MINUTE

OF

THE PROCEEDINGS OF THE

BELFAST

NATURAL HISTORY SOCIETY,

AT THE MUSEUM,

ON WEDNESDAY, FOURTH JUNE, 1834.

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PRINTED BY FRANCIS D. FINLAY,
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NATURAL HISTORY SOCIETY.

Report of the Council.

At the close of another Session of this Society's proceedings, the Council have now to lay before the Members the Report of the progress made during the last year. In doing so, it is most gratifying to them to know, that much has been effected, to ensure the permanency, and increase the usefulness of this Institution.

At one time, our Reports were, necessarily, brief, marking, by small indices, the almost imperceptible movements of an unknown and struggling Society. Now, from the great interest taken by our fellow-townsmen in its success, the Belfast Natural History Society presents, during one Session of its meetings, so much of variety, and so many new subjects of interest, that it is difficult to compress, within the narrow limits of a Report such as this, all the information which may be given respecting it.

The Council hope, that, on this occasion, they may be pardoned, not only for going more than usual into detail, but also for expressing the pride which they feel, in having been the means of carrying forward, to so advanced a situation, the objects proposed by the original Members of this Society. This may the more easily be pardoned, by those who fully know the various difficulties with which the Society had to contend, and the little hope which could have been entertained at our last annual meeting, that, during one year, the Society should not only have been able to free itself entirely from debt, and defray its annual expenses, which (including rent and other fixed charges) are always considerable, but also to leave such a sum in the hands of the Treasurer, as to justify the Council in concluding a contract for the completion of all parts of the building now unfinished. It will be recollected, that, during the year, two general meetings of Members and Shareholders have taken place. At the latter of these, it was determined to change the Subscribers' rights in the Museum, from a life-interest to a perpetuity, devisable like any other property.

By the statement from the Treasurer of the Building Fund, it appears, that the amount of money actually received by him, during the Session, has been £874 5s. 6d., and the expenditure £798 14s. 10d., leaving a balance of £75 10s. 8d., at present on hand.

The regular income of the Society, for the year, has been £84 14s. 6d.; the expenditure £94 7s. 3d., leaving a small balance due the Treasurer.

Before concluding their statement respecting the funds, the Members of Council, who have drawn up

this Report, consider it their duty to state, that the successful efforts made during the year, have been principally owing to the zeal and ardour of one of the Members, the Treasurer of the Building Fund. The anxious wish which this gentleman has always shewn, to promote the interests of the Society, and increase the collection of the Museum, is well known to the Members generally, and has been fully appreciated by them. It is only, however, by his fellow-Members of the Council that his exertions to forward the building of the Museum, can be fully known, and the positive labour and trouble, to which the collection of the Subscriptions, and payment of different contractors, subjected him ; and there is scarcely a doubt, that without his very active exertions, the Society would be still labouring under debt and inconvenience.

Under such circumstances, the Council think, that they should not return a faithful account of the progress of the Society, did they not thus direct the attention of the Members to Mr. ROBERT PATTERSON, individually, as the person to whom the present prosperity of the Society is principally to be attributed.

By the list of Donations attached to this Report, it will be observed, that, during the past year, the collection has received considerable increase by donations from friends, at home, and in foreign countries. Agreeably to the announcement made at the close of last Session, the Museum has been open for the last year, on two days of each week, and it has been visited by upwards of 1200 persons. In this part of the Report, the Council are happy to state, that they hope, before

long, to render the Museum more accessible, and, also, more generally useful.

It is intended, as soon as the two unfinished rooms can be fitted up, to devote one of them, on the first floor, either to the mineral or conchological collection, the principal part of the former not having been yet exhibited.

The favourable state of the funds has, also, enabled the Council to do what has been long required, viz., to appoint a Curator, who will be in constant attendance during the days of public exhibition; and who, under the direction of the Council, will keep the specimens in a proper state of preservation.

The crowded state of the apartment in which the collection is deposited, prevents the exhibition of many specimens sent in by our numerous friends: this, it is to hoped, will soon be obviated; but, in the mean time, the Council request both Members and friends to continue their exertions in procuring specimens, many of which require to be in the hands of the Curator for some time before they can be displayed. Every thing presented, is preserved with the greatest care, and the accumulation of specimens will, in a very short time, enable the Society to render the Belfast Museum well worthy the attention of strangers. The Curator, or any of the Council, will, on application, supply printed directions, for preserving and forwarding objects of Natural History.

During the year which has now elapsed, most valuable additions of specimens have been made in almost all the departments of Nature. In Ornithology the

contributions have consisted chiefly of native species, among which it will be seen there is a specimen of the Honey Buzzard, (*Falco Apivorus L.*) the first ever killed in Ireland. The Council trust that, ere long, all the specimens will be scientifically arranged and marked in their respective cases, and, as soon as the funds will permit, many fine specimens, now in skins, will be stuffed and fitted up. In Entomology, 388 species of foreign insects, belonging to the Belfast Museum, have been compared by J. O. Westwood, Esq., F.L.S., with the Linnæan and Banksian Cabinets in London, as well as with some private ones, and named, as far as possible, according to the nomenclature observed in those collections; although, from the less degree of attention bestowed on foreign insects by Entomologists, many of the specimens yet remain unknown. By the same distinguished Entomologist, 208 British and foreign insects have been presented, in return for some of the duplicate specimens of those foreign insects examined by him. Our fellow Member, Dr. Templeton, has, as will appear from the List of Donations, made also a large addition to the British species, previously in our collection.

The Library has been enriched by a donation from Francis Whitla, Esq., of eighty-eight volumes of *The Annales de Chimie*, and by a very fine copy of the first edition of *Buffon's Histoire Naturelle*, presented by William Ogilby, Esq., of London, in addition to many works sent by other individuals.

The specimens of art presented, have been not only varied, but of great value. The Council would particularly allude to the very extensive donation from Gordon A. Thomson, Esq., consisting of a great variety

of weapons, and domestic utensils, used by some of the natives of Africa, with specimens of their language, models of the people, &c. &c.

Many valuable specimens have been presented, not properly coming under any of these heads, which will be found in the List of Donations attached to the Report.

On the whole, the collection has been augmented in a greater proportion than perhaps in any former Session ; and this furnishes another example of the increasing interest in its welfare, felt by all the friends of the Museum.

In consequence of the increase of the Members and Subscribers, it was found necessary, during the present Session, to occupy the large unfurnished room, above that in which the specimens are now exhibited. This has been attended with some inconvenience, and the accommodation for visiters has not been so good as the Council could have wished. It gives them, however, much satisfaction to announce, that, before next Session, it is intended to have the upper room furnished and fitted up in such a manner, as to afford comfortable accommodation to visiters, until the state of the funds will admit of the building of a regular lecture room.

In consequence of the various points to which the attention of the Society has been directed, very little has been given to the library, and no part of the funds has been expended in this department. Its importance and utility can scarcely, however, be overrated ; and it is the intention of the Council immediately to place the books under the charge of the Curator, so that they can

be rendered at all times accessible. In addition to the other duties to be performed by the Curator, it is, also, intended, that a regular series of Meteorological observations shall be preserved in the Museum ; and it is to be expected, that, by the exertion of those Members who have devoted part of their attention to the subject, that a more correct registry of the various atmospheric changes taking place at Belfast, may now be had, than has been obtained at any previous period. That this part of Natural History possesses much interest, is now generally admitted, and the progress which, of late years, has been made, in the investigation of Meteorology, gives good reason to anticipate much practical advantage from the result of long-continued observations, carried on with accuracy, at a number of places, in different parts of the world ; and it is not too much to anticipate, that rules may be established, by which atmospheric changes may be, with some degree of certainty, predicted.

During the present Session, the plan, so successfully pursued in two former Sessions, of having public nights of meeting, has been continued, and the interest taken, by members and visiters, remains unimpaired, as is best shown by the fact, that upwards of one hundred ladies and gentlemen, on an average, have been present on each of those occasions.

At the private meetings of the Society, nineteen papers have been read ; of these, two have been on Mineralogy, seven on Zoology, four on Botany, two on Meteorology, and the remainder on miscellaneous subjects. During the next Session, it is intended to conti-

nue the plan of having public nights of meeting; but how these shall be arranged, has not yet been decided. By some Members, it has been suggested, that the true objects of the Society would be better attained, by short regular courses of Lectures, on particular subjects, than by the present plan of detached papers. How far it may be practicable, or, perhaps, desirable, to make a change from the present system, still remains undetermined. The Council, in the arrangements they shall make, will, of course, be directed by what appears to be the general wish of the Society.

Having thus given a brief account of the proceedings of the present Session, the Council have again to congratulate the Society on the auspicious circumstances under which the Museum is now placed. A sum of nearly *one thousand pounds* has, within a few months, been paid into the hands of the Treasurer; and, by this means, the debt which, for some time, impeded its progress, and almost threatened its destruction, has been removed; considerable additions have been made to all its various collections, and a wider field of usefulness opened before it. All this is most gratifying, particularly when it is found, that the exertion of Members have not relaxed—that they have continued to procure, (whenever opportunities offered,) additions of specimens in the various kingdoms of nature, and among the diversified productions of art, to enrich our cabinets. Above all, the Council feel most gratified in observing, that the same unity of purpose, and kindliness of feeling, which have always distinguished the Society, still remain unimpaired, and that no circumstance, even the most

trifling, has, at any time, occurred, to interrupt the harmony which has existed from the formation of the Society, in 1821, till the present moment.

The President, Dr. DRUMMOND, after a few preliminary observations, read the following Address:

"TO MR. ROBERT PATTERSON.

"DEAR SIR,

"A FEW friends to the BELFAST NATURAL HISTORY SOCIETY request your acceptance of the accompanying piece of plate, as a token of their personal regard, and a testimony of their sense of your services to this Institution, as Treasurer to the Building Fund. They trust, that you will receive it as a sincere expression of the affection which has been inspired by your upright, amiable, and conciliatory conduct in private life; of the approbation which has been called forth, by your zealous pursuit of natural science, in the midst of the avocations of business; and by your success, both in the acquisition and the communication of this department of knowledge.

"You were, Sir, one of the earliest Members, and you have been one of the most persevering friends, to the NATURAL HISTORY SOCIETY. Your papers and remarks have not only shown your attention to the objects of the Society, but have communicated information to your fellow-Members, in a pleasing and attractive form. You have paid uniform attention to the interests as well as to the objects of the Institution, devoting a considerable portion of your time to its concerns, as a Member of the Council, and as a voluntary labourer in its be-

half. When it was determined to erect the building in which we are now assembled, you interested yourself much in the superintendence of the work; and, more recently, when it became necessary to make an effort to relieve the Museum of the load of debt which pressed heavily upon its funds, and cramped the efforts of the Society, in various ways, your exertions to forward this object were unremitting and indefatigable. You have now, Sir, the satisfaction of knowing, that they have been eminently successful;—for it is mainly owing to your zeal and perseverance, aided by the respect in which your character is held, by all who have the pleasure of your acquaintance, that the finances of the NATURAL HISTORY SOCIETY are, at length, in a situation which holds out a pleasing prospect of extensive, and permanent utility.

"That you may long continue to adorn the NATURAL HISTORY SOCIETY by your labours, and to aid it by your exertions, and that you may enjoy every happiness of life, is the wish of your sincere friends; who beg your acceptance of this memorial of their esteem.

"JAMES L. DRUMMOND, M. D.
"President B. N. H. S."

TO this Address, Mr. PATTERSON made the following reply:

I know not, Mr. President, in what terms to thank you, and my fellow-Members, for their kind, complimentary, and flattering address; or for this, their handsome and valuable present. Not having had an oppor-

tunity of reading the address, or of hearing it, until now, I am unprepared to reply in terms meet for the occasion. Yet, perhaps, this is of little consequence. With preparation, my periods might have have been more elegantly rounded—sentences arranged with more precision—metaphor and simile might have been employed—yet all these would have expressed no more than what those simple words convey—'I thank you.' The briefest expression is, generally, the most forcible. The simplest phrase is that by which the deepest feeling is oftimes evinced. Therefore, to you, and to my fellow-Members—briefly, simply, but most sincerely—do I say, I thank you.

To every man, the approbation of his fellow-townsmen must prove gratifying. When I consider from *whom* this mark of approval comes, the value of the gift is enhanced tenfold. I recognize among the donors, some men distinguished for high literary attainments; some, who, by their writings and investigations, have advanced the cause of science; others, remarkable for their activity in their various avocations, and for their fulfilment of all the duties of private life. With some, I have lived on terms of intimacy, 'even from my boyish days.' The character these friends have attributed to me, is far—very far—from being deserved; but I hope my future life will show, that I am anxious to acquire *some* resemblance to the portrait they have drawn.

I was aware, that, as Treasurer to the Building Fund, my name would be mentioned in the Report; but, that it should be introduced in the manner it has been, I certainly did not expect; and a result has, I think, in

this instance, been attributed to the efforts of one, which arose from the combined exertions of many. A part of the praise I know to be just, and, being so, I value it; beyond that, I cannot but feel convinced, that the kindness of my friends has overmastered their discrimination.

When I look back upon the humble commencement of the NATURAL HISTORY SOCIETY, thirteen years ago, when it consisted of but eight Members, and one small case contained the entire collection of specimens, I cannot but view, with pride and satisfaction, the progress it has made. When I consider the good it is capable of producing, I feel, as every one of its founders must do, that, to have established such an Institution, is, NOT to have lived altogether in vain. I look upon it as honourable to the town in which it is placed, and creditable to the liberality of our townsmen, by whose contributions it has been erected. I regard it as eminently calculated to make known the varied productions of our native land; and to diffuse among the inhabitants of this flourishing and populous town, a taste for intellectual pursuits, instead of merely physical or sensual enjoyments. Above all, I regard it as a temple, where the humble student of nature may enter in, and behold, in all its compartments, those evidences of Almighty wisdom, with which every part of creation is replete.

The Report notices the kindly feelings which have, without any intermission, existed among our Members. To this, every one acquainted with the Society can bear witness. No matter what causes may have stirred up, in our town, the jarring and discordant principles

of man's nature, every emotion of the kind was calmed, when the vestibule of our building was entered. Within the threshold, all were brethren, associated in one common pursuit; and the only difference between man and man, was that which superior knowledge conferred.

Permit me, Sir, to assure you, that it adds to the gratification I feel on the present occasion, that I meet, as President of the Society, the same gentleman whom, thirteen years ago, I met as its founder; and who, by his writings, has done so much to extend a taste for the cultivation of Natural History. To you, and the present numerous assembly, I return thanks, for the patience with which I have been heard; and hope your kindness will excuse the deficiencies, which your judgment must detect.

THE Secretary then read the following list of OFFICERS, chosen for the next Session:

JAMES L. DRUMMOND, M. D., PRESIDENT.
WILLIAM THOMPSON, } VICE PRESIDENTS.
ROBERT PATTERSON, }
JAMES M'ADAM, CORRESPONDING SECRETARY.
ROBERT S. M'ADAM, } RECORDING SECRETARIES.
JAS. D. MARSHALL, M. D., }
WILLIAM WEBB, TREASURER.
WILLIAM PATTERSON, LIBRARIAN.

Members of Council.

JOHN STEVELLY, A. M.
EDMUND GETTY,
GEO. C. HYNDMAN,
JAS. GRIMSHAW, JUN.
JAS. BRYCE, JUN., A. M.
REV. J. SCOTT PORTER,
ROBT. WORKMAN, JUN.
ROBERT BURNS, JUN.

The proceedings of the evening were concluded by an Address from PROFESSOR STEVELLY, one of the Vice-Presidents. It commenced, by congratulating the Society on their progress during the Session; and cautioned them against allowing their past exertions to be followed by inactivity. The Professor then noticed the divisions of human knowledge, the dependence of one science on another, and the variety of objects comprized in the study of Natural History. He then dwelt, at considerable length, on the importance of this pursuit, "to the gentleman, and the scholar; to the Christian, and the minister of the Gospel; to the merchant, and the man of business; to the landed proprietor, the farmer, and the gardener; to the lonely traveller, in unexplored wilds; and to the person who undertakes, after having travelled, to inform others;"—illustrating his remarks by examples, drawn from various sources. The communications made during last year, by Members of the BELFAST NATURAL HISTORY SOCIETY to other Bodies, or to Scientific Periodicals, were mentioned in terms of satisfaction. Some of the papers read during the Session, were next noticed, particularly those which contained original matter, or which had given rise to animated conversation; and the address, which occupied an hour and a quarter in the delivery, concluded, by referring to some of the topics noticed in the Report of the Council.

List of

DONATIONS TO THE MUSEUM,

Presented during the Session, terminated June 4, 1834.

Mr. W. Adams, *Shane's Castle.* Two Goldfinches, and a Buzzard, (*Buteo Vulgaris.*)

William Ainsworth, Esq. An account of the Caves of Ballybunnion, in the County of Kerry; presented by the Author.

Robert Ball, Esq., *Dublin.* Specimens of native shells.

E. T. Bennett, Esq. F. L. S., and Z. S., *London.* His Papers "On the Chinchillidæ, a Family of Herbivorous Rodentia, and on a new Genus referrible to it;" and "On the M'Horr Antelope," with plates; forming part of the Transactions of the Zoological Society of London.

Surgeon Birnie, R. N. A Belt from the Island of Malicolo, in the Southern Pacific. Specimens of Coral. The Cast of a Bushman: and an Albatross.

Rev. Geo. M. Black, *Newtown Crommelin.* Specimens of the Snow Bunting, (*Emberiza Nivalis.*)

Mr. Thomas Blackwood. A Guayaquil Hammock, and three Huacas, or Indian Vessels of Clay, from the celebrated Huacas, near Trujillo.

Robert G. Bomford, Esq., *Annadale.* A Honey Buzzard, (*Falco Apivorus,*) shot at Annadale, County of Down.

Mr. John Corry, *Armagh.* Impression of an Ancient

Brazen Seal, belonging to the See of Armagh, dug up lately on the Site of Templebridget.

JOHN CUNNINGHAM, ESQ., *Macedon.* A Specimen of the Black Rat.

WILLIAM L. CUNNINGHAM, ESQ, *Springhill.* Specimens of the Cray Fish, (*Astacus Fluviatilis.*)

WILLIAM DARLINGTON, ESQ., M. D. The "Florula Cestrica:" the "Address to the Chester County Cabinet of Natural Science:" and the "Address to the Pensylvania Agricultural Society," from their Author.

REV. JOHN DAVISON, *Cookstown.* An Indian Bow and Quiver.

Mr. C. DAWSON. A Quern, or Antique Hand-Mill.

MRS. DILLON, *Claremont-square, London.* A Shell Bracelet from Fernando Po.

GEORGE DUNBAR, ESQ. A Cinereous Eagle, (*Falco Albicilla.*)

CAPTAIN FAYRER, R. N., *Donaghadee.* Specimens of the *Cancer Strigosus*, and *Cottus Scorpius*: of the Hare and Rabbit, from Scotland: the Pole Cat: the Sparrowhawk: a Madagascar Broom: Paper made in India from the Bamboo: Specimens of Limestone pierced by Saxicava Rugosa: and of Wood perforated by the Teredo Navalis, &c.

