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CONTENTS.

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THE OTTAWA NATURALIST.

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POPULAR CHEMISTRY.

Apropos of PROF. LASSAR-COHN'S Lectures.

How far one may reasonably expect the more thoughtful fraction of the general public to interest itself in the methods and results of chemical research, is a question that many others than the writer have asked. Here is a universe of wonderful completeness and of infinite extent in the midst of which man finds himself; and as far as he is able to judge he is himself the only conscious intelligence within this vast domain. Other living beings there are, and some degree of intellectuality we must grant them to possess, but in the full consciousness of an individuality which feels itself distinct from the rest of creation, we have a conviction that man stands alone. He finds, so far as he is *man* in the sense in which this term contradistinguishes him from the lower animals, his chief satisfaction and pleasure is the activity of his mind employing itself upon the vast problem of *this universe. He views it from different standpoints*, and speaks of it as material or spiritual, natural or supernatural, the world of the senses, or the world of the soul, according to attitude of his mind towards it. He may not hope to solve in its entirety the Sphinx riddle which is thus presented to him but at all moments when he knows himself to be at his best and highest *as a man*, he feels that the only true satisfaction which he may hope to attain as a thinking being is to be got from the serious study of what life means. Every new relation of one phase of existence to another causes, in its discovery, a thrill of pleasure to him, and this, whether it be the inter-relations of the

heavenly bodies, or the reciprocal influence of human beings upon each other. The discovery of a widely operative principle like that which while it "Moulds a tear and bids it trickle from its source," at the same time "preserves the earth a sphere, and guides the planets in their course," is like a red-letter day in the calendar of his mind's growth; and whether as in the instance given, it touches the material side of things, or like the law of heredity which makes us "the heirs of all the ages," it goes deeper and touches the "spirit in man which giveth him understanding," its cognition is a supreme joy, and itself a *pou sto* from which a new purchase may be taken.

What we know as the sciences of Chemistry, Physics, Botany, etc., are nothing more than the imperfectly distinctive names given to different directions in which investigation proceeds. It is quite wrong to suppose that the universe is mapped out into mutually exclusive areas for purposes of research, as an unexplored territory may be divided. Every so-called science overlaps every other; and this is as true of the so called physical sciences as of the metaphysical and of the members of each group in relation to the other. For *knowledge is one;* and there is no so-called material problem which has not a spiritual side to it. It is true that every scientific principle admits of a practical application, and no sooner does a Faraday discover the laws governing induced magnetic currents, than an Edison applies this knowledge to the construction of an electro-motor. We have no fault to find with the utilitarian application, but we would insist that from the only true point of view—that of man's getting closer to the heart of things,—the apprehension of a principle is the main thing. Of course, the great mass of mankind will never apprehend and never value the principle as such; but this is only to say that the masses are developed on the material side only;—a fact too freely acknowledged by us to cause any surprise. They will, however, fully appreciate the practical application; will run their sewing machines and fans by electricity, and will invest their capital in railroad stocks, and hope to realize big dividends.

But one surely has a right to expect that the thoughtful few, "the saving remnant," will find in the appreciation of *the principle itself*, a mental satisfaction full and complete in its degree. —And whether any particular general principle or law of nature be won by the labours of a worker in the domain of Chemistry, of Zoology, of Political Science, of Theology, or any other of the much overlapping but conventionally recognized divisions of this immense field of research—co extensive with the universe of matter and mind—every thinker will yearn to be made acquainted with it; every true man will wish to add it to his treasure-trove.

So far as any poor attempts of my own are concerned, and so far as I have welcomed and approved the attempts of others in this direction, these have aimed at making clear the fundamental principles which have been discovered in the domain of chemistry, so that they should be a part of the common stock of natural knowledge won by man. A manufacturing chemist, an analytical chemist, has need of a thousand and one details of knowledge, not only of chemistry proper, but of mechanics and what not, that he may successfully prosecute his *craft*, for he is a craftsman. As a *craftsman* he is distinguished from his fellow men; as a student of nature he is *one* with them, *i.e.*, provided that he is a thinking man at all, which is by no means necessary; for even the successful chemist is no more necessarily a student than the successful builder of electric motors is a Clerk-Maxwell, or a Faraday, or a Lord Raleigh. Now, the one feature in common which all efforts known to me to popularize chemical science have had, is the apathy with which they have been received. On learning that a certain series of lectures on chemistry, delivered by Professor Lassar-Cohn in Germany (Konigsberg) had been received with marked favour, had been published again and again, edition after edition, and had finally been translated into English by no less well known a chemist than Professor Pattison-Muir, I hastened to procure a copy of the volume, feeling hopeful that at last the art of presenting scientific truth in taking garb had been discovered. The result

