far as identified, the remains are of conifers, ferns, and calamites. But these would not have been sufficient to characterise the system if they were not associated with an undoubted Mesozoic Dinosaur. *Bathygnathus borealis*.

A line drawn from the little inlet of the north coast between Stanhope and Tracadie across the Island to the mouth of the Clyde River, then following the course of the Elliot River to Bonshaw and westward to DeSable, then northward to where the Anderson's Road crosses the county line, and thence, with a flexuous course, to the head of the French River, New London, will include the great mass of the Triassic system in P. E. Island. There is included in this area a small ridge of Permian on the S. West River; and there is possibly a small outline of the Trias about the head

waters of the Grand River in Kings County.

This Triassic area includes some of the roughest and most picturesque districts in the Island. The range of hills extending from De Sable to North Rustico, and forming the principal watershed of the country, is all within it. Lofty St. Ann's overlooking the distant sea and fair New London Bay jewelling the swells of blue; the sea of hills round New Glasgow, bright with meadow and grain fields and smiling snow-white homesteads; Strathalban's wild, bleak valleys; and the varied scenes of forest and foaming flood, quiet stream-traced vales and tossed billowy heights, retired nook and majestic valley that fill all the tract drained by the headwaters of the Elliot River, all belong to this Triassic area.

There is a great trough of subsidence cleaving the rock formations of the Maritime Provinces in a N. East and S. West direction and extending from the Bay of Fundy to George's Bay, Newfoundland. Within its area all the sedimentary deposits are of great depth and importance. The vast coal deposits of Cumberland County occur within it, and in P. E. Island the Permian strata appearing within its limits are ten times the depth of those on the western end which are beyond its bounds. It is within this great trough of subsidence that the Triassic rocks of the Maritime Provinces alone are found

F. BAIN.

NOVA SOTIAN GEOLOGY.

PAPER IX.

Geology of Wolfville and Kentville.

CARBONIFEROUS.

No Carboniferous strata were observed west of the point indicated at Wolfville, and Harding's Brook. Still it is possible that concealed or overlapped strata may exist in the valley.

During the Carboniferous Period there was no North mountain or Blomidon narrowing the Bay of Fundy. It then extended as far as the Wolfville, Kentville and Nictaux Pre-carboniferous, or

nearly so. Conditions similar to those now existing in the Bay of Fundy seem there to have prevailed—conditions more favorable for the denudation of shores, than for the accumulation of littoral deposits.

The first littoral check given to the sweep of the waters seems to have been the pre-carboniferous rocks of Wolfville which seem to have been a cape of the Carboniferous Period, elevated in Devonian time. This appears to be a coarse sandy accumulation which was subsequently consolidated into Grit, while at the same time the Cobequid on the north had a shingle forming shore which was converted into a Conglomerate.

POST-CARBONIFEROUS.

The east side of the area is beautifully exposed in sharp clear sections from Starr's Point onward to Blomidon. In this area conglomerates similar to the lower beds of the Cobequid Triassic do not appear and the compactness of bedding which makes the sandstones of the latter available for building purposes is notably wanting. I have already noticed in a preceding Paper (VIII) that at Starr's Point the strata contain veins of calcareous-spar; some of these are of considerable thickness. Crystals are of sufficient size and transparency to show the phenomena of double refraction. At Blomidon's foot were observed considerable masses of *Selenite* and *Fibrous Gypsum* dislodged from the Triassic sandstone.

Irregular beds of impure manganese were seen in a road section near Starr's Point. At the close of the Carboniferous Period, conditions of deposition appear to have changed so as to favor the formation of the Triassic sandstones at Kentville and elsewhere, but not so far as to form conglomerate as in the Triassic of the Cobequids. The pre-carboniferous area of Kentville seems to have formed a break-water in the Triassic period.

TRAPPEAN ROCKS.

We generally designate these igneous rocks as *Triassic*. As they are obviously *intrusive* I sometimes call them Post-Triassic rocks.

Notably, has the Blomidon area of rocks suffered from the exactions of post-trappean and post-pliocene agencies. Its height

must therefore have been considerably greater than we now find it. The sandstones of the valley must have risen to a greater elevation than at present, forming a highway for the transit of the mountain *debris*, the valley having been subsequently formed and the highway destroyed. The remains of these sandstones on the sides of the Trappean area and the sections on the shore as well as the elevation of the drift on the south side of the valley tend to prove the former existence of the highway.

(*To be continued.*)

CORRECTION: I wish here to correct a mistake or two that occured in PaperVII, No. 8.