DOCTOR FERRIER, *Kilrea.* A Specimen of the Lamprey, (*Petromyzon Marinus,*) caught in the Bann.

MR. GALBRAITH. The Skins of Twelve North American Birds, and of a Solan Goose, (*Sula Alba.*)

GEOLOGICAL SOCIETY OF DUBLIN. The First Number of their Journal.

EDMUND GETTY, ESQ. A Copy of Vancouver's Voyages, in 7 volumes.

ROBERT E. GRANT, ESQ., M. D., F. R. S. EDINBURGH, L. S., Z. S., G. S., LONDON. His Papers on "The Structure and Character of Loligopsis, and Account of a new Species from the Indian Sea:" "On the Ner-

vous System of Beroë Pileus Lam., and on the Structure of its Cilia;" and on "A new Species of Sepiola from the Mauritius," with plates, forming part of the Transactions of the Zoological Society of London.

Mr. James Garrett. A Specimen of the Missel Thrush, (*Turdus Viscivorus.*)

James Gibson, Esq. A Sharp-tailed Swallow, (*Hirundo Caudacuta,*) from New Holland.

Mr. John Gould, F. L. S., *London.* His Paper on "A new Genus in the Family of Corvidæ," with plates; forming part of the Transactions of the Zoological Society of London.

Mr. Weston Grimshaw. A nimble Lizard, (*Lacerta Agilis.*)

James Grimshaw, Jun., Esq. A Number of Reptiles, preserved in spirits.

John U. Grimshaw, Esq., *Massachussetts.* Fac-simile of the Inscription on Dighton Rock.

John Hagan, Esq., *New Orleans.* The Pouch and Belt of *Tuskina*, the Chief of the Creek Indians.

Mr. Hugh Hannay. A large Leaf of the Fan-Palm, from Ceylon: a Fan made of the same material: four Specimens of Ceylonese Insects: and a Basket made by the Natives.

John Harrison, Esq. A Turtle from the Mediterranean.

Rev. Dr. Hincks, *Killileagh.* A Copy of his Essay on the "Enchorial Language of Egypt."

Rev. William Hincks, *York College.* Specimens of Insects.

John H. Houston, Esq., *Orangefield.* Polished Stalactites, from Gibraltar: Semi-opal, and Chalcedony, from Fairhead.

Mr. James Hutchinson, *Stranocum.* A Medder containing Butter, dug up in a Bog near Stranocum-House, County Antrim.

John Irving, Esq., R. N., *Moville.* A Cingalese Coin.

JOHN JAMISON, ESQ., *Dublin.* Stalactites from the newly discovered Cave of Mitchelstown.

MR. ROBERT JOHNSON, M.R.C.S.L. A Silver Coin of one of the Dukes of Brabant.

A LADY. A Bag made at Bahia, of a Species of Grass.

A LADY. Capsules of the Cotton Tree.

THOMAS LANCASTER, ESQ., *Pernambuco,* by GEORGE T. MITCHELL, ESQ. A Sangada, or Raft; and a fine stuffed Specimen of the Alligator.

MR. MAGUIRE, *Dublin.* Four curious tiles, dug up in the Ruins of Christ's Church and St. Patrick's Cathedral, Dublin.

DR. JAMES D. MARSHALL. Specimens of the Cuckoo: the Herring Gull: Purple Jacana: some Bird's Nests and Eggs: a Kitten with Eight Legs and Two Bodies; and Two Chickens united in One Body: a "Description of Instruments designed for extending and improving Meteorological Observations," by the late Sir John Leslie.

Mr. WILLIAM Marshall. Fourteen stuffed Specimens of Native Fishes, including some rare Species.

CAPTAIN MERRY, *of the Sarah Sheafe.* A Turkish Firman, Signed by the Grand Seignior.

DOCTOR M'GEE. An Asterion, or Universal Sun-Dial.

J. MILLER, ESQ., *Comber.* A Specimen of the Golden-Eye Duck, (*Clangula Vulgaris.*)

ANDREW MOORE, ESQ., *Derry.* Two Boxes of Minerals.

R. I. MURCHISON, ESQ., V.P. GEOLOGICAL SOCIETY OF LONDON. Lithographic Drawings of Organic Remains, illustrative of his remarkable Discoveries in the North of Scotland, and the Eastern Alps.

MAURITIUS NATURAL HISTORY SOCIETY. A Box of Minerals, presented by the Society, by order of their President, the Hon. Edward B. Blackburn.

RIGHT HON. EARL O'NEILL. Specimens of a White Hare; and a Fawn-coloured Variety of the Rabbit.

WM. OGILBY, ESQ., A.M., F.L.S., R.AST.S., Z.S.,

&c. A Copy of the Original Edition of *Buffon's Histoire Naturelle*, in 14 vols., 4to, with plates: a Paper "On the Characters and Description of a new Genus of *Carnivora*, called *Cynictis*," with plates; forming part of the Transactions of the Zoological Society of London, by Mr. Ogilby: the Memoirs, composing the First Part of the Transactions of the Zoological Society of London, presented by their respective Authors, through him.

Richard Owen, Esq., F.Z.S., *London*. His Paper "On the Sacculated Form of Stomach, as it exists in the Genus *Semnopithecus*, F. Cuv."—forming Part of the Transactions of the Zoological Society of London.

Mr. William Patterson. A number of Autographs of Eminent Individuals.

Mr. John Patton. A Mass of Flint, of remarkable Form, found in the Isle of Wight.

Royal Irish Academy. The last published Volume of their Transactions.

Professor Silliman, *Connecticut*. Two Parts of the "American Journal of Science."

John E. Sloan, Esq. Eggs of the Domestic Hen, of very singular formation.

Mr. Shillington, *Portadown*. An Ancient Irish Medder, or Drinking Vessel.

Geo. Sowerby, Esq., F.L.S., *London*. Specimens of British Shells.

Dr. Templeton, *Royal Artillery*. 176 Insects, collected in the Vicinity of London, and a number of Irish Spiders.

Richard Thompson, Esq. A Nest of the Tree Wasp, (*Vespa Britannica*.)

Wm. Thompson, Esq. Specimens of the Roebuck: Ruff (*Tringa Pugnax*) Capercaille, or Cock of the Wood, (*Tetrao Urogallus*:) some Native Fishes: Cygnet: Eggs of Native Birds, &c.

GORDON A. THOMSON, ESQ., *Jennymount*. Models of a Bushman and Woman, made by the Moors in Africa: an Amopondes Battle-Axe, Snuff-box, and Knife: a Caffer's Spear, Fowling Club, Snuff-box, and Pipe: Two Drinking Baskets: Specimens of the Language of some of the African Tribes, printed by English Missionaries in Africa: a large Carross or Blanket, made of Leopards' Skins, used by the Native Kings: a Zooler's Battle-Axe: Two Specimens from the Cango Grotto: a Skin of a Young Ostrich: Five Ostrich's Eggs: a Nest of the Woolbird, or Cape Titmouse: a Nest of the Bushfinch, or Hanging Grosbeak: Minerals from the Bed of the Great Orange or Gariep River: Eyes of the Black Whale: a Foulah's Sword and Bow: a Quiver and Poisoned Arrows: Case of Eye Powder: Extracts from the Koran: a Mandingo's Knife, Snuff-box, and Spoon: a Fetish, or Charm: a Foulah's Sword and Hat: a Tusk of a Sea-Cow: a Young Porpoise: a Shark's Jaws: a Porcupine Fish: Lava and Shells from the Island of Ascension: Magnetic Stone from Sierra Leone: Three Land Tortoises: Two Poisoned Arrows, &c. &c. from the Cape of Good Hope.

MR. WILLIAM TUCKER. A Silver Coin, found near Larne.

T. W. WARREN, ESQ., *Dublin*. Specimens of Native Shells.

J. O. WESTWOOD, ESQ., F. L. S., *London*. 208 Specimens of British and Exotic Insects, in return for some Duplicates, forwarded by the Belfast Natural History Society.

EDWARD WILMOT, ESQ., *Woodbrook, Portarlington*. A Silver Coin of Edward the Third, a quantity of which was lately found in the Queen's County.

HENRY T. WITHAM, ESQ., *Lartington, Edinburgh*. His Essay "On the Internal Structure of Fossil Vegetables."

FRANCIS WHITLA, ESQ. "Les Annales de Chimie," in 88 volumes, 8vo, bound.

J. E. WILLIAMS, Esq., R. A. Skeletons of Two Gazelles, from North Africa: and a Toad from Gibraltar.

WM. YARRELL, ESQ., F. L. S., Z. S., *London*. His Paper, entitled "Observations, which appear to influence the Assumption and Changes of Plumage in Birds:" and "a Description, with some additional Particulars of the *Apteryx Australis* of Shaw:" forming part of the Transactions of the Zoological Society of London.

MR. JOHN YOUNG, *Shamrock Lodge*. An antique Set of Brass Weights, and a Brass Spear Head, found several feet below the surface of Glenone Bog, Portglenone: a Ball of Hair from a Cow's Stomach: and a Pipe Fish.

ZOOLOGICAL SOCIETY OF LONDON. The Second Part of their Proceedings, presented by the Council.

END.

FINLAY, PRINTER, BELFAST.

PROSPECTUS.

A WISH had often been expressed, by Members of the NATURAL HISTORY SOCIETY, that some of the papers read at their meetings, should be laid before the public. As several visiters, and many other friends, concurred in this desire, it was suggested that a work should be published, in which these papers might appear. The Council of the Society, though fully aware of the propriety and utility of such an undertaking, conceived that the time for carrying it into effect had not arrived; and that, while the erection of the Museum, and subsequently the liquidation of the debt, engrossed the attention of the most active Members, it would be unwise to enter on a new enterprize, which, by fresh demands upon their time, might diminish the efficacy of their exertions.

As these obstacles are now removed, the Council proposes to make arrangements for publishing, in Periodical Parts, a Work, which shall contain some of the papers read, and facts communicated in any other way, at the meetings of the Society. It is not, however, intended that it should appear under the title of "*Transactions*," or that it should contain only Original Observations, or New Investigations, such as those to which the Transactions of similar Societies are generally limited. Its objects, though, perhaps, less dignified, will be equally useful—to disseminate the knowledge of Natural Science as widely as possible. Each Number will contain something that is original, and, at the same time, much that is already known, but which, from being enveloped in technicalities, from being scattered through many, and often expensive, works, or contained in those written expressly for persons conversant with such subjects, is scarcely accessible to the majority of readers.

A Periodical, such as that now proposed, would be serviceable to the cause of Natural Science, by diffusing a taste for its cultivation—it would be useful to the BELFAST NATURAL HISTORY SOCIETY, by making its objects more widely known—and while it would open up a channel for communicating any new facts that may be observed by its Members, several of whom have been obliged to have recourse to the Scientific Periodicals of the day, and Transactions of Metropolitan Societies,—it would be interesting to the learned Associations of our own, and even foreign countries, from its information respecting the Topography, Antiquities, and Natural History of Ireland.

The intended publication will be similar in appearance to the *Journal of the Geological Society of Dublin*, (8vo, 80 pp.) The price of each Number will be *One Shilling*; or, to Shareholders in the Belfast Museum, and Members of the NATURAL HISTORY SOCIETY, who may be desirous of procuring six, or more copies, *Ten-pence* each.

It is intended that Two Numbers shall be published during the year: the First to appear on 1st January, 1835.

A.

SPECIAL MEETING

OF THE

NATURAL HISTORY & PHILOSOPHICAL SOCIETY OF BELFAST,

HELD IN THE MUSIC-HALL,

ON WEDNESDAY, THE 23D OF OCTOBER, 1850,

RELATIVE TO

TWO MUMMIES TRANSMITTED FROM THEBES,

By Sir James Emerson Tennent,

AND UNROLLED IN THE MUSEUM, ON THE 17th AND 18th OF THE ABOVE MONTH.

(From "The Northern Whig," of the 24th October.)

BELFAST:

PRINTED BY FRANCIS D. FINLAY,
CALENDER-STREET.

1850.

BELFAST

NATURAL HISTORY & PHILOSOPHICAL SOCIETY.

A Special meeting of the above Society was held in the Music-hall, yesterday, at one o'clock, for the purpose of giving the public an opportunity of hearing the Rev. Edward Hincks, D.D., explain the results of the examination which took place at the unrollment of the mummy on Thursday last, and an account, by Sir James E. Tennent, of the circumstances under which that and the other mummy, unrolled on Friday, were procured by him. The attendance was very numerous and fashionable. Among those present we observed Dr. Hincks, Dr. Stevelly, Professor Hancock, Professor Carlile, Professor Craik, Professor Wilson, Professor Reichel, James Stirling Esq., Mayor, Sir James E. Tennent, Rev. Dr. Murphy, Rev. R. W. Bland, Rev. Dr. Cooke, Rev. R. Oulton, Rev. J. S. Porter, Rev. J. Porter, Rev. W. Lynar, Islandmagee; Rev. Mr. Johnston, Tullylish: Rev. T. F. Miller, Rev W. M'Ilwaine, Dr. Browne, R. N. Gordon, A. Thompson, S. K. Mulholland, R. Davison, J. Owden, J. Grattan, W. Bottomley, A. J. Macrory, Robert Macrory, John Mulholland, Robert Taylor, John Hind, John Cunningham, John Hancock, Lurgan, Esqrs., Dr. Read, Dr. Marshall, Major-General Bainbrigge and party, &c., &c.

Letters of apology were received from the Lord Primate, the Lord Bishop of Down, Connor and Dromore, Lord Dufferin, Dr. Robinson, of Armagh, Lieutenant-Colonel Wright, Robert James Tennent, Esq., M.P., Dr. Reeves, and Sir Robert Bateson, expressing regret at their inability to be present.

It was intended that the Chair would be occupied by Mr. Getty, M.R.I.A., one of the Vice-Presidents of the

Society, but, as he was prevented, by indisposition, from being present, it was moved by Richard Davison, Esq., and seconded by the Rev. R. W. Bland, as members of the Society, that the Chair should be taken by

Professor Stevelly, who read the notes which Mr. Getty had prepared for the occasion. They commenced by stating that, in the absence of the President, the duty of presiding had devolved on him, but that he felt satisfied he would neither gratify his own feelings nor contribute to the anticipated pleasure of the audience by intruding on the meeting any protracted remarks of his own, and that the very brief observations he would make were principally to points of order, and with a view to explaining the nature of the proceedings as arranged by the Council. It was, at one time, intended to produce, at this meeting, a detailed report of the unrolling of the mummies; but, from the limited time and the difficulty of ascertaining what had been determined by others on several questions that appeared to the Committee of importance, they had considered it preferable to confine the proceedings of this meeting to a few points of general interest, reserving the result of investigations now in progress to be reported on at a future meeting. With respect to the two mummies, it was sufficient to remark that, from the effects of time, they had collapsed very much, and were so carbonised that they immediately fell to pieces when the bandages were removed. On the present occasion, it was intended that the only subjects brought forward should be some account of the hieroglyphics found on the cases of these mummies, with the view of ascertaining their age and such circumstances of the personal history of the individuals as were generally found on these ancient coffins. This had been kindly undertaken by Dr. Hincks, of Killileagh, an honorary member of the Society. As this country has now become what Egypt was in ancient days—the land of fine linen—two gentlemen, Mr. Owden and Mr. John Mulholland, had agreed to make a short report on the linen fabric of Egypt, compared with our own staple manufacture. Sir James Emerson Tennent, one of the earliest

members of this Society, would conclude the business of the day by detailing the circumstances under which the mummies presented by him to the Museum were procured, in 1845, at Thebes, the city of the dead. Although the antiquary was not considered as holding a high place amongst inquirers, but was generally treated as an ingenious trifler, such as the Wizard of the North—himself a distinguished member of the body—had described his Jonathan Oldbuck; still, it must be acknowledged that the study of national antiquities, properly conducted, rendered valuable aid to the elucidation of history. This remark was one of very general application, but there was no country, perhaps, whose ancient history possessed so much interest, in every respect, as Egypt—a land associated with their holiest feelings—where they found the language, the religion, the customs of one of the most ancient people of the world, whose works continue to be objects of admiration to the present day—they were so vast in design, so indestructible in material. They were equally causes of wonder on account of their antiquity to those whom they called ancients. Speculations concerning them had employed the pens of many moderns. They also afforded subjects of discussion in the days of Herodotus, who delighted the people of Greece, at the Olympic games, by their description. The ancient Egyptians seemed to have studied, as far as in their power, to perpetuate a memory of their history by means of their works of art. The graceful obelisks which adorned their cities, the temples, the statues of gods and heroes all bore inscriptions of an historical character. The very language in which these were inscribed being associated with their religion, concurred with the hardness of the material and the dryness of the climate to ensure the perservation of each valuable record. Nothing, however, contributed so much to give an interest to the history of this extraordinary people, as the fact that they themselves remained to be examined by posterity, having, in consequence of the pains taken to embalm them, endured many ages beyond the usual term of human remains. By this means, the bodies

of those who were once a living multitude within their cities, who attended to their erection, who saw them in their glory, or witnessed their decline—of those who were the contemporaries of the Patriarchs, or were the task-masters of the Israelites—still remained to enable us to form some idea of the appearance, the dress, the ornaments of a people, who, in their day, were so intimately connected with the progress of human civilisation. The same circumstances of climate that had preserved the bodies of the inhabitants had kept fresh as the day they passed from the hands of the artist, paintings on tombs and mummy cases, inscriptions, manuscripts, all illustrative of the history of Egypt, and of a people with whom the Bible had made us familiar. Tacitus informed them that when Germanicus visited Egypt, he proceeded to the extensive ruins of the city of Thebes, where there was still to be seen on ancient monuments, a description, in Egyptian characters, of the wealth and grandeur of the place. It appeared from the interpretation given in his native language, by an elderly Priest, that Thebes was described as having at one time contained within her walls 700,000 men capable of bearing arms ; and that this army, under one of their Kings, called Rhamses, had subdued many of the neighbouring countries. This notice was interesting for two reasons :—the fact of Thebes being in ruins so early as the commencement of their era, and as the locality from which the mummies were procured, whose history they were then about to investigate. Although not immediately connected with the subject, it might be mentioned, that one of the most remarkable works of art pointed out to Germanicus was the gigantic statue of Memnon, one of whose hands was presented to the Belfast Museum at the same time with the mummies, by Sir J. E. Tennent. It was rather difficult to account for the knowledge of the language in which these inscriptions were written having been lost ; for the political changes that took place in Egypt, at least to a comparatively late period, were not of such a kind as to obliterate the traces of former learning. The Greek empire succeeded the ancient Government with-

out violent convulsion, and they had the evidence of the Rosetta stone to shew that the hieroglyphic or sacred, the encorial, a kind of running-hand of the original inhabitants, and the Greek were understood at the same period. Nor did any violent revolution, likely to influence the literature of the country, mark the period when Egypt became a dependency of the Roman Emperors. The highly educated of the Greeks and Romans, indeed, viewed it as a land of classic association. It had afforded them, most probably, the first germs of their religion and their philosophy. It was the place of resort where their great men, who travelled abroad, completed their education—it was associated with their superstitions—it was looked to as a place of authority in sacred matters—it was, in fact, to the ancient Roman what Greece and Rome are to us—a place consecrated by its former greatness and its high advancement in the cultivation of the fine arts; and he might have addressed Egypt nearly in the words of our modern poet,

> "Mother of arts as once of arms: thy hand
> Was then our guardian and is still our guide;
> Parent of our religion! whom the wide
> Nations have knelt to for the keys of Heaven!"