has been a grievous disappointment. I find the lectures to be a concentrated digest of the technical application of chemical—and other—principles, such as one finds and expects to find in treatises on such subjects. No one who possesses a copy of Wagner's Chemical Technology, or other work of a similar kind, need refer to the text of Professor Lassar-Cohn's lectures. Contrariwise, however, it must not be supposed that these lectures take the place of an extended treatise; for they are necessarily a mere skimming of the surface of so vast a subject Much better trust to a volume of Cooley's Receipts or Spon's very valuable Encyclopædic work.

Let it not, however, be imagined that I hold the learned professor in the very least to blame. He has performed, and very well performed, the task he set himself. Every reader of this work will learn, in a general way, the *modus operandi* of the manufacture of soap, sugar, leather, starch, shoeblacking and ten thousand other things—and that is something, is is not? Whether the language, simple as the author has tried to make it, will convey any clear meaning to him, is often doubtful; as, for example, where he is told that cellulose and starch resemble each other chemically, in each having a molecule of 21 atoms, 6 of carbon, 10 of hydrogen, and 5 of oxygen, and that by the addition of two more atoms of hydrogen and one of oxygen—the equivalent of one molecule of water—the Starch molecule is changed into a molecule of glucose. He is much more likely to remember the bare fact that by boiling starch with an acid it is turned into glucose; a fact, the knowledge of which to him is of no use for manufacturing purposes, unless he adds to it a hundred others, regarding details of manufacture, which he can only learn by a long apprenticeship to the business, or by years of experiment at his own cost; a fact, morever, which I hold, is of no more value to him as a thinking human being, than that ethyl alcohol boils at 174° F. under normal conditions of temperature and pressure.

No, the saddest aspect of the matter is this: that thousands of human beings can be interested in a treatment of the subject which restricts itself to a recital of the practical application —while no interest can be aroused in such a presentation of the subject as makes it a part of true human knowledge.

A. MCGILL.

August 19, 1896.

ELECTRICAL FISHES.

By PROFESSOR EDWARD E. PRINCE.

Dominion Commissioner of Fisheries, Ottawa.

Some recent researches have added much to our knowledge of electrical phenomena in fishes. That certain fishes possess electrical properties has been known from classical times, and Oppian, with provertical poetic liberty, describes the shock produced by one of these creatures as passing along the angler's line and rod into the fisherman's body:—

> "His arm of sense bereft,
> Down drops the idle rod; his prey is left,
> Not less benumbed than if he felt the whole
> Of frost's severest rage about the Arctic pole.

Pliny ventured the opinion that these mysterious powers were utilized in killing victims for food, and there is some ground for that view. Fishes classed as electrical belong to very widely separated orders and families but the total number of species is small.

Amongst the Sharks and Rays, the Torpedinidae and two or three species of Skate, alone, are known as electrical. Out of nine or ten thousand species of Teleosteans or Bony Fishes, not more than a dozen possess these remarkable organs,

which are very variable in position, sometimes being located near the head, at other times in the tail, while a new and hitherto unsuspected type of electrical organ is the scattered glandular form, which recent investigations have shown to be spread in the skin of one of our commonest fishes. Naturalists have hitherto been unaware of the fact that the common eel of our rivers and lakes is really an electrical fish. It is possible that extended studies will reveal many more common species endowed with this remarkable property.

The most complex form of electrical organ is that of the electric ray *Torpedo* of which several species exist. Five years ago I secured a living torpedo during an official survey on the Kerry coast, Ireland: an interesting capture when it is noted that Thomas Pennant a hundred years ago says of this fish that it "is very rarely taken in British Seas: the only one we ever heard of being took off the county of Waterford."