On Page 115, line 9, from bottom of page, for CARBONIFEROUS, read PRE-CARBONIFEROUS. In line 4, for "such" read, Archaean. Dana represents the Granites to be of Archaean age, while Dawson and Selwyn considers them to be of Devonian age As they are subjects of controversy; I deem it advisable to give different opinions.

D. HONEYMAN, D. C. L.

CHESTER, AS A SPORTING PLACE

Chester is a town of about one thousand inhabitants situated at the head of Mahone Bay and about half a day's drive from Halifax. The wood-land country which stretches out to the north of the town and the bay to the south form as good places for hunting as can be found in the Province.

In the fall large flocks of partridges swarm the woods, and quite frequently rabbits are seen skipping and gamboling in some wood surrounded clearing, while in the winter they are shot and snared by the hundred, and form an important article of food to the poorer classes. Besides these, out and around New Ross, bears, carabou and moose are often found. But it is on the water that the principal sport is to be obtained. Around the coasts black-ducks, whistlers long-necks, loons, sea pigeons, etc. are shot in large numbers

Out on Tancook (an island six miles out to sea) the fishermen use what they call "the tub" which is a square box about six feet high, and two and one half wide, the mouth surrounded by an edging of boards two feet in width. In this a man will anchor on a fine day with his decoys,(wooden birds, of which he has twenty or thirty, fastened at different distances from the tub, and entirely concealing himself, waits for the splash, which tells him that there is game for him.

In this way a day's shooting often amounts to three or four dozen birds of various kinds and sizes.

In the summer all the common birds are to be found, such as, plover, snipe, ringneck, common tern, leaches petrel, stormy petrel, mother Cary's chickens, sea gulls and loons.

For several summers back, Chester has been the resort of two majestic eagles, which the fishermen have tried in vain to shoot.

Woody Island, is the night abode of hundreds of crows, which are to be seen leisurely flying over from the country for miles around, from five to six o'clock in the evening, and back again at dawn next morning. In the day time it is entirely deserted.

K. C. A.

ORIGIN OF PETROLEUM.

As to the origin of petroleum, scientific men are by no means agreed. In the early period of American oil-mining the only question much debated was, whether it was of animal or vegetable origin, or both. Of late, however, a theory has been started that the oil is not due to the storage of organic remains under the surface, but that it originated from chemical combinations of carbon and hydrogen in the interior of the earth. This view of the subject has been taken up in consequence of petroleum having been found in such large masses as almost to preclude the idea of its origin in animal or vegetable deposits. If this be true, it is probable that the oil exists in still larger quantities than any which have yet been observed.—*Ex.*

A TEXAS CENTIPEDE

The centipede is not a pretty insect. He runs too much to legs. Once I thought them of no use, but after seeing a lot of little Chericahua Indian papooses pulling centipedes from their holes and greedily devouring them, legs, poison, and all, I no longer doubted the wisdom and beneficence of their creation. In the course of my checkered career I have had several adventures with centipedes, and always came out second best. A centipede can raise a blister on a man's body quicker than a red-hot iron, and if you don't immediately apply a remedial poultice of pounded prickly pear, and dose yourself inwardly with post whiskey—which latter is warranted to kill anything but an army mule—the resultant effects may be serious. Centipedes usually attack their victim at night, when he is asleep and can't defend himself. They are armed with about 200 little lances conveniently lashed to the toe of each foot—of which they have several—and at the base of each lance is a tiny sack of venom. If a centipede crawls across your body—which he'll most likely do if you lie down anywhere within a half-mile of him—you'll have no difficulty in following his trail, and you'll remember his visit for weeks. No man ever died from the bite of a centipede, but I have known one to make a man wish he was dead.

—*Cor. Philadelphia Times*,

NOTES AND COMMENTS.

THE fruits and nuts imported by the United States have a value of $15 000,000 to $20,000,000 annually.

A gigantic crystal of spodumene, 36 feet long and one to three feet thick, has been exposed in the Etta tin mine in Pennington Co., Dak.

SOAP trees similar to those growing in China and Japan, flourish in Florida. The fruit is about the size of a marble and is ready for use without any preparation. It is usually boiled down, however, and cast into bars.

A new element has been discovered in nickel ore from Norway. It is malleable, of white color, with a tinge of brown, presenting, when pure, a metallic luster, but oxidizing when exposed to the air. It is as hard as copper.

SENNACHERIB'S ARMY.—*Clisiocampa Sylvatica*, the forest tent caterpillar, which two and three years ago appeared to threaten the existence of the deciduous leaved forests in parts of Pictou County, Nova Scotia, suddenly disappeared last year, and has not since been noticed *Hyphantria textor*, the fall web worm, was more abundant than usual, but has done no material damage.