It remained for the genius of the present age, assisted, in some measure, by accident, to discover the long-lost key to the hieroglyphic language of Egypt in the celebrated Rosetta stone which was found to present three copies of the same decree—one in hieroglyphic, another in encorial, and the third in Greek, a language with which all scholars are familiar. This had enabled Dr. Young, Champollian, and other inquirers, amongst whom Dr. Hincks holds a high place, to decipher many ancient inscriptions, and read, as will be done to-day, the legends on the mummy cases, whereby the rank and the family history of the individual were determined as well as the period when he lived. Besides that respect for the dead, amounting to a religious feeling, that seems a characteristic of the great human family, wherever found, the ancient Egyptians appear to have been influenced by a peculiar superstition, which caused them not merely to preserve their tombs

from desecration, but also originated a wish to preserve, as far as possible, the outward form and substance of the body. Two reasons are assigned for this feeling—one, perhaps the more probable, was their belief that the soul, after death, was subject to a series of transmigrations, but was finally permitted to reanimate its own proper body, which was preserved, to enable the individual to enjoy this second course of existence in the human form. Another cause assigned for the practice of making mummies and applying bandages of linen was that, after the murder of Osiris, by Typhon, his remains were carefully collected by Isis, and swathed in linen, to join the mutilated parts, and that this plan of preservation was afterwards adopted, from religious feelings, by his followers. In our own sacred histories, we have the earliest allusion to these customs. The body of Jacob, we are told, was embalmed by the physicians, the servants of Joseph, and the body remained the proper number of days in the hands of these artists. We also find that Joseph was embalmed, with the evident purpose of enabling the children of Israel, at a future and distant day, to carry his body with them when they escaped from bondage, to become the founders of the most remarkable nation that the history of man has recorded. These circumstances afford strong collateral proofs of the power which Joseph possessed in Egypt when he was able to command the performance of one of their most important religious rites, in the case of a party avowedly of a different religious faith, unless we are to assume, which is not probable, that embalming was merely a civil ceremony, unconnected with the religion of the country. Dr. Clarke, one of the most interesting of travellers, to whose exertion England owes the possession of the famous Rosetta stone, has supposed that Joseph himself was laid in the great pyramid, and that the remarkable fact of this monument having been laid open, and its secret entrance disclosed at a very remote period is best accounted for by supposing that the Israelites, to whom the secret was known, had opened it in removing the body of Joseph, which they had bound

themselves, by a solemn oath, to carry into the promised land. We have also the authority of an Irish traveller who preceded our townsman by, at least, one thousand years, to shew that the pyramids were then called the granaries of Saint Joseph. Herodotus—styled the father of history, though only contemporary with the writers of the latest books of the Old Testament—and Deodorus Siculus afterwards, have given very particular notices of the Egyptians and of their method of embalming. Several modern travellers have described the vaults in which the mummies are found. The entrance is commonly by means of a shaft to the depth of twenty feet or more; from this a gallery leads to the several sepulchral chambers that branch off in various directions, each of them containing a great number of preserved bodies ; these are always discovered in a recumbent posture. If of the higher rank, they are contained in cases of sycamore (the *ficus sycamorus* of botanists), sometimes in a double case, of which they had an example in one of the specimens now under consideration. The name, history, and other particulars concerning the body were painted on the cases, which were also ornamented with representations of various deities, such as Netpe, the mother of Osiris; Osiris, with Isis, his sister, and wife ; the four genii of Amenti, sons of Osiris. There were, besides, portions of the funeral ritual of the Egyptians scattered profusely over the case. Those in cases had rarely papyri buried with them, such writings being generally found with the bodies of a lower rank of persons; and Belzoni states that such writings contained particulars of the private history of the party, similar to what, amongst the highest ranks, were found on the case. The bodies of persons of the lowest rank were deposited in similar sepulchral caverns to the others; but little care seems to have been taken in embalming them. On a few of them small pieces of papyri were found affixed to the breast, which give some particulars of the individual. Belzoni remarked amongst the higher order of mummies some in which the eyes had been supplied by enamel, and the eyebrows also added.

The most perfect, according to his description, were those of Priests: these were enveloped in folds of linen, white and red alternately, each part of the body being kept distinct; the arms and legs had each their own bandages, and even on the hands and feet every finger and toe was separately wrapped in linen. He would now call upon Dr. Hincks to detail to the meeting such facts as had been brought to light by the unrolling of the mummy.

The Rev. Dr. HINCKS then came forward, and said—Mr. Chairman, ladies, and gentlemen, I have been requested by the Council to give some information respecting the contents of the hieroglyphical inscriptions on the bandages and cases of these mummies, and respecting their ages. I am happy that my former studies enable me to do so. The first of the mummies which was unrolled being on chronological grounds peculiarly interesting, I was very anxious to ascertain, in the first instance, that the mummy was that which belonged to the coffin. Frequent instances are known to have occurred in which the Arabs, having removed the body which they found in it, perhaps for the purpose of opening it and obtaining the treasures which are sometimes deposited within the folds, have substituted for it another body. An instance of this exists in the museum of the Royal Dublin Society, where a mummy, which appears from a belt of writing round the waist to be that of a man of very low condition, is placed in the coffin of a lady of rank. The doubts which might have been entertained on this point were removed by the discovery of three gilt slips, one of which was found under the body and the other two on its sides, which contain a connected inscription with the same name as appears in the case. A fragment of the same name was found also on one of the bandages. The inscription on the slips is to this effect :—"An act of homage to Seb, the youngest of the gods ; in order that he may give all kinds of offerings, all kinds of perfumes, everything good and pure, everything pleasant and fit to be the food of a god, to the Osiris, the mistress of a great house, Tos-mût-her, the justified ; daughter of the Prophet of Month, Lord of the

Pure Country, Phrâ-mâ-jotu, the justified ; her mother being the mistress of a great house, Te-mut-sheri, the justified." Every embalmed person was called "an Osiris ;" and deceased persons were styled "the justified" or "the speaker of truth," which, in their case, implied that they had been adjudged to have spoken truth before Osiris, the judge of Amenti, and had thus gained their cause. On the outside of the coffin, the names of the grandfather and great grandfather, by the father's side, are added to those of the father. The principal inscription there is to this effect; and you will observe that it is referred to a different deity, and is in a different form :—"What is said by the Osiris, the mistress of a great house, Tos-mût-her, the daughter of the prophet of Month, Lord of the Pure Country, the scribe of the Divine table, Phrâ-mâ-jotu, son of the prophet of Ammon, in Thebes, the military chief, the acquaintance of the King, truly loving him, the scribe of the Divine table of the gods of Upper and Lower Egypt, the owner of a signet—Auvnâwa, son of the prophet of Ammon Har-si-esi ; her mother being the mistress of the house Te-mût-sheri—Oh, Athom, give unto me that sweet breath." It appears, from this inscription, that the grandfather of the mummy was a person of very high rank, a courtier or personal friend of the King of Egypt (which, I am satisfied, is the meaning of the disputed title Souten-rakh). Several inscriptions occur on the outer and inward parts of the coffin, which are either proscynemas or acts of homage to different deities, singly or collectively ; in one place, we have "The dweller in the river of the South, the dweller in the river of the North, all the great gods and all the small gods ;" at the close of such proscynemas, some blessings are sought for from the gods to whom it is addressed ; or else they are statements by the different deities that they give certain things. Thus we have "What is said by Seb, the youngest of the gods—I give all kinds of offerings, all kinds of perfumes, to the Osiris Tos-mût-her." "What is said by Athom—I give that sweet breath to the Osiris so and so." In addition to these, however, there

are on the upper and under parts of the inside of the case two chapters of the book of the dead, which, in Lepsiu' edition, are the 26th and 28th. The vignettes or illustrations to both the chapters are placed over them, and some additional objects are represented along with those in the Turin copy. The titles of the chapters are wanting. In the Turin copy they are "The chapter of giving a person a heart (or mind) in Amenti" and "the chapter of not letting a person's heart be taken from him in Amenti." As much of each chapter is given as could be comprised in four columns; the conclusion of each is wanting. In the part that is given there are some material deviations from the Turin copy, especially in the 28th chapter. Along with the thin slips I have noticed as being found inside the coffin were figures of the same material (thin wood, covered with cloth and then gilt) representing three of the genii of Amenti, as they have been called, whose figures are also painted on the outside of the coffin, with their names annexed. They are Amset with the head of a man, Hapi with that of a baboon and Siumutv with that of a jackall. There was no doubt, originally a fourth figure, as on the outside, who was Kebhsniv, with the head of a hawk. The lower parts of all the genii are human. The inscriptions on the bandages of the first mummy cannot be read in connexion, though enough is left to identify the name of the deceased on one of the fragments; but the bandages of the second contain a short inscription which occurred three times, being always divided between two bandages. It signifies "the clothing of the Osiris Khons-iri-naa," an office which he held precedes the name, but I am unable to say what it was. It seems to have been neither military nor sacerdotal. From his being termed an Osiris, it is certain that this was not written or stamped on the cloth till after his death; yet, from the circumstance that the word used for clothing is that applied to the clothes worn in life, and from the fact of the cloth, used for rolling the body in, being in many places darned, it has occurred to me, that the cloth used was virtually the cloth which had been worn in life;

it having been steeped, as it evidently has been, in some antiseptic liquor. The name and office of the deceased are precisely those which occur on the outside and inside of the case, where they are often repeated. In one place, the office is described somewhat differently, and the names of his parents are added. The father's is, I believe, Ka-nun-ati ; but I cannot speak positively as to the middle syllable.* The mother's is Ten-khar. Some strange representations occur on this case, which I do not recollect to have seen elsewhere. Osiris is in one place represented by the symbol of stability, which some have improperly called a nilometer, by way of a body ; with the symbol of life, or crux ansata, as head and neck and two human arms issuing from it, by which the sun's disk is supported. I now come to the chronological branch of my subject. The first question which most persons ask in reference to anything very ancient is, "how old is it ?" This question may be asked with three distinct meanings, and may thus be susceptible of three distinct answers. The questioner may wish to know the age of this mummy, for example, relatively to the events recorded in Scriptural history ; or relatively to the series of Kings and dynasties who are known to have ruled in Egypt ; or, again, relatively to the present time, or some known past epoch. I will consider the question in all these senses. In the first, I would rather dismiss it than answer it, observing that none of the Kings of Egypt mentioned in Scripture, before Shishak the conqueror of Rehoboam, has been identified on any sure grounds with any king mentioned by Manetho, or named on the existing monuments. This Shishak was

* A letter, respecting the male mummy, which Mr. Birch, of the British Museum, was kind enough to write, was received after the lecture was delivered. Mr. Birch considers what is here read "Kanun" to signify "of like rank;" the entire name being "Ati." He considers this mummy to be, most probably, of the age of the 26th dynasty, and certainly not earlier than the 21st. This would make its age, most probably, from 2,400 to 2,500 years, and the extreme limit 2,900.

the Sesonkhis of Manetho, the first King of his twenty-second dynasty, and the Shishonk of the monuments. Prior to this we can only establish a synchronism between an Egyptian and a Scriptural event, by connecting both with a known epoch. In the second meaning of the question the answer can be given with certainty. This mummy was born after the termination of the 12th dynasty, and very shortly after it. Her father's name was Phrâ-mâ-jotu, or "Pharaoh the speaker of truth," which was the prænomen of Amenemhe IV., the last King, and the last Sovereign but one of the twelfth dynasty. We have peculiarly accurate information in respect to his reign. It lasted nine years three months and twenty-seven days; commencing about thirteen years before the end of the dynasty, and ending about four years before it. It was usual for Egyptian courtiers to give the name of the reigning Monarch to some one of their children, probably with his permission. Now, I have already told you that the father of the mummy's father was a courtier or personal friend of the King of Egypt. He called his son, the mummy's father, after his royal patron; and this fixes his birth decisively within that Monarch's reign. Her own birth was, therefore, at the earliest, a few years subsequent to the close of the dynasty; it might have been, without improbability, even forty years after it. As the mummy appears to have lived from forty to fifty years, we may date her death from fifty to ninety years after the close of the twelfth dynasty. So far seems certain; but, when we come to consider the age of the mummy in the last sense—namely, as computed from the present time, or from the birth of our Lord—we come to what is controverted. The death of Amenemhe IV. is placed at different dates by different chronologers, through a period of no less than 1,400 years. We have, in fact, with respect to the reigns of the old Egyptian Kings and dynasties, very little precise information. We can tell that a King, or a series of Kings, whose reigns are connected, preceded another King or another series; but the length of each reign is rarely known. In some cases it is; but they are exceptions to the general rule. What we know

of most Egyptian reigns is like what we know of geological formations. The order in which they occurred can, in general, be fixed on sure grounds; but the period of time which they occupied is unknown. I will mention the different opinions as to the death of this King, which have been advanced by late writers. According to the Champollions and Rosallini, he died about 1,840 years before Christ. Their chronological system is now generally admitted to be grounded on a false assumption, yet it is adopted by Mr. Osborn in a recent publication. Bunsen places the same event about 800 years earlier. His system is also generally admitted to rest on a bad foundation, and to be inconsistent with monumental evidence. I believe, indeed, that its author has abandoned it. Le Sueur, whose work has been printed by the French Government, having been crowned by their Academie, places it 400 years before Bunsen. According to him, the age of the mummy would be about 4,800 years. This last writer was probably indebted for his prize to the hardihood with which he carried back the chronology of Egypt to the year 8,986 B.C., and with which he placed the birth of Adam, whom he calls "the first patriarch of the Hebrews," in the reign of the ninth predecessor of the King of whom I have been speaking. His system is glaringly inconsistent with the monuments; and his knowledge of the very rudiments of Egyptian writing may be estimated by the fact, that he extends the reign of Amenemhe IV., which is distinctly recorded in a hieratic manuscript, from *nine* years to fifty, mistaking the value of one of the numeral characters. Beyond the limits where French nationality influences the judgment, I imagine that his opinion has the least possible weight. The prevailing feeling among those who have attended to the Egyptian monuments is certainly in favour of Lepsius; and this feeling is evidently gaining ground. His system is certainly free from such glaring errors as disfigure those which I have mentioned previously, and it embodies much which must be assented to by every one who has paid attention to the monuments. As well as I can judge from the portion of his chro-

nological work which has appeared, he places the death of Amenemhe IV. about 2,040 B.C. This would make the age of the mummy about 3,800 years. Most persons must consider it very great presumption in one who has, like myself, very limited means of becoming acquainted with the monuments, or even with the copies of inscriptions that have been published, to dissent from a conclusion which has been arrived at by one who possesses such peculiar advantages as Lepsius. I may venture, however, before this friendly audience, to observe, that Lepsius has taken no notice of evidence which appears to me to have a most important bearing on this part of Egyptian chronology; and to say that I feel confident that, though his errors are not so numerous or so glaring as those of the authors whom I have previously named, they are not less real. It seems to me that a correction of about 430 years ought to be applied to all his dates connected with the twelfth dynasty. This would bring down the age of the mummy to somewhere about 3,400 years. Some months ago, finding it impossible to pursue the subject in a satisfactory manner, amid the disadvantages under which I laboured, I felt it right to direct the attention of Lepsius to the evidence which he was overlooking, and to point out to him what I conceived to be its correct interpretation. Whether he will still reject it, or will interpret it differently from what I do, remains to be seen. I have done my part. The prosecution of the inquiry will, in all probability, rest with others. As the difference between myself and Lepsius involves the question, what series of Kings immediately succeeded the 12th dynasty at Thebes ? and as the name of the reigning Monarch is sometimes found on the bandages of a mummy, I had some hopes that the late unrolling might have afforded more decisive evidence than has yet been adduced. It might have connected the King under whom the mummy died with the King under whom her father was born. Unfortunately, there was no Royal name within the mummy. It is possible, however, that this unrolling will not be without chronological importance. The number of *dated* mummies (that is, mummies

which are connected by positive evidence with any King's reign) is very small. Two, which are about three hundred years older than this, are at Thebes; but they have never been unrolled. I believe, but am not quite sure, that another, more ancient than the present one, was opened, and crumbled to pieces, appearing to have been only salted.—Now, these dated mummies furnish us with criteria by which the age of undated ones may be, in the first instance, conjectured, and it may be, in the course of time, fixed on sure grounds. To use an illustration which I have previously employed, any peculiarity that can be discovered in the mode of embalming, in the materials of the bandages, or in the inscriptions of a *dated* mummy, is like one of those fossils, which, having been once ascertained to characterise a particular geological formation, may be used as evidence to detect the same formation elsewhere. Of course, it would be impossible to point out the peculiarities of the mummy before us, on an occasion like the present—even if I were in a position to undertake doing so at all, which I am not. I will merely give a single example to illustrate what I mean. At the foot of each of the mummy cases there is a representation of the mummy on its way to the tomb, borne by the bull Apis. These representations, however, differ; and the differences are probably due to the different ages of the cases. On the dated case the bull has nothing on his head; on the other he has a red circle, standing for the sun's disk. On the dated case the mummy is carried with the feet foremost; on the undated one with the head. The colouring also differs; and the undated case has a scarabæus flying over the bull, which is wanting in the other. Care must, however, be taken not to consider differences due to a difference of age, which may have arisen from the different styles of embalming, or from the sex of the mummy. The dated mummy had her arms extended down her sides; while the other had his arms crossed on his breast. This distinction is known from other mummies not to have been caused by a change of custom, but to have indicated the sex of the mummy. Some very

valuable criteria of the age of mummies, derived from observations of those which are dated, are mentioned in a letter of Mr. Birch's, published in "The Otia Ægyptiaca" of Mr. Gliddon. I have not yet seen this work; and I was particularly desirous of doing so, before this lecture, in order that I might apply these criteria to the different mummies in the Museum; but though it was written for near a fortnight ago, with directions for it to be sent by post, I am sorry to say that it has not yet arrived. I can, therefore, give no information whatever as to the age of the male mummy. I should think it much less ancient than the other; but whether the interval be five or ten centuries, or even more, I would not hazard an opinion. I will now conclude with thanking my audience for the attention they have paid, and with regretting that what I have had to say has not been more interesting.