I found that the Irish fishermen stood in dread of it, called it a Mum Ray, a corruption no doubt of Numb or Cramp Ray; but begged for the liver of the fish, to which they attributed almost miraculous curative qualities. It was a clumsy ill-looking creature, and unlike the Skate was thick and fleshy at the lateral margin, round in front and lacking the pointed rostrum or snout. In the dirty ochre-coloured skin a rude hexagonal pattern appeared indistinctly, and on dissection, was found to correspond to the columns of modified soft muscle which constitute the electrical organs. They have been aptly compared to a collection of Voltaic piles, each consisting of electric plates of transparent homogeneous substance and invested by tendinous connective tissue, which sends alternating extensions between the plates. Over eleven hundred of these hexagonal columns are said to have been counted in a torpedo weighing seventy pounds. Five large nerve trunks pass from the medulla oblongata, on each side, to the organs, dividing up into 50,000 or 60,000 separate nerve fibres. The nerve terminations in the electric plates were found by Fritsch to precisely resemble those in muscular tissue. The organs occupy the entire thickness of

the body on each side of the massive flattened head. The current, it appears, passes perpendicularly from the underside of the body to the back or *vice versa*. The dorsal side, according to Packard's account, is positive, the ventral side negative, and the discharges are wholly under the control of the fish. In the Irish specimen referred to above this control was unfortunately so strong, not to say stubborn, that the creature refused to give any exhibition of its powers, though every inducement, persuasive and otherwise, was given to it to do so. M. de Quatrefages has recorded the variability of the Torpedo's electric potency, in some examples it is very feeble but in others it is so great as to be dangerous to man and quite fatal to birds and small animals. Repeated discharges weaken its power; but Professor Owen found that under the influence of strychnine the discharges become more powerful. They are accompanied by sounds perceptible by the phonograph. Thus a weak discharge provokes a short croaking sound, but a prolonged discharge of three or four seconds duration is marked by a somewhat lengthened groan. Ordinary muscular contractions, as is well known, are attended by faint sounds like the distant rumbling of carriage wheels.

The two common Skates, *Raia batis* and *R. clavata* it has been found possess curious organs inthe tail which Babuchin styled pseudo-electric. There is every ground for speaking of them, however, as truly electrical. They are, it is true, diminutive, and Prof. Burdon-Sanderson's researches ten years ago showed that their discharges were very feeble, but it is possible that they are either simply rudimentary and progressive in condition or degenerate and retrogressive, and thus differ from those of the Torpedo rather in degree of development than in kind. Into the vigourous discussion on this matter, participated in by the Duke of Argyll, Prof. J. C. Ewart and others in the columns of *Nature*, it is not necessary to enter here. Certainly the huge specimen of a skate, eight or nine feet across the "wings," which it fell to my lot to examine on one occasion, six years ago, possessed electrical organs resembling small corn-cobs situated on each side of the tail. No

electrometer or suitable apparatus was available to test the electro-motive force in a Skate of such enormous dimensions. The Sting Rays, with a tail exhibiting one or more strongly developed spines, and the Eagle or Whip Rays with a slender whip-like tail, appear to be wholly destitute of electric organs.

Turning now to the South American electric eel, *Gymnotus*, we find electric organs differing much from those described. In these large creatures, five or six feet in length, they are lodged along each side of the body towards the under side, and mainly in the tail. Two pairs occur, the upper much larger than the more central pair. Each organ is divided into vertical plates by fibrous septa, and again into a countless number of small cells, arranged horizontally, instead of vertically as in the torpedo. The shock passes laterally from the head to the tail, and no less than two hundred pairs of spinal nerves send electric rami into the organs. The combined result is exceedingly powerful. A captive *Gymnotus* exhibited in London some time ago, was able to kill its victims at a considerable distance. It fed upon fish, and when one of the victims was dropped into the tank, the *Gymnotus* simply curved slightly, stiffened its body, and a shock was communicated through the water which struck the introduced fish lifeless with lightning rapidity.