The great glacier of Alaska is moving at the rate of a quarter of a mile per annum. The front presents a wall of ice 500 feet in thickness; its breadth varies from three to ten miles, and its length is about 150 miles. Almost every quarter of an hour hundreds of tons of ice in large blocks fall into the sea, which they agitate in the most violent manner. The ice is extremely pure and dazzling to the eye; it has tints of the lighest blue as well as of the deepest indigo. The top is very rough and broken, forming small hills, and even chains of mountains in miniature.

A French chemist has brought forward a new method of manufacturing gunpowder. The requisite quantity of sulphur is dissolved in sulphide of carbon, and this solution is then mixed with the carbon, which, instead of charcoal—as in other modes of powder making—is cotton or some cellulose fibre, which is reduced to an impalpable powder. To this mixture is finally added the proper quantity of a saturated solution of saltpetre. The compound is now evaporated and the crystallization broken up, or it is evaporated in a vacuum. A very perfect incorporation of the several substances is thus secured.

Pulverized steatite is coming into use, quite satisfactorily, as a finish or covering for walls and ceilings. It is simply soapstone; it takes a high polish, is pearl gray in tint, presents the best possible surface for painting, either in oil or water color, and will neither crack nor chip. It is claimed for it that it is a non-conductor and non-absorbent; that it can be washed without

injury; nails can be driven into it without damage; when subject to heat, moisture, and chemical fumes it gives no smell; and it does not turn yellow with age. It is thought to be specially adapted for hospitals, factories, cellars, markets, &c.

A PROSPEROUS NOVA SCOTIAN EMIGRANT.—The only native hare in Newfoundland is the Arctic hare, which is by no means abundant. The Nova Scotian hare, *Lepus Americanus*, was introduced about twenty years ago or there about. Now about 2,000,000 skins are brought to market annually. The value of the skins alone, without considering the value of the food to the inhabitants of the Island Colony, is already no small thing. This rapid increase is marvelous. It suggests Australia; but Newfoundland, it is safe to say, can utilize the highest possible rate of increase in this interesting importation.

ROSEWOOD trees are found in South America and in the East Indies and neighboring islands. There are half a dozen kinds. The name is not taken from the wood, as is generally supposed, but by reason of a rose-like fragrance which it possesses when first cut. Some of the trees grow so large that planks four feet broad and ten feet in length can be cut from them. The broad planks are principally used to make tops for piano-fortes. The rosewood tree is remarkable for its beauty. Such is its value in manufactures as an ornamental wood that some of the forests where it once grew abundantly have now scarcely a single specimen. New plantations have been set out, so that the supply will not be exhausted.

There is without doubt no one so well acquainted with the language, traditions and customs of the Micmac Indians as Rev. S. T Rand of Hantsport, N. S. Mr. Rand has spent a long life in missionary labors among the scattered remnants of this interesting tribe whose ancestors were once the masters of our Acadian land. We are glad to know that he has in preparation a dictionary of the Micmac language, advance sheets of which are already in our hands. The Dominion government has wisely appropiated the sum of $1000 to the work and will probably give more if required.

In our present number we publish an interesting paper by Mr. Rand on the Micmac language.

LITERARY NOTICES.

The Southern Bivouac is a new southern magazine, published at Louisville, Kentucky. It is designed and printed in a neat and artistic manner, and contains a number of articles of more than ordinary interest. "Our Native Evergreens," is from the pen of a true naturalist, giving a description of the few species of this interesting family to be found in Kentucky.

Le Naturâliste Canadien.—We are pleased to welcome this Journal again among our exchanges after a lapse of two years during which our contemporary suspended publication.

The July number contains a valuable paper on *Le Nodule Noir* (Black Knot). The Oct. number an interesting account of an ascension of Mount Etna. The article "Sur La Fecondation Des Cypripedes"in the Dec. number will attract attention. For the Entomologist there is a valuable series of articles on *Petite Faune* in which the Hemiptera are described in detail. Published at Cap Rouge, Quebec, by M. l'Abbe Provancher. Monthly, $2.00 per year.

CORRESPONDENCE.

Answer to "One interested in Science":—LATTIN'S CATALOGUE gives the price of 550 species of North American birds' eggs, named and arranged. Price 25c. FRANK. H. LATTIN, Gaines, Orleans Co., N. Y.

Harris' Insects Injurious to Vegetation gives descriptions of our Lepidoptera and figures, plain and colored, of many of them. Price $4.50.

F. B.

TO ASA GRAY.

On his Seventy-fifth Birthday.

Just Fate, prolong his life well-spent
Whose indefatigable hours
Have been as gaily innocent
And fragrant as his flowers!

November 18, 1885. JAMES RUSSEL LOWELL.