Mr. John Mulholland then rose and said—As one branch of the interesting subject that is to-day before us for analysis and illustration, I have been requested to examine the coverings or bandages in which the mummy has been swathed and preserved, and to communicate any observations that might occur to me as to the nature of its material and texture. Such an inquiry may, at first sight, appear somewhat commonplace and trivial, after the grander and more captivating theme of a philosophical translation of secrets concealed by the mysteries of a so long impenetrable record: but, on a little reflection, we must see the interest and importance that attaches to such a material evidence of the state of the useful arts at an age almost fabulous in its remoteness. Inquiry into the progress of civilisation will ever be the most interesting pursuit of philosophy, as from it is poured the strongest light upon that favourite theme of speculation—the nature and attributes of man. Philosophical inquiry, however, is too often baffled even in scanning periods comparatively recent, by the want of facts on which to rest. Written histories have too often limited their records to a mere narrative of wars, and catalogue of Kings and conquerors, and evidence as to the social condition, the state of luxury

and refinement; and the knowledge of the fine or of the useful arts has to be sought for in the chance coins or medals that accident may have preserved, or in the fragments of statues and buildings that may have escaped destruction.—With such faint signs and landmarks for a guide, science had slowly traced backward the stream of human progress until it gained an era when even these failed, and nothing was seen but a vast sea, over which loomed, in misty indistinctness, the giant forms of Eastern fable. European history was traced back to Egypt; but the early history of Egypt, which had baffled the penetration of Herodotus, the earliest and most laborious of historians, seemed for ever sealed in the mysteries of a forgotten hieroglyphic. The theme, however, was one that could never lose its interest—the impulse was uncontrollable, to strive to pierce the gloom that was supposed to shroud so much that science longed for; and richly have these efforts been at last rewarded. The key has been found to the history of centuries engraved upon tablets of imperishable stone, and we have even summoned before us human witnesses that walked the earth three thousand years ago, to tell us of their stature and their race, their food, their dress and ornaments: in fact, all that we could wish to know, to learn their social condition and domestic habits. To this knowledge there attaches the further interest, that the people with whom it makes us familiar were, of all others, the most identified with our own "Sacred History." Egypt, the refuge of the patriarchs, and the cradle of their descendants—the instructor, in all the wisdom it possessed, of the lawgiver and the historian, through whose pen alone we learn

"What we are, whence hither brought, and how!"

was also the nation with whom the Jews appear to have had afterwards the most constant intercourse.—While we trace, therefore, the evidence now so richly supplied of their manners, customs, and habits, we throw, at every step, fresh illustrations upon the allusions of the sacred volume, and gather, if such were required, fresh proofs of its authenticity. Having thus, I

hope, vindicated the claims of the subject to your attention, I will, as briefly as possible, explain the nature of the cloth that is found upon the mummies, and which evidently formed the clothing of the ancient Egyptians. The first clothing of mankind was, probably, the skins of animals; but, one of the first efforts of his ingenuity must have been to exchange a covering so cumbrous and inconvenient for garments made from the wool or hair with which those skins were furnished. The next step was, probably, to find, in vegetables, fibrous substances that, by the same processes of twisting and interlacing, made fabrics still cooler and lighter. So early was this discovery, that each nation ascribed, by their tradition, its invention to their patron god—the Assyrians to Belus, the Greeks to Minerva, and the Egyptians to Isis. Each nation naturally adopted the material that its own soil and climate produced, and soon acquired a proficiency that secured it as a national manufacture. Thus, we find that, as sheep were natives of the mountainous ranges of Asia, Syria and Asia Minor became early famous for their woollen fabrics: it is probable that the introduction of that manufacture into Greece, and the value at which it was estimated, were typified by the fable of the expedition of the Argonauts, and the successful theft of Jason of the golden fleece from the dragon that guarded it. In like manner, India produced cotton, and China silk; and, as the flax plant was indigenous to the fertile valley of the Nile, Egypt became the seat of the manufacture of linen. The fact, that the fabric for which ancient Egypt was so famous, was really the linen of the present day, and actually made from the flax plant, was completely settled by the miscroscopical investigations of Mr. Bruer, under the directions of my late friend Mr. Thomson, of Clitheroe. Mr. Thomson had long given his attention to the subject, and had subjected the mummy cloth to chemical tests, without decisive result, when it occurred to him that, as the fibre of cotton had long been known to have the property of irritating wounds, while the fibre of linen soothed them, there

might be some perceptible difference in the structure. He accordingly wrote to me, several years ago, to send him small specimens of flax, in every stage of its preparation and manufacture. He added to these similar specimens of cotton ; and, with the two, sent several pieces of the mummy cloth, of different qualities, to be subjected to the microscopical examination of Mr. Bruer. The result proved the power of the microscope to distinguish accurately between the fibres of cotton and of linen, and that the mummy cloth was, without any exception, linen. I have here drawings of fibres as magnified. The cotton fibres will be observed to be flat and twisted, while the linen and mummy cloth are all straight and cylindrical. The production of linens in Egypt had existed from their earliest traditions, for they traced back the custom of rolling bandages round the mummies to Osiris, whose remains had been wrapped in linen after he had been murdered by Zyphon. The earliest historic allusion to it, however, is in the account of the reception of Joseph by Pharaoh, 1,700 years before the Christian era. We are told that "Pharaoh arrayed Joseph in vestures of fine linen." The allusions to it afterwards are so frequent and well known that I need not refer to them : suffice it to say, that with the aversion to change for which the nation was noted, the fabric, in the production of which they had acquired such early excellence, continued to be their favourite wear, and was almost the only kind of clothing used in Egypt until after the Christian era. The bandages that have been unrolled from this mummy, and which have been sent to me for inspection, include almost every variety of quality and fabric. The coarsest of them resembles some descriptions of our lighter sacking, while the finest is nearly as fine as our finest lawn, and between these there are all the intermediate stages. These qualities were used almost promiscuously as bandages ; several of them also bear indisputable proofs of having been darned, so that it is probable that all the old linen of the house was collected, on the occasion of a death and embalmment ; and we may, therefore, assume

that the specimens represent the different qualities and fabrics that were in use in their domestic economy. This view is confirmed by the published account of a mummy opened in Leeds, in which, it is said, "Several bandages bear evident marks of having been mended; seams also occurred in others, and in one was an arm-hole, the seams round which were sewn with great neatness—plainly proving that the linen had been made up into garments and worn before it was torn into shreds for the purposes of the embalmers." The first thing that strikes us in examining the quality of the cloths is, that the flax from which they are made must have been of a much finer quality than that at present produced in Egypt, which is, in many cases, nearly as large in its smallest fibre as the twisted thread of which the finer patterns are composed. Now, it is believed that the fibre of the Egyptian flax of the present day is so large and coarse and light in consequence of its rapid and luxuriant growth under their burning sun. From the same cause, the seed is very much larger in its grain than the flaxseed of European countries. This would add another to the many proofs we have of the change of temperature that, in these latitudes, has been steadily progressing, as it would seem that to have produced flax of the quality required for these fabrics the climate must have been much cooler than it is at present. We cannot tell how the fibre was separated from the stalk, but it is probable that it was by the same obvious mode of fermentation in water that is in use at present. Mr. Gordon Thomson has told me that he found this process in use among the inhabitants of Manilla, the principal town of Laconia, for separating the fibres of the wild pine-apple leaf, from which they manufacture their clothing. I think, however, they must have had some process that dispensed with our scutching and hackling, though possibly it was one that would be too slow, laborious, and costly for the present day. The fibre of the flax, when on the stalk, is perfectly whole and unbroken. The short fibres, which we call tow, are broken from the others by our modes of cleaning it; and with us they

amount to forty or fifty per cent. of the total weight of the rough flax. If the Egyptians had made this tow, they would assuredly have used it for their coarser fabrics, as we do; but in none of these, including qualities as coarse as could well be woven, do we find any trace of tow yarn, although, from the short small lumps which are inseparable from such, it would be easily distinguished. Our information is very imperfect as to the mode of spinning used by the Egyptians. Mr. Getty has kindly furnished some drawings copied by Rossalini, which are supposed to represent the process of spinning; but they are not intelligible, unless we suppose that the flax had been subjected to some former process, and brought into a kind of sliver or core. Whatever may have been the system they pursued, the excellence at which they arrived is marvellous. In the finer qualities, the yarn is as level and even as any that is produced at the present day; and, in the finest sample, the yarn employed is what would now be called 150's, or about 15 hanks to the pound. In the weaving, they do not appear to have reached the same perfection as in the spinning, for although the cloth is fine, it has evidently been woven in a rude and imperfect loom. In the first place, the web appears to have been only about six yards long, somewhat resembling scarfs. It is probable that this arose from their being ignorant of the plan of winding a long length of warp upon a beam that would unroll it as required, and that they had to sketch out the entire length of their web in a frame, as the Hindoos do at the present day in the native manufactures of their country. We are ignorant of the time when the beam was introduced, but I suppose it must have been before the days of Penelope, or she could scarcely have so imposed upon her suitors. The quality and fineness of the cloth varies from six hundred to twenty-four hundred. In all of them are the selvages particularly good, shewing the care with which the goods were wrought. Several of the coarser and stouter qualities are made from doubled yarn, both warp and weft; they were thus stronger and leveller than

they could otherwise have been made. All of them have this peculiarity, that instead of having the weft much finer than the warp, and the quantities of each about equal, they have the weft rather coarser, and deficient in quantity to the extent of from a third to a-half. One slip counts 24 threads of warp and only 13 of weft, another 22 of warp and 12 of weft and so on. This evidently arose from the difficulty and tediousness of getting the weft in, where the shuttle had to be thrown by the hand; from this cause, and the impossibility of what is called "tight" weaving in a loom so imperfect, the weft is seen to rise on the surface of the cloth, which gives a twilled appearance to many of the pieces, although all are woven perfectly plain. At the beginning, and at the end of each web, there are the same thick threads to prevent the cloth from unravelling, that are used by the workmen in the present day, and these threads are at about the same intervals; and they and the marks of the fastenings by which the warp was attached to the loom exactly correspond with those found on the Bandana silk handkerchiefs now imported from the East, and worked by the natives in looms, I suppose, similar to those I have described. The great variety of fabric and quality among the patterns shews the innumerable uses to which, in their domestic economy, linen was applied, and the amount of comfort and luxury that existed; while the quality of the finer specimens satisfactorily proves that the universally conferred epithet of "fine linens of Egypt," by which all other nations marked their admiration of its texture, was well deserved. The examination of the only products of the ancient loom that have been preserved from the despoiling hand of time, brief as I have made it, cannot fail to suggest to every mind reflections of deep and varied interest, which, however, I will not take up your time by attempting to trace. The flax plant still waves its graceful blossoms beside the Nile, but the skill that twined it has long since departed. The tide of civilisation has receded from Egypt, and has borne this branch of the world's industry to a Western Island that was,

when this linen was woven, unknown and uninhabited; and here, in the capital of that Province, we have to-day questioned these relics as to the skill of a nation that preceded us in the trade by thirty-four centuries—a period long anterior to that of classic fable—and have found that both in the principle and the details of the processes, and in the perfection of the result, they differed but little from those that now give traffic to our streets, and shed comfort over our cottages.

Sir J. Emerson Tennent felt that after the most interesting matter to which they had been listening from the learned gentleman who had just sat down, anything he had to say was so unimportant and insignificant, that it would be censurable to delay them more than a very few minutes, whilst he endeavoured to comply with the request that had been made to him, that he should state the circumstances under which he had been enabled to procure the mummies now before them, and to forward them to Ireland. These incidents had no public interest in themselves; but, as the removal of any of their antiquities from Egypt had, of late years, been a matter of some difficulty, a very brief allusion to them would suffice to explain the permission granted him in the present instance. In 1844, he had the honour of several interviews with the Pacha of Egypt, Mehemet Ali, and received from him some personal attentions of a gratifying kind. In October, in the following year (1845), he visited Egypt, on his way to India; and before leaving England he made arrangements to remain for some time at Cairo, in order to make a journey to the ruins of Thebes, to the cataracts of the Nile, and the most Northern of the Nubian temples. With this view, he engaged a small steam-vessel at Alexandria, which was to convey his family and himself from Alfet, at the junction of the Nile and the Mahmodieh Canal, to Thebes and Assonau. They went on board on the 11th October, and commenced their voyage about sunset, but had hardly proceeded more than an hour or two when their vessel was suddenly disabled by the breaking of a portion of the engine. To proceed was

impossible; and, by the advice of the captain, they dropped down with the current to Fouah, a city on the Eastern bank of the Nile, where Ibrahim Pacha had a large manufactory of those *red caps* called fez, which are now worn instead of turbans, by the majority of the Mahommedans in Egypt, and whither he (Sir J. E. Tennent) heard that a steam yacht of the Pacha had proceeded in the morning, and was then at anchor. Immediately on acquainting the Governor of Fouah with the accident which had happened to them, he made arrangements with the commander of the Pacha's yacht to receive them and their stores on board. They most gratefully availed themselves of the offer, and by midnight were again afloat upon the Nile, and on the following evening reached Grand Cairo. No other vessel, however, than the one they had originally engaged was then procurable, and most reluctantly they were compelled to abandon their intended journey, and were prepared to remain a month at Cairo to await the arrival of the next steamer for India. The following day, however, he (Sir J. E. Tennent) called to pay his respects to Mehemet Ali. He found that he was already aware of the accident, and of his disappointment; and he most agreeably surprised him, by saying that he had given orders to prepare one of his own steamers for the reception of his family, and that they had only to intimate to his officers the time at which they felt disposed to recommence their journey up the Nile to Nubia. As this was a voyage, going and returning, of upwards of 1,200 miles—and even in the Pacha's steamer it occupied a period of nearly three weeks—the service was important, as the compliment was gracefully conferred. In the course of the day, two gentlemen of the Pacha's suite waited on them to say that, by his Highness's orders, they were to escort his (Sir Emerson's) party to the end of their journey. A guard was sent on board at the same time, and servants from the Palace; and, on the 15th of October, they again embarked at sunrise, and got under way for Thebes. Visits to every place of interest along the entire course of the Nile, from Cairo to Philoe, were

singularly facilitated by these arrangements. The guard that accompanied them were generally able to send intelligence from place to place, in advance of their arrival, and they always found, in consequence, a welcome reception from the authorities of the chief towns in their course, and horses waiting to convey them to the tombs and ruins. He mentioned these particulars, because, as they would presently perceive, they had a material influence on one object of his journey—the procuring of antiquities ; and in fact, without the assistance derivable from them, he would not have been able to obtain these two mummies afterwards at Thebes. In this manner, he (Sir Emerson) ascended the Nile from the pyramids to Thebes, past Minyeh, Sions, Girgeh, Dendera, and Keneh ; and it was an illustration of the activity and improvement then perceptible in Egypt, that, when upwards of 300 miles beyond Cairo, their engine broke, and in the very same part which had disabled the steamer in which they first embarked. By a day's delay at Girgeh, where the Pacha had established a large manufactory for spinning cotton, they were enabled to have a considerable casting made in brass, by one of his Highness's Arab workmen, and the damage so repaired as to enable them to proceed upon their voyage. The first important temple, as the traveller ascends the Nile, is that of Dendera, which, in beauty, freshness, and preservation, excels almost any other to be seen in Egypt, but it wants the charm of their great antiquity, Dendera having been built only in the era of the Ptolemies. It is the first spot at which we meet with the doom palm, which grows no farther North. It produces a fruit, the flavour of which is scarcely distinguishable from gingerbread, and its nut is capable of being carved and turned as vegetable ivory. About 50 miles further South than Dendera is the grand scene of Egyptian magnificence—the ruins of Thebes, which lies on either side the river, covering an area of no less than seven-and-twenty miles, into which are congregated a multitude of ruins, which, in point of number, grandeur, interest, and sublimity, far surpass anything that is to be seen in the universe besides.

The great temples of Luxor and of Carnak, with their propylœa, obelisks, sphynxes, and avenues, of two miles long, lie on the Eastern bank; and, on the Western, Gournon, with the Memnonum, the temples of Medenet Abon, the statues of the vocal Memnon, and the wild and solitary valleys, in which are situated the celebrated tombs of the Kings. One example may afford a conception of the gigantic proportions of these huge monuments of the ancient Egyptians which are to be seen at Thebes. There is a statue of Ranerses II., the supposed Sesostris of the Greeks, who reigned about 1300 years before Christ, which lies overthrown beside the ruins of the Memnonum—it is in a sitting posture, 60 feet high, and 26 feet across the breadth of the shoulders. Its weight is 887 tons, and, strange to say, it is worked out of one single block of syenite, or red granite, and was brought to its present locality from Associan or Syme, a distance of 140 miles; but by what means its carriage was effected the Egyptians have left us no memorial, and the difficulties are such as baffle all conjecture. The hills and rocky mountains in the vicinity of Thebes abound in excavated tombs and sepulchres, in which are deposited the mummies of the ancient Thebans; and, although these have been objects of curiosity and plunder from the days of Herodotus to the present time, so prodigious must have been their numbers that fresh depositories are perpetually opened, and fresh discoveries made of multitudinous tenants of these narrow chambers. The most renowned of all these receptacles of the dead are the tombs of the Kings, which are situated in a gloomy mountain gorge, on the Western bank of the Nile, above the temple of Medenet Abon. This valley is some miles in extent, and, at its furthest extremity, it abounds in these mysterious excavations. They were hollowed out at least 4,000 years ago, and yet the paintings which decorate them in every part—covering the walls, the roofs, and passages are all as fresh and beautiful as though they had been finished but a day ; and these, and similar decorations elsewhere, represent the habits, customs, occupa-

tions, and manners of this ancient people, with such fidelity and such pictorial effect, that no other nation of antiquity is now so well known to us, in all their domestic and their public lives, as are the inhabitants of ancient Egypt from the recent study of their inconceivably minute and numerous delineations. One of his (Sir Emerson's) first inquiries, on arriving at Thebes, was as to the practicability of procuring some mummies from these memorable tombs, in the hope that he should be able to transmit them to Belfast. But the difficulty had become extreme, as the Pacha, some short time before, had issued a peremptory order, prohibiting the opening of a single tomb or the removal of a mummy, or any other object of antiquity, from any ruin or temple on the Nile.—This order he (Sir J. E. Tennent) had reason to believe was as rigidly enforced as such commands can usually be where the disposition to offend is kept in subjection by the certainty, in the event of detection, of a punishment as summary as it would be unceremonious. Those to whom he addressed himself admitted that they knew where mummies of the most remarkable class were to be found. But his attempts were unsuccessful to discover a single individual disposed to furnish one. In this extremity, he found the circumstances under which he travelled of signal importance in smoothing away the difficulty. The two officers of the Pacha who accompanied him exerted themselves successfully, and he at length succeeded in consequence of their assurances, that, sailing as he was in the Pacha's yacht, under his immediate guardianship, and as his guest, those who might provide him with mummies would be regarded as doing so for the Pacha's use; and even if their removal to England were finally forbidden by his Highness, that the circumstance should be so explained at Cairo as to keep the authorities at Luxor harmless. It was accordingly arranged that they were to proceed on their journey to Nubia and Philoe; and, on their returning, they were again to call at Thebes, and receive on board the mummies. In the interval they continued their journey, and visited

the other wonders in the valley of the Nile—the Temple of Hermonthis and the Portico of Esneh; the ruins of Apollonopohi, at Edfou; the great sandstone quarries of Silsilis; the Roman temple at Syrne, and the beautiful islands of Elephantina and Philoe. Here they turned back, and again passed the cataracts at Assouan, and commenced the descent of the Nile, on their return to Grand Cairo. And at Luxor, as they again lay at anchor, the two mummies, which were now before them, and which, in the meantime, had been disinterred from a sepulchre near the entrance of the valley which leads to the tombs of the Kings, were put on board, under the charge of the two Effendis of the Pacha who accompanied Sir Emerson. On arriving at Grand Cairo, he made the Pacha's Ministers acquainted with the circumstance ; and applied for his Highness's permission to embark the cases for England. This was obligingly granted ; though, as he was told, not without some expression, which denoted that it was a favour, and in the December following the mummies were sent to Malta to be forwarded to Belfast. After the highly satisfactory account which had been afforded them by Dr. Hincks, as to the appearances which have been presented on the opening of the mummies, and of the results which he had noted of his examination of the cases, their decorations and contents, it would be superfluous and presumptuous in him (Sir J. E. Tennent) were he to attempt a single remark upon those profound and learned subjects, even did he feel himself competent to discuss them. But there was one fact connected with these mummies, which had been discovered by the genius of Dr. Hincks, and communicated by him—one incident of such surpassing interest and suggestive of such endless thoughts that it almost overpowered the mind by the feeling of its mystery and its immensity—he meant the prodigious and almost inconceivable antiquity of these remnants of organised mortality which now lay silently before them ; but which, 3,000 years ago, were instinct with all the passions of humanity, and moved and lived, rejoiced and wept as we do. But this last reflection, touching as

it is, was not the one to which he alluded as that which most powerfully arrests and forces us to think. It was not merely that 3,400 years ago these fragments of discoloured dust were animated by hopes, affections, fears, and sorrows like ourselves—all this we are prepared to know, because we have within us those sympathies and impulses which teach us to identify the individual with ourselves, and to fill up, from our own experience, all that seems blank throughout their history. The triumph of enlightened science, exhibited to-day, has told us all we wish to know—their parentage, their names and age; and we feel as if no more were wanted, for such is the prodigious lapse of time, that two emphatic words describe the rest—theirs was the common lot.