Another form of electric organ is that found in the African siluroid, *Malapterurus*, a fish not remotely related to our mud-pouts and cat-fishes, to which it bears much external resemblance. A layer of cells, lozenge-shaped and about one-sixteenth of an inch in diameter, extends between the skin and the underlying muscles except in the region of the head and the fins. Just as in *Gymnotus*, the current passes from the head to the tail. It is comparatively feeble, and probably only defensive. Instead of a nerve supply consisting of many thousands of fibres, a single nerve trunk passes from the spinal cord to the organ on each side of the body. The Nile is the home not only of the electric Siluroid *Malapterurus*, but of the electric Nile pike *Mormyrus*. There are many species of *Mormyrus* and, in all, the electric organs are somewhat feeble and located mainly in

the tail. The thick lateral muscles present no unusual features and the electro-motive property is purely superficial, being confined to a glandular layer in the skin and best developed in the caudal region. *Mormyrus*, it may be added, is allied to the herring and pike families, and belongs to the same order as *Gymnarchus niloticus* which exhibits like *Mormyrus*, rather feeble electric powers.

Some researches recently conducted in Scotland by Dr. E. Waymouth Reid have yielded the remarkable discovery that a series of scattered cutaneous glands in the common eel, *Anguilla*, constitutes an electric organ of great interest. Eel-skin has long been an old wives' remedy for sprains and rheumatic affections, and carefully devised experiments have quite recently shown how an electric discharge (the electro-motive force of the tissue's "current of rest") results from the activity of the gland cells in the integument by which the body of the eel is enveloped. We have in this remarkable discovery another illustration of the fact that the commonest of common objects may yield scientific results of rare interest and profound importance. The French-Canadian peasant who wrapped around his sprained wrist a piece of eel-skin had little notion that the dried tissue of the fish really possessed some of the most marvellous and mysterious properties exhibited by the finny tribes.

That activity in the skin-glands of the eel is associated with an electric discharge of appreciable power is a fact which considerably enlarges our ideas as to the nature of electric organs. In the electric organs of the Torpedo, the Skate and *Gymnotus* there is full evidence that we have examples of transformed muscular tissue. The organs may differ in situation, arrangement and general anatomical features, but they have this in common that they have a direct nerve supply from the central spinal system and are under the immediate control of the animal. We know that in many lowly animals, tissues are found which are neither muscle nor nerve, but a union of both. The neuro-muscle cells of the jelly fishes (Medusae) are an example. These cells are so primitive in structure and function that they

have not yet exclusively taken up either muscle or nerve functions, but perform the purposes of both. The metamorphosed substance, soft, transparent, and homogeneous, of the electric organs referred to recall this remarkable tissue as though the muscular tissue in the fishes in question were retrograding as it were, and returning to the early neuro-muscular condition.

On the other hand, in the eel and the Nile-pike, we have another type of tissue no less interesting and curious. The gland cells of the skin, instead of devoting themselves solely to secretion, have metamorphosed their energy in such a way as to be effective in the production of electricity. They are so well developed in *Mormyrus* as to form quite a compact layer beneath the integument. In the eel they retain their more primitive scattered character. It may be that an unsuspected number of common fishes are possessed of powers similar to those of the eel. A mysterious tremor is said to be felt by the patient when a piece of eel-skin is applied to an affected part of the body. Can it be that the electro-motive force in the dried fishes' integument can be again aroused by the damp acid exudations of the human skin? At any rate we have in the surprising properties of the eel's glandular integument not only a key to the interpretation of many forms of electric organs in fishes, but possibly an explanation also of the luminous or phosphorescent features which many fishes exhibit. Biologists have perhaps not fully realised the large place which electrical phenomena fill in the complex vortex of animal life. All muscular contractions involve more or less marked electric phenomena. Muscle we have seen may become essentially electric in its properties, and it now appears that glands may assume the *role* of electric and possibly phosphorescent organs in fishes.

THE ROYAL SOCIETY OF CANADA.

The fifteenth meeting of the Royal Society of Canada was held in Ottawa on May 18th, 19th, 20th and 21st of this year, and although somewhat tardy, this brief review of work done, more especially with reference to Natural History and the sciences in general, may not be deemed out of place.

The sessions were held in the Provincial Normal School building on Lisgar street. The evening public meetings were very well attended, but the meetings of the various sections which are also public were not as well attended perhaps as on former occasions. The presiding officer of the year was Dr. A. R. C. Selwyn, late director of the Geological Survey of Canada, who took as the subject of his inaugural address at the evening session of Tuesday, the 19th, "The Origin and Evolution of Archæan Rocks, with remarks and opinions on other Geological subjects; being the results of personal work in both hemispheres from 1845 to 1895." We hope to receive an abstract of this paper for the NATURALIST at a future date.

Amongst contributors of articles are several members of the OTTAWA FIELD NATURALISTS' CLUB. The following is a list of some of the papers read by title or *in extenso*, or presented in abstract by the authors or substitutes during the meetings of the sections:

"*A Theory of the Morphology of Stellar Structures.*" By E. C. Jeffrey, B A., communicated, presented and read by Prof. Ramsay Wright.

In this paper the author sought to adduce Ontogenetic and Phylogenetic evidence to show that the cylindrical fibro-vascular complex of the Phanerogamia and certain of the Vascular Cryptogamia, is derived by formation, first, of a channel and then of a tube, from the circumflexion of the oval pithless *stele*, presented by certain of the lower Pteridophyta.

The tubulation of the *stele* when complete is generally accompanied by the isolation of a medulla from the external fundamental tissue, and the more or less marked atrophy of the internal bast.

The writer further proposes the term *cælostelic* as descriptive of the morphological nature of the medullate stelar structures of the higher vascular plants, and the term *Protostelic* as indicative of the Phylogenetic status of the pithless steles of the Selaginellæ, etc. He considers that the cœlostelic type of stem presents a mechanical adaptation to enable comparatively slender axial organs to support large leaves. This paper was accompanied by excellent micro-drawings and micro-photographs of stelar structures in *Pteris aquilina* and other cryptogamia.

"*Past Experiences and Future Prospects of Fruit Growing in the Canadian North-West.*" By Dr. William Saunders.

This eminently practical paper contained many facts and notes of observations recorded as guides for subsequent research in this line. We hope to see the reports on successful trials in fruit culture in our great North-West soon published and distributed broad-cast amongst the farmers of that region. The work conducted by the Experimental Farms of Canada is undoubtedly of inestimable value to the country.

"*Contributions to the Pleistocene flora of Canada.*" Prof. D. P. Penhallow, M.A. Sc., etc.

This very interesting paper sums up to date our knowledge of the flora of pleistocene times in Canada. Several new species are described from the St. Lawrence (or Great Lakes) and Ottawa River valleys. Many of the species referred to were obtained in the so-called interglacial beds of Scarboro Heights, near Toronto, and others from the calcareous nodules of Green's Creek and Besserer's, below Ottawa, of Leda clay (marine) age. A very interesting discussion followed this paper in which Sir William Dawson, Prof. Macoun, Mr. H. B. Small, Prof. Penhallow, Dr. Ami and others took part. Sir William pointed out that the association of species representing the flora of Scarboro Heights horizon indicated a climate even less severe than there exists now at Toronto and along the north shore of Lake Ontario in that vicinity.

"*Generic Characters of the North American Taxaceæ and Coniferæ.*" By Prof. D. P. Penhallow.

In 1894 the author presented a preliminary outline of the diagnostic characters derived from a study of the woody portion of the

stem, which would serve as a basis of classification for the North American Coniferæ. Since then, somewhat extended opportunities for verification and comparison have been offered, and the present synopsis is now given in the belief that it embodies what may be regarded as final deductions.

The classification as at present outlined, indicates that the Taxaceæ and Coniferæ must be regarded as distinct families. It also shows that among the Coniferæ, the genera heretofore recognized as distinct, are separable from one another on anatomical grounds with the exception of Cupressus and Chamæcyparis, between which there is no adequate ground of differentiation. They are, however, combined in the former genus, of which there are two sections, Cupressus proper and Chamæcyparis.

Additional Notes on Fossil Sponges and other Organic Remains from the Quebec Group at Little Metis, By Sir J. William Dawson, LL.D., F.R.S., with descriptions and remarks on some of the specimens, by Dr. G. J. Hinde, F.G.S., etc.

This paper is intended as a continuation of that on the same subject published in the transactions of the Royal Society of Canada for 1889.

It notices, in the first place, the present state of our knowledge of the rocks of the Quebec group of Sir William Logan, as developed on the South shore of the St. Lawrence, below Quebec, and especially at Little Metis Bay; with the sub-division of these rocks resulting from the recent observations and collection and study of fossils by the officers of the Geological Survey of Canada, and by Prof. Lapworth. From these it would appear that the beds at Little Metis which have afforded so many interesting species of fossil sponges, may be referred with some certainty to the upper part of the Sillery series, the lowest member of the Quebec group; and which should probably be regarded as equivalent to the lower Calciferous of the interior of the continent, and may therefore be held to be on the confines of the Cambrian and Ordovician Systems.