"They suffered—but their pangs are o'er,
Enjoyed—but their delights are fled;
Had friends—but friends are now no more,
And foes—but foes are dead.

The bounding pulse, the languid limb,
The changing spirit's rise and fall;
We know that these were felt by them,
For these are felt by all.

They saw whatever thou hast seen,
Encountered all that troubles thee;
They were—whatever thou hast been,
And are what thou must be."

But it is not this reflection that weighs upon us now, for every day's experience has more or less familiarised us with it. It is the enormous section of time with which the two bodies now before us are associated: it is the huge mass of the world's history which rushes in upon us, crowding the interval and bearing down memory and imagination together, where we would make the attempt to link ourselves with these predecessors of ours who lived 3,000 years ago, and who seem as if they had returned to us now from some intermediate resting-place; for the grave, as we are familiar with it, seldom sends us back such visitants as these. Even our ordinary words

and language mislead and fail us when we try to speak of periods of such vast remoteness; and when, a moment ago, he had used the term of this world, "history," as associated with those two human beings, now palpably in their presence, it was almost a misnomer; for not only all that we account authentic history—every chronicle and written record—but even every legend, myth, and dim tradition on which, in ancient times, men framed what they imagined history, even these stop short, unable to carry us backward to that distant era when these two fellow-creatures lived. A blank in history occurs—an unexplored and undiscovered interval of upwards of one thousand years, which lies between the very birth of history and the death of her who now rests within that mouldering case. She died five hundred years before the birth of Homer, whose epics, before history itself was known, served as chronicles for them of olden time; and Herodotus himself, the father of ancient history, was yet unborn when she had rested in her sepulchre 1,000 years. These mummies lived and bore their part in life 3,000 years ago; but we are scarcely conscious of how imperfectly those words express the vast ideas they convey. Three thousand years is a portion of time so immense that, unless we measure it by its great events, it is with difficulty that the mind can comprehend and grasp its magnitude.—When, in Great Britain, for example, we would search for an idea of extreme antiquity, or illustrate it by our own historic annals, we speak of former Kings—of Agincourt or Cressy, the Conquest, or the first Crusade; but these are like the news of some late year, when marshalled in the suite of those events that make the history of mankind since the birth of those whose dust is now before you.—We feel a sense of awe and veneration in looking on a thing so ancient as a fragment dug from the ruins of Pompeii, whose walls were overwhelmed, by a great calamity of nature, nearly 2,000 years ago; but here before us is a fragment of humanity itself, returned to light after having been entombed for upwards of 1,500 years before the occurrence of that phenomenon that overthrew Pompeii.—

All modern history, the stories of all the oldest European empires, are but as tales of yesterday, compared with the far-off dates at which these bodies were embalmed. That fragile form that lies extended now before you has seen the glory and decline of all the greatest dynasties of Asia, Phœnecia, Hebrew, and Assyria; she lived before the rise of Tyre, and died before the fall of Nineveh; she had been ages in the tomb before Darius sent his hosts to Marathon, or Leonidas repulsed the Persians at Thermopylæ. The siege and overthrow of Troy took place long after her decease; and she was in her cerements for 700 years before Romulus began to lay the foundation of the Roman empire. But in her actual lifetime she was herself the contemporary, and, perhaps, the eye-witness of many strange and great events. Living, as she did, 3,400 years ago, as stated by Dr. Hincks, she must have been alive when Thessaly was inundated by the deluge of Deucalion. She lived when Cecrops founded Athens. She was alive when Cadmus taught the Greeks the use of letters, and when Danaus arrived from Egypt in the first ship that had been seen in Greece. She lived when the Etrurians—a race as polished and accomplished as the inhabitants of her native Egypt—were diffusing civilisation over Northern Italy, where they founded and maintained a kingdom, at a period so remote, that it had passed away before the very name of Rome was heard. From the date which has been established by Dr. Hincks, this mummy was, in all probability, the contemporary of the Israelites, when sojourners in Egypt; and this coincidence suggests another of strange and solemn interest. Such is the uncertainty as to mere precise detail, that it is no straining of conjecture to suppose that she may possibly have been a witness to their exodus, that she had watched their departure from the land of Egypt—may have seen them take their last farewell of the fertile valley of the Nile—and turn their wandering footsteps towards the desert and wilderness of Sinai.—Nay, more, it is no extravagant conjecture, to imagine that that poor wasted form may possibly have stood in presence of the great Hebrew lawgiver himself, and that

those now sightless eyeballs may have gazed upon the face of Moses—the man who saw God. Reflections such as these were inexhaustible, but he would not pursue them further. His object had been to place them in possession of the circumstances under which he had been enabled to obtain possession of these mummies, and permission to remove them from Egypt. To attempt more than this, or to hope to cast any light upon the value of their contents, illustrative of the ancient history of Egypt, would be to venture beyond the depth within which he felt it safe to entrust himself, and to exhaust their patience, which he had already tried too far.

The Rev. Mr. M'Ilwaine, after Sir J. E. Tennent had concluded, said that, as a fellow-member, he had been requested by the Council of the Belfast Natural History and Philosophic Society to move that the marked thanks of the members of the Society should be given to the Rev. Dr. Hincks, to Mr. John Mullholland, and Sir James Emerson Tennent, for their able and interesting communications with regard to the mummies.

Mr. Patterson, in seconding the motion, said that the circumstance of his being one of the original members of the Society had induced his fellow-members to confer on him the honour of seconding the vote of thanks to the gentlemen who had such claims on them. Dr. Hincks had hereditary claims on the kindly regards of the Society, for his venerable father had joined its ranks at an early period, and was for many years their zealous and efficient President. With regard to Sir J. E. Tennent, the Natural History Society was established on the 5th of June, 1821, under Dr. J. L. Drummond; and on referring to the records of the Society, he found that in July, 1821, Sir J. E. Tennent joined the Society as a member, and read a paper in the very first session. On the 4th of May, 1830, the first stone of the museum was laid by the late Marquis of Donegall, and Sir James Emerson Tennent, with his usual activity, assisted in the preliminary arrangements. His transmission of these mummies, and of other objects of antiquarian interest from

Egypt, and of specimens in different departments of natural history from Ceylon, testified to the undiminished interest he took in the welfare of the Society.

The CHAIRMAN having conveyed the thanks of the meeting to the parties named in the resolution, the proceedings terminated.

FINLAY, PRINTER, BELFAST.

BELFAST
Natural History & Philosophical Society.

There were two meetings of this society in December, one private and the other public. The private one was held on the 8th ult. when Doctor Dickie made a communication on the "Fauna and Flora of the Arctic Regions," illustrating his observations with a series of specimens. He also exhibited some specimens of the Hydra, which he had discovered in the ponds at the Botanic Gardens.—The public meeting was held on the 22d ult. when Dr. Carlile gave a lecture on "The Typical Relations of the Skeleton in Vertebrate Animals." The lecturer pointed out the greater or less degree of symmetry in the shape of animals, especially in the lower, in many of which the exact correspondence of the parts is extremely remarkable, even upon their external surface. In animals of the higher orders this symmetry is not so perceptible on their surfaces, but if their interior portions, or their skeletons, be subjected to examination, there is a correspondence of parts that is extremely interesting to the observer, and in the highest degree suggestive to the philosophic naturalist. This correspondence had been conceived by different eminent anatomists on the Continent, but each had his own opinion on the subject, so that it remained in some uncertainty until Professor Owen compared their several systems, and by adding numerous valuable investigations of his own, he has brought the subject to a degree of perfection which reflects the highest honour upon himself, and is one of the great steps forward into the do-

main of nature for which the present century is distinguished. A number of beautiful drawings were exhibited to the meeting, copied from those originally designed by Professor Owen, and which served in the most satisfactory manner to illustrate the statements brought forward in the lecture. One of these drawings represented an ideal skeleton, termed the archetype, from which all others could be conceived to be derived; other drawings represented typical skeletons of various classes, and of parts called vertebræ. A number of beautiful specimens were also shown, which served to illustrate the remarkable observations of the London Professor. The division of skeletons into a number of portions was particularly explained, which portions are now called vertebræ—that term being no longer restricted to the particular small part of the spine, commonly known by that term, and which restriction continued up to late years. The lecturer pointed out, by means of this enlarged meaning of the term, many extraordinary phenomena in different skeletons, the most remarkable of which was the division of the skull into vertebræ in like manner as in the trunks. He demonstrated the existence of four of these, and illustrated it by the head of a fish, where they were easily separated, and then showed the same arrangement in the human cranium. He pointed out a number of other curious arrangements in the osseous structure of various animals, all showing the admirable adaptation of their parts to their separate habits of life. Without the aid of specimens and drawings, and the use of various technical terms, it would be impossible to impart a full knowledge of the valuable matter brought forward in the lecture.

Belfast Natural History and Philosophical Society.—At the public meeting held at the Museum on Wednesday evening, 9th Feb., 1853, Prof. M'Coy read a paper on "Some Modern Geological Theories." The author first discussed the theories of the central heat of the earth, and, after pointing out the nature of the experiments and reasonings which established the original fluidity of the earth from heat, he explained the difficulties which arose from the mean specific gravity of the earth, so greatly exceeding that of the crust, and refuted the notion that the central portions should consequently be composed of some substance of greater specific gravity than any of the rocks of the surface, referring to calculations of the effect of the pressure of the superincumbent masses, which, if not counteracted by some other cause or influence, would render even water or air of far too great density to agree with the observed mean gravity of the whole globe. He then explained the action, according to the modern theory of Mr. Hopkins, of central heat in counteracting the effects of pressure alluded to, and concluded the notice of this theory by shewing how it explained the extreme thinness of the crust at some geological periods, and in the localities of earthquakes and volcanoes of the present day, while it also accorded with the astronomical necessities for the general solidity of the earth. The next subject, the modern theory of which was explained, was the abrupt exhibition of an Arctic climate in the British Isles, and in part of Continental Europe, Asia, and North America, during the deposit of the superficial gravels of the "glacial epoch" of geologists. First, the nature of the evidence was pointed out, demonstrating a tropical climate in our latitudes in all geological periods before the deposition of the glacial or Northern drift (owing to the remains of the central heat); then, the anomaly of the sudden depression of temperature at that period, and the subsequent increase of temperature to our own times. It was shewn that the ordinary theories accounting for this reduction of temperature, either by the distribution of land about the poles, or by the elevation of those parts of Europe and America which were covered by glacial drift to a height sufficient to greatly reduce the temperature, did not accord with the observed facts, and could not be admitted. On the other hand, the districts in question must have been beneath the sea to allow of the drift action; and it was shewn that, if the American and European drift districts were submerged, the Gulf Stream, instead of being reflected from the Gulf of Florida to warm the Western shore of Europe, would run along by the Rocky Mountains over the Eastern parts of North America, and turn over to the North of Europe and Asia, warming all those Northern tracts in which the frozen remains of elephants, &c., are found, and Great Britain would have a lower temperature than the Island of South Georgia, which is covered with great glaciers extending to the sea. In this way, all the phenomena of the glacier period were naturally accounted for. The discourse was illustrated by numerous large drawings and geological maps.

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

A PUBLIC meeting of this Society was held last evening in the Museum. The large room was densely crowded with a most respectable auditory of ladies and gentlemen; and among the latter were several eminent in the scientific world, and connected with mechanics, from Glasgow, &c. The subject to be treated of was, Caloric or Air Engines, on which Mr. James Thomson, C.E., was announced to read a paper.

Professor STEVELLY, one of the Vice-Presidents, occupied the Chair, and, in a few brief remarks, announced the subject, and introduced

Mr. J. THOMSON, C.E., who then proceeded to read the following paper:—The gigantic experiment with a new caloric or air engine, which is at present in progress in America, and which has already attained a very wonderful degree of success, invests with new interest all that has hitherto been discovered in relation to the scientific principles of the motive power of heat, as well as to the various mechanisms, by means of which that motive power can be realised. In respect to the scientific principles, great advances have of late been made. The admirable theory of heat, which was developed in France by Carnot, thirty or forty years ago, lay for a long time nearly dormant. It has, however, for some years past attracted more of the attention that was due to the high value and originality of the modes of reasoning employed in it; and having undergone revision and correction in some parts in which it proved to be irreconcileable with the results of experiment, it has formed the basis of a new theory from which many important results have already been derived. It leads to the conclusion that there really exists a definite mechanical equivalent for heat, or that when any portion of heat, arising from any source whatever, is really applied without waste in the generation of mechanical power, that power is the same in amount no matter what substances or mechanisms have been concerned in its development. This new theory also enables us to calculate with confidence what is the actual amount of motive power which would be obtainable from a certain quantity of heat

by means of an absolutely perfect engine, or one capable of eliciting the power with no loss whatever. There are, however, no materials available to men possessing all the properties which would be required for the construction of an absolutely perfect engine. It becomes, then, very desirable that we should be able to determine what approach to absolute perfection is made in any of the numerous engines for obtaining motive power from heat which can be devised, and be practically constructed. It is desirable that we should be able to measure out and compare these invisible and subtle agencies — heat and mechanical power; that we should be able to trace them in their changing conditions; and that, in our operations with them, we should be able to determine how much of either agency has been absorbed from external sources into our mechanisms; how much has been given out from our mechanisms in such conditions as to be subservient to our wants; and how much has been wasted or thrown away in the processes. The long sought means of settling these and many other points of the like kind are now rendered available through the new theory of heat, combined with other previously matured branches of physical science. It is in fact now found that heat or caloric and mechanical work are one and the same thing; or that the mechanical work given out by an engine is simply a portion of the heat of the fire collected and applied in a different way from that in which it proceeds from the burning fuel. I say a portion of the heat of the fire, because it is found that by no possibility, and not even by an imaginary perfect engine, such as I before alluded to, could the whole of the heat of a hot body be converted into mechanical work. A part of it can be converted, but to effect the change, it is absolutely necessry that another part should be allowed to diffuse itself from its state of concentration, and pass away at a lower temperature than that of the body in which it is at first contained. Farther —it is found that the greater the available depression of temperature is, the greater will be that portion of the whole heat expended which can be brought out in the condition of mechanial work. This last fact, I may here state in passing, has a very important and a very favourable influence on the efficacy of air engines; because in them the heat can be allowed to commence its action at much higher temperatures than would be safe or even possible in steam-engines. On first learning the fact that heat and mechanical work are one and the same thing we are apt too hastily to suppose that indefinite stores of mechanical work are available to man in the heat which is contained in all the matter around us. We all know that cold water, although called cold really contains a great deal of heat which would be given out by contact with any other substance

colder than itself. Thus, for instance, if on a summer day we wish to cool a glass of cold water, and for that purpose we put a piece of ice into it, the ice is melted by heat taken from the water. It is also clear that at any season of the year the waters of the sea and of rivers, and also all other substances around us, contain great stores of heat. Why then, if heat and mechanical power are the same agency, can we not employ these stores of heat in the production of mechanical power, rather than resort, with great labour, as we do at present, to the vegetable fuel on the surface of the earth, or the mineral fuel in its interior? The reason lies in the second great fact in the theory of the motive power of heat which I before announced: namely, that if we wish to derive mechanical power from the heat of any body, we must allow a part of the heat to disperse itself into some colder body. It is, then, the want of a body colder than the objects around us which prevents us from being able to employ their heat in originating motion; and it is from differences or variations in temperature that motions can arise. The natural motions of the elements on the face of the earth spring almost wholly from the difference between the temperatures of the earth and the sun.—So also in the condensing steam-engine, the power is derived from the difference between the temperatures of the boiler and cold water in the condenser. The case is similar with the various caloric or air engines which have been devised. [Mr. Thomson then exhibited a model of Stirling's air-engine, which, he said, belonged to the Natural Philosophy Class of Glasgow College, and for permission to bring which to Belfast he had been indebted to his brother, Professor Thomson.] He continued to say:—The form of air-engine, which I have just explained, was originally invented in Scotland, by Mr. Stirling, between thirty and forty years ago. He has, since that time, proceeded with the farther development of his invention, and has introduced various modifications and improvements into his plans. About thirty years ago an engine was constructed on his principles in Glasgow, and was employed in propelling the *Highland Lad*, a passage-boat on the Clyde. The engine is stated to have been of about 20-horse power, and it propelled the boat at the moderate speed of about four miles an hour. The speed, it appears, was, at the time, not deemed unsatisfactory; but the engine was soon destroyed by the excessive heat to which some parts of it were necessarily subjected. It was then abandoned, and a steam-engine was substituted in its stead. At a subsequent period another of Stirling's air-engines was at work, for about two years, at the Dundee Foundry in Dundee. It is described as having been of about 45-horse power, and as having consumed 11lbs. of coals per horse power per hour. This consumption of fuel is certainly

not by any means very small; but still other accounts make the air-engine appear to have been much more economical than a steam-engine which had been working in the same place before. The cause of the abandonment of this engine was, I believe, the same as in the former case—the rapid destruction, namely, of the parts exposed to the intense heat of the fire. The fact, however, that Stirling's engine has not proved such, on the whole, as to excel the steam-engine must not lead us to withhold from it our admiration. It is a most ingenious invention, and it seems not unlikely to have a material effect in leading on to further improvements. To Stirling, I believe, the invention of the regenerator, is due which comes now to play a most important part in the new American caloric engine. The action of this regenerator will be readily understood by reference to the respirator that has been recently introduced for warming the air breathed by invalids.—[Mr. Thomson then proceeded to describe the engine of Sir George Cayley, which was one of the first hot-air engines ever tried, and in which the air impelling the piston of the working cylinder had previously passed through the fire, and was thus composed in part of the products of combustion. He then explained, at great length, by means of a large drawing, the new American engine of Captain Ericsson.] Such, then, he continued, is the nature of the new engine, which has of late deservedly attracted so much public interest in both hemispheres. Whatever may be the final result of the great experiment with the caloric ship *Ericsson*, the very magnitude of the undertaking must excite our wonder. The ship is stated to be no less than 1,900 tons register. Her length is 250 feet, and width 40 feet, She has four working cylinders of very great dimensions, each of the four being 14 feet in diameter; the supply cylinders are also four in number, and each is 11½ feet in diameter. In respect to the efficiency of the caloric engine, and the performance of the ship, there are, as might have been expected, numerous and conflicting reports in circulation. Thus, while one account says that the caloric engine does as much duty with six tons of coal as a steam-engine can do with fifty-four, another makes it appear that the *Ericsson* could not go to England at the highest speed she has ever reached, carrying coal enough to get there, and leaving any room for freight. Other accounts, which bear every appearance of authenticity, strongly commend both the engine and the ship. It does not seem, however, that we have as yet sufficient evidence to enable us to judge conclusively as to the amount of success which has been attained in this experimental undertaking; but enough is already positively known to lead us to look forward with eager expectation to the results of farther trials.