That the beds of the Lower Cambrian were already hardened and in process of denudation at the time when the Sillery Series was laid down, is evidenced by the fact that in the conglomerate almost immediately overlying the sponge-beds, boulders occur holding *Olenellus* and other characteristic Lower Cambrian fossils. This fact, observed last summer, is noticed in the paper, with a list of these fossils.

Attention was then directed to the results of recent excavations in the sponge-beds, revealing some new forms and new facts with reference to those previously known; special mention is made of the giant sponge referred by Dr. Hinde to a new genus *Palæosaccus*, and described by him in the London Geological Magazine; and to the occurrence of a

species of *Stephanella* resembling that discovered by Dr. Ami in the Utica shale at Ottawa. A new species of *Chondrites* is also noticed, and illustrations are given of the varied and curiously constructed anchoring-rods of some of the species.

In an appendix, a complete classified list is given of species discovered at this place, with figures and short characters.

Palæozoic Outliers of the Ottawa River Basin. By R. W. Ells, LL.D.

At many points throughout the area drained by the Ottawa, but more particularly to the south of that river, outliers of fossiliferous rocks, largely calcareous, are found. Some of these areas are quite extensive, embracing several square miles, while others are limited to a few hundred square yards. The area from the vicinity of Ottawa City to the south and east is continuous with the great series of deposits found throughout the St. Lawrence River basin.

In most of these rocks an abundance of fossil forms are found. Collections of these have been made from time to time, both by members of the staff of the Geological Survey and by other gentlemen interested in their study. These collections have been carefully examined and show that the formations represented in this basin range from the Potsdam formation upward to the Lorraine shales, both inclusive, thus embracing the entire series of formations pertaining to the Cambro-Silurian system as now understood by the Canadian Land Survey. Black River and Trenton forms are particularly well represented at several points. These outliers are presumably the remains of a once largely developed series of fossiliferous rocks which rested upon the older Crystallines, and which probably occupied much of the area between the St. Lawrence and the upper Great Lakes.

"*On the Fossil Remains of the Ottawa Palæozoic Basin.* By H. M. Ami, M.A, F.G.S.

This paper which accompanied the preceding one by Dr. Ells, contained an extensive series of succinct reports upon the palæontological characters of the various geological formations comprised in the Ottawa Palæozoic Basin. Useful systematic lists of fossils from the Lake Temiscamingue outlier, from Paquette's Rapids, Bonnechère River, from Ottawa and vicinity, as far east as Lachute, have been prepared and afford a means of ascertaining the faunas and faunal relations of the various members of the Palæozoic formations included in the Basin. The Silurian and Ordovician or Cambro-Silurian systems are the only two systems recognized.

Catalogue of the Phytophagous and Parasitic Hymenoptera of Vancouver Island, B.C. By W. Hague Harrington.

The species enumerated in this list are in large proportion represented in the valuable collections made by the Rev. G. W. Taylor during his residence at Cedar Hill, near Victoria, and the list is offered as a contribution toward a better knowledge of the rich fauna of the Island. Much extensive and systematic collecting must be done, however, before anything approaching a satisfactory catalogue can be compiled. At present many of the families are almost, or entirely unrepresented in collections from this region; the larger and showier insects have naturally been first collected, while the much more numerous minute and obscure forms have been neglected.

PROF. E. E. PRINCE, Dominion Commission of Fisheries, contributed a very interesting series of papers as follows—In Section IV. :

"*Further Observations on Trophoclasts in Fishes' Eggs.* By Sir James Grant, M.D., K.C.M.G., etc., and Prof. Edward E. Prince, B.A., F.L.S.

In continuance of the paper presented at the Society's meeting in 1894, the authors now bring additional evidence to show that the Trophoclasts are not nuclei of the germ or of the yolk, but by difference in size and details of structure they are demonstrated to be, like the osteoclasts, in an ossifying matrix, nuclei with special functions and characteristics, and chiefly active in breaking down the crude yoke of the egg.

"*A Study of the Pelvic Girdle of the Pike* (Esox) *in its Bearing on the True Interpretation of Paired Fins.* By Prof Ed. E. Prince. Communicated by Dr. G. M. Dawson.

The author states his grounds for regarding the so-called girdle as not really a girdle at all. His former studies on the shoulder girdle in fishes led him to the view that certain elements generally held to belong to the shoulder, are really arm elements and belong to the free limb. They originate in a horizontal plate of cartilage, which is drawn in towards the clavicle, and becomes altered in position and relation. The Pelvic Girdle is really composed wholly of free limb elements and is not truly pelvic.

This paper elicited a spirited discussion, Professor R. Ramsay Wright, among others, criticizing the position taken by Professor Prince.

'*The Spawning Habits, Coloration and Form of the Sockeye Salmon of British Columbia.*" By Prof. Ed. E. Prince. Communicated by Dr. G. M. Dawson.

The author from personal observations on the spawning-beds of the Pacific Salmon, states that recorded observations are wholly erroneous, and gives a detailed account of the actual facts as observed by him in the summer of 1895.

In section II. :—

A New Suggestion for a New Psychological Basis of Belief. By Prof. Ed. E. Prince. Communicated by Dr. Bourinot.

The Ego and the Non-Ego are not given in the primary act of consciousness. The apprehension of the sensible world is gradual. It develops from the primitive sensation, not, as is generally supposed, of resistance to voluntary movement, but of non-resistance (*i.e.*, space), and of duration (*i.e.*, time). The consciousness of voluntary power affords the original ground to which is added the consciousness of space and time as the true psychological basis of belief.

Sense Deception a Secondary Acquirement. By Prof. Ed. E. Prince. Communicated by Dr. Bourinot.

A study of the exercise of the senses in animals and young infants shows that the reports of the senses are normally true: but that an intellectual element is added by education and secondary conditions, and sensations originally simple and true, become complex and false. The sensations of a trained organism are thus found to involve not only sensory perception but intellectual judgment, hence sense-deception arises.

The Present Low Water in the Great Lakes. By Robert Bell, B.A. Sc., M.D., LL.D.

Periods of high and low water of these lakes in recent historical times. Comparison with levels of other lakes in North America at corresponding periods. Evidences of higher levels in recent geological times. Some striking examples of terraces and beaches of moderate elevation. Ancient terraces of higher elevation. Some of the more lasting of the old high levels. Inclination of terraces and differential elevation or canting of the land. Former connections, separations and discharges of the great lakes. Much greater extent of the lakes in former times and their gradual contraction to the present dimensions. Differences in origin and in the probable duration of the different

lakes. Transient characters of fresh-water lakes in general. Questions as to the effects of dredging channels in outlets, also as to rain-fall and evaporation in effecting the levels. Present and future effects of the low water effects on navigation and commerce. Means of relief. Experiments in damming lakes. Possibility and advantage of damming the outlets of some of the great lakes. Conclusions.

Geracus Tubifer. A New Thysanuran of the Little River Group, St. John, N.B. By G. F. Matthew, D. Sc.

This anomalous insect is referred to the Thysanurans because the joints of the thorax are separated, and there are no wings, and because of the uniformity of adjoining somites. The head is reduced to a small conical projection, terminating in a prolonged tube or proboscis. Apparently the nearest ally is a tube-bearing, few-jointed (aquatic?) insect found by Dr. S. H. Scudder in the Oligocene beds of Florissant, which he has referred to the Thysanurans. The reduction of the head to little else than a sucking tube is not easily paralleled among these lower insects, and gives the head somewhat the appearance of that of a weevil. The fossil is from a bed which has already yielded a large number of insect remains.

Coal Mining in Pictou County, N.S. By E. Gilpin, Jr., LL.D.

The paper gives the principal facts in connection with the pioneer workings carried on by the Grand Mining Association in this county, the dates of the various finds, workings, railway construction, etc.

On the Sequence of Strata Comprised in the South-west quarter-sheet Map of the Eastern Townships of the Province of Quebec, and their palæontological relations. By Henry M. Ami, M.A., F.G.S., of the Geological Survey of Canada. Communicated by Dr. R. W. Ells, F.R.S.C.

The recent investigations of Dr. Ells, of the Canadian Geological Survey, in the "South-west Quarter-sheet Map of the Eastern Townships of the Province of Quebec," serve to throw a great deal of new light upon the various problems involved in that district on which so much has already been written. As the strata in question are highly fossiliferous, and the numerous fossils collected serve as excellent material with which to ascertain the sequence and age of the strata in these disturbed regions, the results thus far obtained will be discussed and the various faunas and zones indicated.