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

A MEETING of this society was held on the 6th of April; Mr. Patterson, president, in the chair. Mr. Grattan read a paper on "A New and Exact Method of Measuring Human Crania, and of Recording the Results." Of all the portions of the human skeleton, the skull is the most likely to be the longest preserved, and many interesting specimens have been obtained from burial places. These, on exposure to the air, are in danger of being destroyed, and it is, therefore, highly desirable that such an accurate record should be taken that by means of it a skull could be afterwards delineated or modelled; and, to accomplish this, Mr. Grattan has invented and constructed a very ingenious instrument, which he exhibited to the meeting. By means of this, he is enabled to measure all the parts of a skull with the greatest accuracy, so that, by the record of the measurements, an exact model of the original can be, at any time, made; and, consequently, there can be accurate descriptions possessed of the crania of different races. This at once removes the difficulty experienced by phrenologists in making exact observations upon skulls, and the still greater difficulty in communicating these observations to others. It has greatly the advantage over the usual method of measuring the skull by means of callipers, which is totally devoid of the precision which is afforded by Mr. Grattan's instrument. The models which can be made after these measurements are also much superior to drawings, as the latter give only general notions, while the former are exact counterparts of the crania. The meeting was highly interested in the examination of the instrument, and several members anticipated that it would very likely lead to other results than mere measurement, as from its precision new laws in anatomical arrangement would be doubtless ascertained.—Mr. Hyndman afterwards exhibited the cone of a remarkable tree, the Zamia, which had lately come to perfection at the Belfast Botanic Garden. It had been a present from Colonel Portlock, and was a native of the Cape of Good Hope—it is of the family of the *Cycadeae*, intermediate between the palms and the pines. The cone was 10lbs. in weight.

BELFAST

Natural History & Philosophical Society.

The first public meeting for the Session, 1853-54, was held at the Museum on the 30th November, Robert Patterson, Esq., President in the Chair, when a paper was read by the Rev. J. Scott Porter, on the state of society, arts, and manners, among the primeval inhabitants of Ireland. The sources from which most of the facts embodied in the paper, are derived, are the County, the Parochial, and the Ordnance Surveys; the works of Harris, Stewart, Petrie, Dr. D. Wilson, Wakeman, Shirley, and Wilde; and the writers of various articles in the Archæologia, the Transactions of the Royal Irish Academy, the Ulster Journal of Archæology, the Newry and Belfast Magazines, and the Dublin Penny Journal. Many objects which would have illustrated the antiquities of Ireland, have unfortunately been destroyed, of which no account that can be relied upon, had been preserved. This invests the subject with peculiar difficulties: but it is also in itself obscure, because it relates to a period of which no written records exist: so that it may appear to some to have no other foundation than conjecture. This, however, may be said to be the case with geology; yet the main conclusions reached by that science are now admitted by every person who has examined and understood the facts on which it rests. There is often a blending together of the facts relating to the more recent changes of the earth's surface and the primeval history of man. Thus the remains of an ancient canoe were found embedded in the earth, on the banks of the River Carron, in Scotland; and in the same stratum,

but deeper down, those of an elephant, of a species which has been for many centuries extinct. In the same district, was found in 1824, the skeleton of a whale, and beside it the rude harpoon, tipped with deer's horn, from which it had probably received its death wound. Both lay far above the level of the tide; and it is the province of geology to determine the limits of time, within, or beyond which that region had been the bottom of a Frith, in which the whale once sported, and the primeval mariner pursued the monsters of the deep. Mr. Porter was not aware of any recorded instances of the discovery of boats &c., in the alluvial soil of the valley of the Lagan; but such remains have been found in that which borders Lough Foyle, and are frequent in many of the bogs and inland lakes. But although the first inhabitants of Ireland were necessarily acquainted with the rudiments of the nautical art, they were quite ignorant of the industrial use of metals: many of their weapons and tools which would have been made of metal if they had been made acquainted with the mode of working such substances, were made of bone, flint and other kinds of stone. Stone knives, chisels, hammers, axes, alts, &c., are common, of which specimens were exhibited, illustrated by comparison with others brought from various places in which society is yet in a rude state. Not only the finished weapons are found, but in some cases the material rudely blocked out in stone: and several flint arrow-heads were exhibited, found in Dunmurry, which appear to have been rejected before they were completely formed, on account of flaws and imperfections. Dr. Hart thinks it highly probable that a deer of the extinct species, *Cervus Megacerus*, a part of whose skeleton is in the Royal Irish Academy's Collection, had been wounded by an arrow in one of the ribs; but Professor Owen disputes this conclusion. Another art in which the primeval inhabitants of Ireland had made some progress was that of pottery: several drawings and specimens of urns from the sepulchres of the most ancient period were exhibited; and it was mentioned that sometimes the pattern had been impressed by tying down on the soft clay a piece of knitted woollen cloth. This shows that they had sheep, and were able to apply their fleeces to account as clothing; indeed, implements have been discovered

made of the bones of the sheep, the ox, and the deer; and the bones of the hog and the dog have also been found both in their habitations and their sepulchres. They must, therefore, have had property and the rudiments of law; and were advanced beyond the fishing and hunting state, in which some modern archæologists are disposed to place them. Their clothing of course included the knitted woollen fabric of which the impression is sometimes found on the pottery; and also doubtless the skins of beasts. An account was given of the remains of a young man so clothed, whose body was found in a bog at Mount Bellew, as described by Mr. Petrie. Mr. Porter stated that in his opinion the singular golden ornaments resembling collars, and double cups connected by a curved bar, belonged to this primeval period in the history of man. Gold, being found native, is often gathered and wrought by people who are quite unacquainted with any other metal. Perhaps the division of the world's duration into the ages of gold, of silver, of brass and iron, might originally have had a historical reference to the successive inventions in the arts of life, as well as that moral application to which the poets have restricted it. In reference to the habitations of the people, an account was given of the wooden house found, under sixteen feet of bog, in the County of Donegall, and described by Capt. Mudge, which, though skilfully framed, mortised, and grooved, was manifestly made by people who had no metal tools, and who subsisted largely on hazelnuts for food; but it was stated that the more common dwelling places were circular, generally depressed in the ground, surrounded with a low wall of uncemented stone, and probably thatched with heather, reeds, or bent. Mr. Porter did not conceive it to be proved that the use of corn was then known, or agriculture practised. The low wall of their common habitations may have given rise to the circular stone forts, consisting of large stones uncemented, but wedged tightly together, such as Staigue Fort in Kerry, Greenan in the neighbourhood of Londonderry, and Dun Aengus in Arran Isle, off the coast of Galway. The different modes of burying practised by this ancient people were enumerated:—simple interment in shallow graves; in kist-vaens or rude stone coffins; under cromlechs, cairns, and raths; of which several kinds were described, and illustrated by drawings; as also funereal

urns found beside the unburnt bones under raths and cromlechs, showing that inhumation and cremation were both in use at the same time. Pillar stones belonging to this period were described. No idols, nor any object apparently designed for idolatrous use, has yet been discovered in the remains of this primeval race: while the arrows, weapons, utensils, &c., found in the urns and sepulchres manifestly shew a rude anticipation of a future state. On the whole it was concluded that the state of society and manners among the people who at an unknown era first occupied the soil of Ireland, was much farther advanced than some recent inquirers seem disposed to admit:—although no historical reliance can be placed on the tales of bards and seannachies, or the chronicles compiled by uncritical annalists, thousands of years after the date to which they profess to carry back their narratives. Mr. Porter concluded by expressing his belief, grounded on the evidence afforded by the primitive burying-places, that the people who first inhabited Ireland, whoever they may have been, were not swept away or extirpated by a succeeding body of invaders, as has been contended by some archæologists. Skulls which these inquirers look upon as characteristic of the two races, are often found in the same sepulchre, manifestly deposited there at, or very nearly at, the same time; shewing that the two races, if they were really distinct, had dwelt amicably together, and were laid by survivors side by side to sleep peacefully in a common grave.

PRINTED AT THE "MERCURY OFFICE" BELFAST.

Belfast Natural History and Philosophical Society.—At a meeting of this Society, held on the 14th December, 1853, Dr. Stevelly in the Chair, Professor M'Coy read a paper "On experiments to determine the effect of pressure in modifying the temperature of fusion, with their applications to geology;" in which he drew attention to the great apparent difficulties of reconciling the precision of the equinoxes and rotations of the earth's axis, with theoretical views supposed to follow from a consideration of experiments on central heat. He then described the instruments and mode of procedure adopted by Mr. Hopkins, of Cambridge, in his recent successful experiments, which proved that the great mass of the earth might be solid, although heated far above the temperature required to fuse all known rocks at the surface. Another meeting was held on Wednesday evening, 21st December, Mr. Patterson, President, in the Chair, when Mr. A. O'D. Taylor read a paper on "The gigantic birds formerly found in the Mauritius and adjacent islands." Having glanced at the subject of geographical distribution, he mentioned the Apyornis of Madagascar, a bird which M. St. Hilaire, of Paris, supposes to have been from $9\frac{3}{4}$ feet to 13 feet in height. This conclusion had been arrived at from inspecting some immense eggs and bones found in the alluvial deposits of that island. The Dodo of the Mauritius was next noticed; it was exterminated by the year 1679, and now the only sources of information regarding it are the rude descriptions of unscientific voyagers, three or four oil paintings, and a few bones. It appears that two species of brevi-pennate birds were to be found in Bourbon during the 17th century; one of which was mentioned by a French visiter in 1669, and by him called the "Oiseau Bleu;" and another species was described by a Captain Castleton, who touched there in 1613. It is also known that a very large bird, called from its habits the "Solitaire," inhabited the neighbouring island of Rodriguez, in the early part of the 18th century. These four last-named species seemed to have been destroyed chiefly, if not entirely, by the agency of man, from whose destructive powers escape was impossible, for these birds had no means of defence in the shape of dangerous talons or otherwise: they were supplied with merely rudimentary wings, and the isolated tracts over which they ranged were exceedingly limited. It cannot, however, be positively affirmed that the Apyornis of Madagascar is extinct, as that island has

been scarcely explored in any parts by scientific men, and it is not impossible that the Apyornis, or some allied species, may yet be discovered in the lonely central tracts. In illustration of the subject, Professor Carlile exhibited some bones of the "Dinornis," sent from New Zealand to Dr. Dickie. Professor Carlile explained the peculiarity of structure in these osseous fragments, their formation indicating a more simple or less advanced stage of development than now obtained amongst birds. He also alluded briefly to the "Porphyrio Melanotus," a cognate species of which a specimen was exhibited. After the conversation which the paper elicited had terminated, the President, Mr. Patterson, laid before the meeting a specimen of the sea loche, "Motella Tricirrata," which had been captured in Strangford Lough, and forwarded immediately to the Museum through the kindness of Mr. B. Meenan, to whom the thanks of the Society were desired to be offered for his attention.

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BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

[From the "Belfast Commercial Chronicle" of April 5, 1854.]

A public meeting was held on Wednesday evening, 8th March—Dr Stevelly, V.P. in the chair—when a paper was read by Dr Andrews, on the Composition and Properties of Ozone. After taking a general view of the elementary bodies, and of their chemical relations, and referring to the remarkable fact, that three of the most widely diffused in nature—oxygen, hydrogen, and nitrogen—are known only in the gaseous form, and, therefore, cannot be referred with certainty either to the group of metallic or of non-metallic elements, Dr Andrews proceeded to describe the singular property possessed by some bodies of existing, at the same temperature, in different physical states, and which has received the name of allotrophy. Sulphur and phosphorus were cited as furnishing remarkable examples of the allotrophic condition. The latter has been obtained recently in the form of a red, opaque body, not altered by exposure to the air, and requiring a much higher temperature to inflame it than ordinary phosphorus. Ozone is probably an allotrophic variety of oxygen, and is the only instance known of the allotrophic state occurring in a gaseous body. Recent experiments have, however, thrown some doubt on the identity of oxygen and ozone, and appear to indicate that at least some varieties of ozone contain hydrogen as a constituent. Dr Andrews entered very fully into the discussion of this question, and described some experiments in which he has been for some time engaged for its elucidation. Ozone is characterised by its peculiar odour, its bleaching properties, its power of decomposing such salts as the iodide of potassium, and the facility with which it is decomposed, as well by the action of heat as by contact with certain chemical bodies. It is produced under a great variety of circumstances—as in the slow oxidation of some bodies in air or in oxygen, in the decomposition of water by voltaic action, and in the

passage of an electric spark through oxygen gas. The chemical affinities are very powerful, and if it could be obtained in quantity, it would probably admit of many valuable applications to the arts.—In reference to the latter view, its bleaching properties were particularly referred to. It has been found in minute quantities in the atmosphere, where its presence is probably due to electrical action, and it has been supposed to exercise an important influence on the spread of epidemic diseases; but such views Dr Andrews considered to be at present altogether conjectural.

At a private meeting on Wednesday, the 22d March—Mr Patterson, President, in the chair—Mr. Joseph J. Murphy read a paper on "the mountain chains of Asia and Europe, in their physical and political relations." Remarking that geographical structure has its laws as well as organic structure, he described the greater part of these mountain chains as constituting one connected system of nearly parallel chains, stretching east and west, and turning their steepest sides to the south. The southern chains of this system are the highest: among them are the Alps and Himalayas. From the south side of this system of parallel chains, other chains strike off nearly at right angles, and, running out into the sea, form the Peninsulas of Spain, Italy, Greece, Arabia, Hindostan, and Further India. He then mentioned the great mountain chains running east and west, and the deserts of Central Asia, as forming a natural barrier between the wandering tribes of Northern Asia and the civilised nations of the south; in our times, between the Russian empire and British India, and concluded by observing that Russia, notwithstanding its barbarian character in relation to the south and west, is doing good service to the cause of civilisation in Northern Asia.

BELFAST

Natural History and Philosophical Society.

The first meeting of this society for this session took place at the Museum, on the 1st November, 1854, Dr. Andrews, president, in the chair, when

Dr. Dickie read a notice on specimens of the axolote, from the Lake of Mexico, where it is abundant, and is highly prized as an article of food. It belongs to the perenni-branchiate reptiles, so called from the persistence of gills which co-exist with the usual pulmonary or air-breathing apparatus. The axolote, in general appearance resembles the tadpole of the common water salamander, but is much larger, being, when fully grown, eight or nine inches long. Cuvier examined two young individuals procured by Humboldt, and came to the conclusion that it might be the immature or tadpole state of a gigantic salamander. This idea he subsequently abandoned; the view in question is still, however, held by some zoologists. Dr. D. entered into details regarding the organisation of the axolote, and of the perenni-branchiate generally.

Mr. M'Adam exhibited specimens of sandstone from Scrabo, having upon them ripple marks similar to what may be observed at the present time on sandy beaches, and which were evidently produced by the action of sea water many thousand years ago.

Dr. Dickie stated that he had observed in the East of Scotland similar markings on recent dry sand at some distance from the sea, and which had been caused by the action of the wind.

The first public meeting was held on 15th November, Dr. Stevelly, V.P., in the chair, when

The President of the Society, Dr. Andrews, read a paper on the art of photography. After alluding to the early attempts of Wedgwood and Davy to copy the fleeting picture of the camera by receiving it on a sensitive chemical surface, which, although attended with partial success, led to no practical result, from the impossibility of subsequently fixing the picture, the author gave a short historical account of the more recent discoveries of St. Victor, Daguerre, and Talbot, the two latter of whom especially may be considered as the founders of the present art of photography. The processes now chiefly in use for obtaining light pictures were then briefly described, and the chemical actions which accompany them explained. The causes of the imperfections in photographic representations of natural objects were fully considered, one of the most important of which arises from the circumstance that certain visible portions of the solar spectrum produce scarcely any effect upon the sensitive surfaces usually employed, while other portions of the spectrum, which produce no impression upon the organs of vision, act with great energy upon the same surfaces. In conclusion, the many interesting applications which this art has already received were shortly alluded to.

An interesting discussion followed the reading of this paper, in which Dr. Dickie, Professor Stevelly, Mr. M'Adam, and other members took part.

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

A MEETING of this Society took place on Wednesday, 6th Dec., 1854—Dr. Dickie, V.P., in the Chair; when Mr. Stephen Archer read a paper on the Geography of the Ancient Greeks. It commenced by noticing the inferiority of the ancient Greeks to the Phenicians in the art of navigation, and in a knowledge of the earth's surface, the prevalent opinion being that round the dry land there existed a circumfluent ocean, from which the principal rivers flowed into the Mediterranean, and that, on the outer boundaries of the ocean, there was a chaos or mixture of the elements. Allusion was then made to the opinions of Homer, Hesiod, Thales, and Anaximander, the last of whom may be considered as the founder of geographical science. He was the first to form a map, or chart, which he had engraved on a tablet of brass. The rivalry of the Greek and Phenician navigators was then noticed. A short abstract was given of the chapter of Herodotus on Scythia; and a comparison was made of the tribes mentioned by him, viz., the Scythians, Cimmerians, Sarmatians, Anthropophagi, Argasippi, Tauri, &c., with the present inhabitants of the Russian Empire. The Ural and Altai mountains, so celebrated for their produce of gold, were mentioned by Herodotus, but he did not give their names. The Tauric Chersonesus, or modern Crimea, with its Greek settlements and interesting legends, was then adverted to, also Sinope, and the warlike nation of Amazons. The paper concluded with an inquiry into the origin and language of the Turks, and allusion was made to the Mantchous, Tungusians, and other inhabitants of Northern Asia.