There are many and intricate problems involved in a detailed study of the geological formations of the Province of Quebec. Particularly so is this the case respecting the sedimentary formations of the south and eastern portions of this Province.

Leaving out of consideration the unfossiliferous rocks of the district, the paper deals with the more recent discoveries that have been made in this region, and discusses their bearing upon the problems involved.

To the sum of palæontological evidence adduced by the late Mr. E. Billings, in effecting a correlation of the strata in question with their equivalents in other and undisturbed regions of Canada and elsewhere, there has recently been discovered a fauna which may now well be designated the Fauna, (for a description of which the reader is referred to the writings of Prof. Whitfield, by Profs. H. M. Seely and Ezra Brainerd, of Middlebury College, Vt.) and the relation of this remarkable fauna to the faunas described by Mr. Billings from the Phillipsburg district as well as from the Stranbridge and intermediate regions are herein discussed. Thus far the views promulgated by Billings and by Sir William Logan regarding the existence of a series of geological formations deposited under peculiar conditions, and all capable of being brought under the one continuous group or series (designated by them the "Quebec Group") are found to be correct.

From the above it can readily be seen that in section IV. of the Royal Society which deals with geological and biological science generally, there was considerable activity. Besides the presidential address, which, owing to its special nature, did not come in for a share of discussion, there were general geological papers, and some of these led to most important as well as interesting and lengthy discussions. On Prof. Penhallow's paper relating to the Pleistocene Flora of Canada, a most interesting discussion followed, in which were involved numerous problems touching upon the climatic conditions at the time in question. Subsequent to the reading of Sir William Dawson's paper on the Metis Sponges and the Quebec Group of the Lower St. Lawrence—as also after Dr. Ami's paper to the same section on a similar subject to Sir William's —there were important discussions in which Dr Ells, Dr. Selwyn, Mr. Whiteaves, besides the authors of the papers took

part. Without wishing to dogmatize upon the validity of the term "Quebec Group"—as established by Sir William Logan and Billings—the sum of evidence adduced, stratigraphical and palæontological, leads one to conclude that so far, at least, as the fossiliferous portion of that group is concerned, it is characterized and easily recognized as forming a truly natural group oceanic in its origin, related to Atlantic formations, and essentially differing in its details from the Continental formations of undisturbed American central plateau. Amongst other interesting features of the May, 1896, meeting of the Royal Society, may be mentioned:—

PROF. PRINCE'S public lecture on "*The Fishery Industries and Resources of Canada*," illustrated by a fine series of lime light views of the Atlantic and Pacific coasts, of the various inland lakes and rivers, of nets and fishing apparatus, and of the more remarkable species of fish with their eggs and young. Prof. Prince entertained his unusually large audience for nearly two hours, and gave a more complete and concise review of our vast resources and fishing industries in Canada than had ever been presented before any audience.

PROFS. COX and CALLENDER, of McGill University, presented a most timely and attractive paper entitled, "*Some Experiments with X Rays.*" These were illustated with interesting negatives taken in the laboratories of the Macdonald Physics building.

MR. BARNES' paper, "*On Some Measurements of the Temperature of the River Water opposite Montreal, made during the winter with a differential platinum thermometer*," brought a most practical question before Section III of the Royal Society. The conclusions with regard to the formation of "fragile" and "anchor" ice are discussed at length in the paper, which we hope to see published at length in the annual volume of the transactions of the Royal Society.

DR. BOURINOT contributes two important papers to section II.—one an historical one, the other a constitutional study. These and another historical paper by DR. S. E. DAWSON, also an honored member of our club, on the "*Voyages of the Cabots*," together with papers by DR. DOUGLAS BRYMNER, by MR. W. W. CAMPBELL by CAPT. E. DEVILLE, by BENJAMIN SULTE, by DR. FRECHETTE, HON. MR. MARCHAND and others, serve to show what great activity is displayed in Canada, both in the fields of letters and science.

THIRD EXCURSION OF THE SEASON.

The third general excursion of the club will be held on Saturday the 26th September. The council are now considering the best locality to visit, and due notice will be given to the members by post cards when the arrangements have been completed.

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