A public meeting was held on the 20th Dec.—Robert M'Adam, Esq., V.P., in the Chair. Before commencing the business, resolutions were adopted, expressing the deep sorrow felt by the Society for the lamented death of one of their most distinguished Honorary Members, Professor Edward Forbes, of the University of Edinburgh; and the Secretary was directed to transmit a copy of the resolutions to the bereaved family of the Professor. A paper was then read by Dr. Dickie on the "Relations of Position, Number, Form, and Colour in the Flower."—Proofs were, in the first place, adduced that all the parts of the flower are homotypes with the leaf; the transition from leaf to bract, from the bract to the calyx, and from the latter to the corolla, being often sufficiently obvious. The

ovarium or seed-vessel, in general aspect, frequently presents a nearer approach to the leaf-type than some other parts of the flower; in the stamen the relation to the leaf is frequently not so evident; in the water-lily and allied plants the stamens, however, have an obvious resemblance to the petals, and in double flowers all are alike. The law of the spiral regulates the position of leaves, their alternation being thus explained:—The opposite and whorled positions of leaves in some plants are modifications of the alternate, owing to shortening of the axis. The flower and its parts consist of a series of whorls upon a short axis, and, as in whorls of leaves, those of each series stand opposite to the spaces between those in the next, so the pieces of the calyx alternate with those of the corolla, and so throughout, and no plant is known in which all are opposite to each other. Relations of number are not less evident; the two great types of flowering plants called exogens, or dicotyledons, and endogens, or monocotyledons, have the parts of their flowers regulated principally by the numbers, five and three, respectively, presenting thus an interesting relation between the structure of the flower and that of the stem, of the leaf, and of the seed. When the pieces of the calyx and of the corolla are of the same size and form, these parts are called regular, when not so, they are irregular; some forms of the latter are peculiar to certain natural families, and we observe fixed conditions of form and colour. The colours of plants are regulated by generally understood principles—viz., that a certain primary colour is associated with a certain secondary, which is its complement—that is to say, the two together contain all the elements of white or compound light. Relations of structure, of position, and of number, have long been familiar to botanists; such between colour and form are not less obvious and interesting. In regular corollæ there is not only uniformity in the size and shape of the different pieces, but also in the distribution of the colour or colours, when, as is often the case, two are present, and these two a primary and its complement. When the corolla is irregular, so also is the distribution of the colours; and, in flowers whose parts are arranged on the quinary type, the piece, called by botanists the odd lobe, may be usually distinguished by its colour, which differs from that of the others.

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1855

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

1855

YESTERDAY evening, 14th November, a public meeting of this society was held in the Museum—ROBERT M'ADAM, Esq., Vice-President, in the chair. A lecture was delivered by Mr. H. O'Neill on the "Fine Arts of Ancient Ireland, with copious illustrations." The large room of the Museum was crowded with a most respectable and attentive audience.

Mr. O'NEILL commenced his lecture by stating that, at a very early period, artists were sent from Ireland to the continent of Europe, and hence traces were found of the existence of a school of Irish art. Modern artists were struck with the extraordinary beauty and execution of the Irish crosses. On the day previous, he was at Antrim, and taken a copy of the cross there, which had produced so much sensation among antiquarians. He took a faithful copy of the sculpture upon it, which was a difficult operation, as the relief was very low. Mr. O'Neill then referred to the metal work of Ireland, which was of the same school as that of sculpture. The metal work of ancient Ireland was different from that of the present day, inasmuch as the ancient Irish did not appear to regard the intrinsic value of the metal made use of. If gold was required, they used gold, and the same applied to silver and glass. One of the metal works, a drawing of which was exhibited to the meeting, had been executed by order of King Turlogh O'Connor, who reigned from 1106 to 1156, and bore an inscription to that effect. It was produced forty or fifty years before the great Norman invasion, and was thought to have been got up when the Pope, who then reigned, sent to King Turlogh a piece of the true cross. The lecturer then referred to a representation of an ancient Tara brooch, the property of Mr. Waterhouse, of Dublin, the material of which was only

valued for a few pence, but, as a work of art, it ranked so high that its proprietor valued it at £500. It had been sent to the late Paris exhibition; and it was admitted that no French artist of the present day could produce such workmanship as appeared on that brooch. This was a very high testimony to the artistic merit of the ancient Irish. The time at which it was produced could not be decided, but it was very ancient. It was not a mere ornament, but was perhaps a badge of distinction worn by ancient chiefs. Another metal work exhibited the shrine of St. Patrick's bell, an illustration of which was presented. This bell was said to belong to St. Patrick himself, and was of a quadrangular form. It had been made for O'Loghlin, a King of Ireland, who reigned during the latter part of the eleventh, and at the beginning of the twelfth century. The lecturer next referred to the ancient Irish manuscripts, and described the mode of tracing by which he had obtained his copies. The illuminations presented were taken from two books, one of which was in Trinity College, Dublin, and was said to have been written by Columbkill, at so early a period as the fifth century. The illuminations, however, could not have been executed by that ancient saint. The book was written on parchment; and on the borders of each page were four symbols, which represented the evangelists. The Book of Kells was referred to, the illuminations of which were so unique that in the present day, any man would shrink from copying them. The Book of Kells was of the same age as the Book of Durrow. The Book of Armagh belonged to the early part of the ninth century. The lecturer again referred to the Irish crosses; and observed that the cross at Monasterboice was the finest in Europe. The carving upon it would, it was computed, require one person 20 years to accomplish. It was likely that the ancient Irish coloured their crosses. With respect to the use of colour, in proving that subject, he came to the conclusion that, until the time of the great rebellion against the Pope —the time of the Reformation—all art was coloured. The Greeks used colour extensively, both in their architecture and sculpture; and there was not the least doubt that the artists of the early Christian era used colour as an integral part of their designs.

It was the opinion of Owen Jones, that he could hardly conceive how an artistic eye, so long accustomed to colour, could submit to plain white walls. The lecturer then referred to the cross of Tuam, which was thirty feet high, and carved to the top, as a proof that colour must have been employed to distinguish the carving at the summit. Long before the time of St. Patrick, art had attained a high position in Ireland. It was known that there had been a parliament in this country — in Tara — twelve centuries before the Christian era; and it was also known—for the Irish records bore witness to the fact—that the ancient Irish were skilful workers in metal. There was a civilisation in Ireland when England was in a state of barbarism. The testimony of Bede, of Geraldus Cambriensis, Sir William Betham, late Ulster King-at-arms, and Digby Wyatt was decided and disinterested, and recognised the fact that ancient Ireland was in advance of all the rest of the nations of Europe. Mr. O. Neill concluded an interesting and instructive lecture, amid the general applause of the meeting.

After some remarks on the probability of the use of colour by the ancients, by Rev. J. S. Porter,

Mr. MacAdam moved that a vote of thanks be given to Mr. O'Neill for the admirable lecture he had delivered, which was passed by acclammation.

The meeting then dispersed.

Natural History and Philosophical Society.

At a private meeting of the Society, held on the 28th November, 1855, Dr. Dickie, V.P., read a paper on Unity of Form in the Individual Bones of the Skeleton. It is admitted that the skeleton in every vertebrate animal is constructed according to a common plan, and the series of vertebræ of which it consists may be referred to one model; it appears to us that there is good reason for proceeding a step farther, and coming to the conclusion, that unity prevails also in the elements of the typical vertebra and its appendages. We may first examine the appendages or limbs, as affording the most evident indications of such unity. If we take as the type or model a bone of the hand (metacarpal), or that of the foot (metatarsal), we shall find that a very striking resemblance to it pervades all the elements of every limb. This typical bone may be described as having a cylindrical shaft, but dilated towards both ends. Now, this is the prevailing form in all the principal parts of the limbs. In man, for example, such general character exists in the bones of the arm, forearm, hand, and fingers; in thigh, leg, foot, and toes. The short and irregular bones of the wrist and ankle present the greatest departure from the type; but in some cases the relation is obvious—for instance, in the frog certain bones of the ankle (calcaneum and astragalus) assume exactly the form spoken of. In the elements of the typical vertebra—as distinguished from its appendages, the limbs—we shall find evident traces of similar conformity to a model. The centrum, or body of the vertebra, presents a close approach to the type in the caudal part of the skeleton. This is evident in a great number of instances; the extreme bones of the tail in the African elephant consist of centrum only, and each very much resembles in shape a metacarpal or metatarsal bone. The pieces of the inferior or hœmal arch present very clear examples of conformity to the type. Pleurapophyses, or ribs, are not always curved and flat bones, such as we see in man, or most mammals, and in many birds. In not a few instances, especially certain aquatic birds—the guillemot, for example—they are narrow and cylindrical, and not much farther removed from the type than the bones of the hand and fingers in the wing of the bat, which they very much resemble. The ribs of serpents also offer a transition to the model form. The shoulder-blade is a rib (sometimes with conjoined hœmapophysis—the coracoid). In man and mam-

malia generally, it presents a wide departure from the typical form. But, in many birds, it is long and narrow, exactly like a rib; and since, in the case just mentioned, the ordinary ribs very much resemble the model bone, we have thus transitional forms of shoulder-blade conducting us to the original type. In man, the collar-bone (a hœmapophysis) has the typical form, only it is curved; and in birds the coracoid (another hœmapophysis) is almost similar. In the pelvis, intended to support important viscera, and give attachment to strong muscles, there is generally a wide deviation from the type; but in some cases the likeness reappears—in the frog, for example, the iliac bones exactly resemble it, being dilated at the ends with an intermediate shaft. In both rib and hœmapophysis the mere curvature of the part, so as to assist in the formation of an arch, cannot be considered as very materially affecting the conclusion to be drawn. As regards the hœmal spine, it would not be easy to recognise any conformity to a model form in the breast-bone of man or of the bird; but in many mammalia, such as the lion, tiger, walrus, dog, &c., &c., that part of the skeleton consists of a series of pieces, having an exact resemblance to the typical bone. In the elements of the superior or neural arch, the departure from the model is generally greater than it is in the hœmal arch. The bones entering into the formation of the skull present a very wide deviation, but, certainly, not much greater than the shoulder-blades or the iliac bones, all of which, as we have seen, may be traced to the typical form. The very important functions of the brain case, as a protector of the important parts within, necessarily imply great and constant departure from the model. If we examine the principal element of the neural arch (neurapophysis) in any large vertebra, as that of the sperm or baleen whales, we shall find that, after all, it may be referred to the same general form which ribs usually present; and they, as we have seen, can be traced to a model bone. The neural spine is indirectly referable to the same type, and by similar steps. We observe it, in ruminating animals and others, attaining great length, and resembling a rib, but generally straight. There is but little difference in form between the longer neural spines of the dorsal vertebræ in the horse, and the shorter ribs of the same animal.

It is a curious fact, that the same model form appears in plants—for example, in the leaf stalk of the horse chestnut, &c., &c. The common petiole of the ash resembles a series of phalanges, like those in the finger of the bat.

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BELFAST
Natural History and Philosophical Society.

At a public meeting of this society, held on 19th December, 1855, Mr. Patterson, V.P., in the chair, Dr. M'Cosh read a paper on "The Colours and Forms of Plants." The doctor brought forward a number of highly interesting facts and statements, which will shortly be laid before the public in a work now in progress of publication.—At a public meeting, held on 9th January, 1856, Dr. Andrews, F.R.S., President, in the chair, Mr. P. Duffy, F.C.S,. read a paper on "Some Articles of general Consumption and their Adulterations." Mr. Duffy commenced by observing that, owing to the special nature of the subject, he was obliged to confine attention to a few only of the articles, the adulteration of which was practised. On account of their social importance, he had selected tea, tobacco, and coffee. Although discarding rumour altogether, he purposed to state only such facts as had come under his own observation. His remarks would have no special reference to Belfast; his opportunities of acquiring experience in the subject had extended over Ireland and the greater part of England, and his remarks would, therefore, be general. Tea, as most persons are aware, consists of the dried leaves of a plant which is a native of China, Japan, and some other countries in the East. Whether the two sorts of tea known in commerce, viz., black and green, are the produce of the same or of different species, is a question which is still disputed; the difference between the two sorts is not greater than may be found in the leaves of many plants growing in our own country, when modified by climate, soil, and cultivation. In China the plants producing the green tea of commerce grow on the North-Western slope of a ridge of hills, at a distance of about 700 miles from Canton, the chief port of shipment, while the black tea plants are cultivated on the South-Eastern slope of another ridge of hills at a distance of about 200 miles. Land-carriage in China being performed almost entirely on the backs of porters, is necessarily expensive, and in the case of green tea, which has to be conveyed long distances, frequently precarious. On one occasion the supply of this article fell short of the demand. Some American captains, in the port of Canton at the time, finding that they could not obtain all they had bargained for, threatened the destruction of the Celestial Empire if it were not supplied. The Chinese, who have an excel-

lent knowledge of colours, in order to obviate the ruin of their country, devised the expedient of *making* green tea, which they did by painting with a mixture of turmeric and Prussian blue the leaves of an inferior tea, which grows in the neighbourhood of Canton.—Since then the Americans have never had occasion to complain of a short supply of green tea, although they consume more of it than any other people in the world. The Chinese, finding the fabrication of tea a profitable business, have not failed to improve on the original process. They now make in large quantities what they expressively denominate *lie* teas, which they take care never to use themselves. These *lie* teas consist chiefly of tea dust, sand, and powdered mica, held together by a paste, and rolled into the form of pellets, which, when the object is to furnish an imitation of black tea, have added to them a portion of catechu to give astringency to the infusion, and are then "faced" generally with black lead; in the case of green tea the "facing" consists chiefly of Prussian blue and turmeric. The fictitious black tea may be known by its glossy lustre, the green by its lively colour, inclining to blue, and both by the compact appearance of the pellets, of which they consist, being so different from what any leaf could be made to retain. With the aid of the microscope and chemical tests the specific nature of the "facing" can be fully identified. Formerly the leaves of the sloe, ash, willow, sycamore, and oak were employed to adulterate tea, but of late years their use has been almost entirely abandoned. The cultivation of tea has lately been tried with marked success in Assam, a district of Northern India. We have never seen Assam tea sophisticated in any way. Mr. Duffy then gave a brief history of the use of tea in Europe, and referred to some of its properties, noticing the remarkable fact that the alkaloid, called *theine*, which is found in tea, is now known to exist also in coffee, Paraguay tea, and some kinds of cocoa; all vegetable products that different sections of the human race, dissimilar in almost every other habit, have, as it were, by a common instinct, selected for the same purpose. Of all the desires that man has created for himself, there is perhaps none for which he can so imperfectly account to his reason as that which finds its gratification in the use of tobacco. It is perhaps on this account, rather than because real evil can be satisfactorily traced to it, that the practice of consuming tobacco in any form has been so much censured. In snuff manufactories the workmen live almost constantly in an atmosphere of tobacco dust, and in tobacco manufactories are exposed more or less to the same influences, yet it does not appear that the health of those employed in them has suffered in any

manner different from that common to all persons engaged in close and ill-ventilated apartments. The average period of life of the men employed in one of the largest snuff manufactories in England has been found to exceed that adopted as the basis of calculation by most life insurance offices. Some years ago a report was furnished to the French Government by a commission appointed to investigate the question, in which the same conclusions were expressed. Tobacco, as imported, consists of the leaves of a plant belonging to the natural family *Atropaceæ;* there are several species known to botanists, but the tobacco chiefly used in these countries is the produce of the *Nicutiana Tabacum,* or common Virginian tobacco. After a description of the treatment which the tobacco undergoes before exportation from America, and an account of the several processes of manufacture pursued in these countries, the paper referred to the various substances which are sometimes used to adulterate tobacco, among others, the leaves of rhubarb, cabbage, dock, and chicory. Tobacco may be readily distinguished from these by the form of the hairs, with which its surfaces are clothed, and from nearly every other leaf as well, by the arrangement of the vascular tissue in its midrib, which, instead of being broken up into separate bundles, is collected into one large one, which, on a transverse section, presents a horse-shoe form. Molasses are frequently employed to adulterate tobacco; liquorice and some inorganic salts have also been sometimes used. Their presence can be ascertained only by chemical tests. Cigars are very seldom adulterated. Sometimes hay and brown paper, wrapped up with a single tobacco leaf, have found patrons among youths aspiring to a fast reputation at such places as Epsom, on the Derby-day, but nowhere else. A description of the processes pursued in the manufacture of the various kinds of snuff used in these countries having been given, it was stated that the peroxide of iron, in the form of commercial pigments, the oxides and chromates of lead, the chromates of potash, the spent bark of tanners' yards, sawdust, ground wood (especially dyewoods), ground cereals (such as barley-meal and wheat-flour), pounded orris root, peat, and coal, have been used to adulterate snuff—in one or two instances, there could be no doubt that dried guano had been added. Some of these substances, especially such as contain lead, are highly dangerous to health; others of them inflict no injury except upon the public revenue. The appearance of the cell in hard woods is essentially different from what is in the *stalk* (as the midrib is technically called) or blade of the tobacco leaf. These latter also contain no medullary rays, the presence of the muriform

tissue of which in a sample of snuff is quite sufficient to indicate that it has been adulterated with ground wood. Cereals are recognised by their starch and the characteristic appearance of their covering membranes, and peat by the unmistakable character of the leaves of the several species of *sphagnum*, of which, in a decaying or decayed state, it chiefly consists. The coffee of commerce consists of the ripe seeds of the plant known to botanists as *Coffoea Arabica*. Coffee in the raw state is almost tasteless and inodorous. The process of roasting works an entire change on its constituents. It is only after torrefaction that the valuable qualities of coffee become perceptible, and it is only when in that state that attempts have been made to find an equivalent for it. Among the seeds that have been tried for this purpose may be mentioned maize, barley, rye, and the other cereals; also the seeds of the yellow flag, of the common cleavers of the hedges, acorns, chesnuts, peas, and other leguminous seeds, the pips of the gooseberry and grape, and capsules of the box. The root substitutes which have been most used are those of chicory, beet, carrot, parsnip, rush-nut, earth-nut, and butchers' broom.—Chicory is almost the only substance, if we except some instances of burnt sugar, which, for some time past, has been used. Mr. Duffy exhibited drawings illustrative of the structure of coffee, and the various vegetable substances employed to adulterate it. The drawings had been prepared at the instance of Mr. Wood, Chairman of the Board of Inland Revenue, by Drs. Lindley, Hooker, Carpenter, and Taylor. He then gave an account of the chemical means of distinguishing coffee from its adulterations, and suggested as a convenient test, and one quite sufficient for domestic purposes, of the presence of chicory in a sample of coffee, to drop a small quantity of it on the surface of some cold water in a test tube. Some portions of it may fall to the bottom, but that indicates nothing to the point—if chicory be present, streaks of an amber colour begin to descend almost immediately from the point of contact between the powder and the water; while, if it be pure coffee, no streaks make their appearance, and the water remains colourless for a considerable time. A practised eye can, by this simple test, discover five per cent. of chicory. The paper concluded with an account of the institutions to which coffee had given rise, and of the influence it had exercised on the characters of the several nations among whom it had been introduced, as well as of the manner in which it has been associated with the literature and politics of most nations of modern Europe.

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BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

THE first meeting of this Society, for the present Session, was held in the Museum, on the evening of Wednesday, the 7th inst.—Dr. Andrews, F.R.S., in the Chair. On this occasion, Mr. R. Patterson exhibited and explained a series of Zoological Diagrams, which had been prepared by him for the Department of Science and Art, Marlborough House. Having been frequently asked what was meant by this department, he adverted, very briefly, to the circumstances which had led to its formation, in March, 1853, with the view of extending a "system of encouragement to local institutions for practical science, similar to that already commenced in the Department of Practical Art." One of the earliest objects to which the attention of the department was directed was the selection of text-books on different branches of science, and the arrangement of illustrative models and diagrams. An idea of the range of subjects which these may ultimately embrace may be formed from an enumeration of those which have been already announced. Among them are—Electrical Models and Diagrams, by Professor Wheatstone and Sir Snow Harris; Geological Diagrams, by Professor Jukes and Professor Ramsey; Economic Botany, Mr. Archer; Botanical Physiology, Professor Henfrey; Easy Methods for Teaching Botany in Schools, Rev. Professor Henslow; Human Physiology, Mr. Marshall; Physiology of Animals, Professor Huxley; Chemical Manufactures, Dr. Hoffman; and Mechanical Models, by the Rev. Professor Willis. The preparation of the Zoological Diagrams had been entrusted to Mr. Patterson, in consequence of his little book, "Zoology for Schools," having been adopted by the Department as one of their text-books. The series consisted of ten of these diagrams, five being devoted to the vertebrate, and five to the invertebrate animals. Of these, three were executed by Mr. Wolfe, two by Mr. Forde, one by Mr. Bailie, and four by

Mr. Tuffen West. He felt under great obligations to these gentlemen for the pains they had taken to combine, with artistic effect, the accuracy which the Zoologist required. He was, also, greatly indebted to Messrs. Day & Son, the eminent lithographers, for the manner in which the sheets had been brought out; to several Natural History friends, for valuable suggestions and kindly criticism; and to Dr. Lyon Playfair, the Secretary of the Department, for the desire he uniformly manifested to secure, by every means in his power, the accuracy and utility of the diagrams. The Lecturer then proceeded to point out the manner in which each sheet illustrated the classification of some one great group of the animal kingdom, each figure being the representative, or "type," of a minor group—the marginal references being so arranged that a learner could, without difficulty, ascertain the name of any animal, and refer it to its proper order and class. He expressed a confident hope, that the introduction of Botanical and Zoological Diagrams into our schools would exercise a beneficial influence on the minds of children, and tend to the development both of their observant and æsthetic powers. In conclusion, he presented to the Society, from Messrs. Day & Son, the series of diagrams which had formed the subject of the lecture. The thanks of the Society having been voted to those gentlemen, it was announced that, on Monday evening next, at eight o'clock, Mr. Patterson would commence his intended course of Zoological Lectures to Young Persons. It was also announced that, on Wednesday evening, the 14th inst., Mr. H. O'Neill would deliver a lecture on "The Fine Arts of Ancient Ireland."

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Sanitary Reforms.

LECTURE BY SURGEON BROWNE, R.N.

Surgeon Browne, R.N., delivered a lecture to the members and friends of the Belfast Natural History and Philosophical Society, on 23d April, 1856, in the lecture-room of the Museum, College-square, on the subject of "Sanitary Reforms." The lecture was illustrated by diagrams. Dr. Dickey, Professor of Queen's College, Belfast, was called to the chair.

Surgeon Browne, on rising, said, he had been induced to bring the question of sanitary reforms once more before the public of Belfast, although it appeared now not to be very fashionable, if they took the attendance on that occasion as a criterion; and it also seemed to be forgotten, if they took into consideration the small number of sanitary operations now being carried on. But as he had given to the subject a good deal of his time, and had assisted in bringing it prominently before the public, he was determined not to let it lie in abeyance, but if possible to resuscitate it. He felt that the present was peculiarly the time for making an effort to have sanitary measures carried out, as they enjoyed a lull from those epidemic diseases which for five years afflicted the country. Those living in Belfast knew something of the fearful ravages among the poor of the maladies which sanitary reformers knew were clearly preventible diseases. The subject which he had the privilege that evening to submit to their notice, was really the most important temporal question that could exercise human intelligence. How much of their earnest solicitude did the preservation of individual health call forth, and how anxious they all were to protract their inevitable doom? From the earliest hour of reflection, till the last moment of existence, that first innate principle was

ever in operation. All were desirous of life's greatest blessing, the "*sana mens in sano corpore*," and few there were who would willingly shorten its span. Yet, how really few take the proper steps to secure the one, and prolong the other! Health and life were treasures which all wished to enjoy; and when either was imperilled—the one broken, or the other endangered—every one was aroused to a due appreciation of their value; but in their ordinary avocations in the pursuit of wealth, pleasure, or knowledge, how few gave serious attention to the innumerable patent evils that surrounded them; still fewer turned a thought to the many imperceptible agencies to which they were all subjected, but all of which evils and agencies were constantly sapping, it might be by slow, but as surely by certain operations, the well-spring of health, the very basis of existence. In this advanced period of the world's history, in this age of knowledge, of wonderful discovery and application of science to the increase of wealth and happiness, it seemed a paradox that sanitary science was so little understood, or if understood, so little valued—so seldom carried on with persevering faith. Occasionally some bold reformer, some one ahead of his fellows in this easily-acquired knowledge, would startle society by evident and demonstrable facts regarding the manner in which sanitary neglect affected the health of individuals and communities; and would show that many of the causes of death were mitigable or removable. Yet, while those facts surprised, and were received as quite new, every one, on reflection, must perceive that the same causes had been in operation ever since the creation of man, and that people, in all ages, had only to observe some natural and simple laws to be impressed with the conviction, that many of the evils they suffered from were self-imposed or easily removable. Indeed, of that they had clear evidence in the history of all nations—the records of the Egyptian and Jewish people, and of the Greek and Roman Empires, exemplified that the inhabitants of those lands were not inattentive to the protection of the public health. Yet, it was clear that through the lapse of long ages, and up nearly to the present century, that salutary knowledge seemed to have been in abeyance, both national and local authorities having generally slumbered on in the false security of sated indolence. Of this

the hereditary habits of the peoples of Europe, and the construction of most of their towns, gave ample evidence—narrow streets, want of rear accommodation, imperfect or no sewerage, deficient supply of water, and often complete neglect of street cleansing attested the mental darkness which usually had prevailed through many a long and fatal year. However, a brighter era again dawned on these countries, and some people became impressed with the opinion that disease and premature decay were not of necessity part of the divine plan in dealing with fallen man; and statistical inquiry demonstrated two extremely valuable facts in the physical history of mankind—namely, "that the mean duration of human life is generally less than half that of the three score and ten years commonly assigned as the term of man's existence; but that, on the other hand, communities have it to a certain degree in their power to diminish and restrain the causes by which the lives of their members are thus abridged; and it has become evident that in consequence of the judicious employment of this power, the average duration of life amongst us has been for many years slowly, but progressively, upon the increase." Now, when it was ascertained from these statistical data that the inevitable mortality of the people of the United Kingdom was not much beyond ten in every thousand annually, while in some of our towns from twenty to thirty-six in every thousand perished yearly, it was not to be wondered at that some few become enthusiasts in the propagation of sanitary knowledge. The surprise, on the contrary, was, that either apathy or indolence could be found in connexion with it, or that the Legislature as well as home authorities had constantly to be reminded of the important claims it had upon them as trustees of the public weal. Was it that there was not faith in the resources of science and art, or was it that life and the essential to its due enjoyment—health—were secondary to the acquisition of gain, the promptings of ambition, or the pursuit of pleasure? Dr. Chevers had said, that in civilized society mankind died before the expiration of their prime, or the natural or reasonable inroads of age had commenced to operate upon them; and that there must be something morally as well as physically degraded in the people who did not adopt every means in their power for attaining old age. But as he (Dr. Browne) had formerly written, there was

such a mass of selfishness and prejudices to be overcome, and vested rights to be met, that sanitary progress was impeded. There never would be much progress while the Legislature viewed the sanitary question as one of secondary importance, or while it yielded to the clamours of those who claimed vested rights in property that was detrimental to the health of the community. There never could be much progress made until the Government demolished vested rights in what was noxious, for no rights could be held sacred which had such injurious effects. It was absolutely necessary that the Legislature should take the whole matter into their own hands, and pass a sweeping measure on the subject, not leaving it in the power of any person or Corporation to reject or adopt the provisions of hygienic laws which were beneficial to the community at large. He felt, upon that part of his subject, that it was due to his profession to state, that its members throughout the kingdom had written and spoken upon the subject, forcibly and frequently, throwing aside personal considerations, for the purpose of preventing epidemic diseases. It was true there were a few who sneered at sanitary reforms and at the endeavours of their professional brethren; but these, he was happy to say, were far in the minority, in which he hoped they would still remain. He would now refer to some of the removeable causes of disease and death, and the best means for their prevention. He would select a few of the more important provisions of sanitary requirements, and discuss how each assisted in the prevention of disease, and the consequent extension of human existence. First of these was the proper laying out, ventilation, and drainage of towns. If a town was situated on a hill or dry sandy soil, beside a running stream or river, the drainage of it was easy; but if it was built on alluvial soil, or low, swampy mud, sanitary works would be more difficult of construction, and were generally defective. The statistics showed that the mortality in towns built on low swampy soil bore a striking contrast to the mortality in those which were more favourably situated. But there were causes which produced these results besides that of situation, and these were ventilation and a proper system of sewerage. There should be no narrow lanes or blind alleys in towns or cities; all the thoroughfares should be spacious and uniform, and squares and open spaces should abound. Perhaps the proper plan

for the streets would be to build them running out to the country, and not into each other, and this would catch every breath of wind that blew, and supply the inhabitants with an abundance of fresh air; or else, as he had seen them in other places, in squares. Without some such arrangement, towns could not be healthy; if they prevented the free circulation of air in the streets, they, at the same time, prevented the free ventilation of houses. He did not insist upon a proper supply of air alone; sunlight was also wanted. Without it animal as well as vegetable life must languish. There were very many proofs of that statement. In the valleys of Switzerland the inhabitants presented deformities of their bodies as well as mental disorder. The cause of that deterioration was their continued residence in the deep valleys, and beneath the overhanging crags of their native land, from which the sunlight was generally excluded, and in which the atmosphere was not sufficiently stirred, assisted by their intermarriage with each other. But they did not require to travel far from home for corroboration of his statement, for they knew that in the crowded parts of the towns and cities of their own country, epidemics and the mortality were double what they were in the more airy and open situations. It was stated by Dr. Guy, that in London diseases of the respiratory organs increased fifty per cent. in closely inhabited and badly ventilated localities; and that of the 5,000 who died annually in that city of those diseases, one-sixth might be attributed to the want of ventilation in work-shops, and the remaining five-sixths to other neglects of free ventilation. He differed from some, however, who stated that foul air was the only incitement to consumption and scrofula; but most certainly it was one of the principal agents. He maintained that sunlight was necessary for good health; shut out, the light of the sun and they would produce languor and disease. In rooms from which the sun's rays were excluded, although properly ventilated, there was a heavy air and plants that were kept in them lost their colour. Dr. Chevers had stated that sunlight was only less important than air for the healthy life of animal and vegetable existence; wherever there was absolute darkness vegetable and animal life was absent. In like manner Dr. Edwards had shown that if tadpoles were kept from the sun's rays, and had air and water, although they would increase in size, that they would never become air-

breathing animals, but continue tadpoles, breathing by means of gills; he also stated, that persons living in dark alleys generally beget deformed children. He (Dr. Browne) had frequently seen the most marked change for the better, on the free admission of light into a room which had previously been in darkness, and in maladies where the patient did not desire the sunlight. It was clear, therefore, that if they deprived mankind of sunlight and free circulation of pure air, they took away two of the main stimulants of life. One great thing which tended to promote the health of towns was drainage or sewerage; yet this was little attended to. The report of the Commissioners of the Board of Trade stated, that they did not find the sewerage of any towns in a proper state; that, out of the fifty towns they had visited, the drainage of seven was very indifferent, and in forty-two it was decidedly bad, particularly as regarded those parts of the towns inhabited by the poorer classes of the people. In those towns where sewerage was adopted to any extent it was generally defective, and the ratepayers were burthened with rates for the construction of works which were either totally useless or aggravated the evils which they were intended to remedy; and that was one of the chief reasons why there was so much opposition to sanitary improvements. Dr. Browne then pointed out on a diagram the deposits which were formed in the large brick sewer in common use for drainage purposes. The main cause which militated against the effective sewerage of towns was the great expense attendant on the formation of the large sewers generally in use. That should not be a barrier; but when the people found that, after being constructed, they were generally inoperative, unless with a large supply of water, and produced noxious gases—became cesspools under the streets from which, at every opening, pestiferous gases were sent forth, and that every house connected with them by drains was also filled with these poisonous gases, they put the question, was it not better to do without them than to have sewers of such a description? Instances could be adduced to show that such sewers only increased the evil. Now, independent of the defect of accumulation in those large sewers requiring to be cleared out by the hand, they were also liable to percolation, in proportion to the porous nature of the materials employed in their construction. Sanitary reformers thought they could ob-

viate that difficulty, and accordingly tubular ones were adopted with complete success. The system had been carried out in London on a large scale, and was most successful. Other towns, according to the commissioners' report, had adopted them instead of the large sewers, and they had been everywhere found to answer all the purposes, except in Croydon, where the want of success was entirely owing to a defect in the laying of the pipes, and not from any defect in the system itself. Then, with regard to expense, the Board of Health stated, that the self-cleansing sewers, when compared in point of costliness with the hand-cleansed ones, could afford to be taken up every four years, and the house drains oftener, while, at the same time, the population was saved from inhaling noxious gases. Having shown the necessity there was for an improved system of sewerage, and that it required a copious supply of water, he would proceed to make a few remarks upon it. It must not be supposed that a supply of water which was sufficient for culinary or washing purposes, really was an efficient supply, more especially if it happened to be intermittent; because they had examples in other places to show that no town could be properly supplied with water unless the supply was constant, and at high pressure, ready at any time to be turned on to clean the drains. It was clear, therefore, that no expense should be spared to have a plentiful supply of this most important element of health. It was surprising that while the world had advanced in almost every department of science, that of sanitary operations had fallen into disuse. Dr. Browne then proceeded to state, that ancient Rome, and even the barbarous nations of old, surpassed the people of the present day in their attention to sanitary improvement, particularly in reference to the supply of water; and he went on to show the quantity necessary for household purposes, and quoted the opinion of the General Board of Health touching the supply for London. He then urged the necessity of cleansing streets from the impurities of animal and vegetable matter; and in adverting to the evils that existed in communities by neglecting the sanitary laws, he pointed out the practice of burying the dead in overcrowded graveyards as one of the greatest, expressing his surprise, that under the existing circumstances the ravages of epidemic diseases were not even greater than they had been. He recom-

mended that graves should not be re-opened until after a period of fifteen or twenty years, and reprobated the practice of having places of interment contiguous to towns and cities. He showed that the neglect of sanitary laws was always productive of great evil, and that attention to them had been the means of checking and preventing epidemic diseases; and that, in a pecuniary as well as in a moral point of view, inattention to sanitary arrangements during the prevalence of cholera was a great loss to the nation. He contrasted the loss of life in battle during the wars with Napoleon with the mortality caused by one visitation of cholera in Great Britain, and stated, that the mortality produced by the latter cause was greater than that resulting from the former. Dr. Browne then referred to the sanitary condition of Belfast, and after pointing out its defects in that respect, asked, how were the various evils he had mentioned to be remedied? It would not do, he said, for the people and the local authorities to fold their arms in the false security of ignorance; they must exert themselves in order to improve their sanitary condition. It was unquestionable that Belfast was badly situated for sanitary arrangements, but that was an especial reason why there should not be a single day's remission in their exertions for improvement. He referred particularly to the nuisance of the Blackstaff, and condemned its existence for so long a period, as being a disgrace to any community. In conclusion, Dr. Browne said:—What I recommend, what we immediately require here, as the first essential, is an abundant supply of pure water, with a constant service at high pressure. On this much of the safety of property depends, and without it, it is totally impossible to introduce any effective system of cleansing sewers. I also recommend the use of tubular drainage, as soon as it is practicable. The duty of the Water Commissioners should obviously merge into that of the police authorities, as it would be impossible to carry out drainage in connexion with water supply if the law continues to be administered by two bodies whose functions and opinions would frequently be at variance. I recommend the abolition of the smoke nuisance, since it is abundantly testified that smoke is consumable. I advocate the removal of all slaughter-houses, pig-sties, manure heaps, pools of stagnant water, and all kinds of refuse from the midst of human habitations. I advise the safe and decent interment of the dead. I recom-

mend the strictest attention to lodging-houses and houses let in separate tenements, and the opening up and constant cleansing of close and narrow streets. I advise the imposition of heavy penalties for the adulteration of every kind of food and drink. The sale of poisons should be entirely prohibited, unless under stringent regulations, and the traffic in spirituous liquors should be placed under the strictest supervision. In a word, everything that militates against the health, and which experience has proved to be detrimental to communities, should be speedily abolished. The views I have expressed are neither extreme, nor, as some may imagine, Utopian. We may not hope to see remedies all at once applied to the many evils that especially surround the poor; but I trust the period is not far distant when the Legislature will find it an imperative duty to improve the physical condition of the labouring classes, by enforcing an observance of these salutary principles of hygiene, which avarice on the one hand, and ignorance on the other, have caused to be despsed—when municipal authorities and public bodies, possessing like power, shall look upon sanitary police as the very highest of social requirements, the care of the public health as their primary consideration—when the people shall be impressed with the same belief—when those who look upon disease as the necessary result of man's primeval fall, a fit retribution for his disobedience, will take a more benign view of the case, learn that much of his temporal suffering is self-imposed and removable, and that it is no transgression of the Divine law for man to seek the extension of the now reduced limit of his life, or to feel that it is within his power to increase the present term of human existence. Disease is either preventible or it is not:—If preventible, as it assuredly is, what is our reasonable course? I leave it for you to decide. (Applause.)

The Chairman asked, were there any members disposed to make any remarks upon the subject of Dr. Browne's paper?

Mr. Hyndman said, the subject of sanitary improvement was very extensive and very interesting, as it came home to them all. He concurred in all that Dr. Browne had said. In an economical point of view there was no doubt that it would be a vast saving to a community if it would in time take proper precautions for the prevention of disease, which was shown to be perfectly pre-

ventible. With regard to Belfast much evil arose from the neglect of sanitary laws, and he was afraid that the course they were here pursuing in reference to the ventilation and drainage of new houses was productive of much evil to the community. The greediness with which the people filled up every available piece of ground was remarkable, and most of the houses were built without the slightest consideration to ventilation. He understood that some houses were built in such a way as to induce the tenants, after a short period of occupation, to leave them. A great deal yet remained to be done by the public bodies of the town; but the people themselves had it in their power to remedy many of the evils.

Mr. Patterson said, that the paper which Dr. Browne had favoured them with that evening was one of practical application, and was one of the most important that they had heard during the present session. He hoped that every one of the points which Dr. Browne had brought forward and enforced with arguments that could not be called in question, would go forth to the public and produce the effect to some extent that he desired. He (Mr. Patterson) was speaking to a gentleman within the last few days on the subject of graveyards, and his idea was that they had around Belfast and the neighbourhood seven or eight burying-places. They had Shankhill, Friar's-bush, the New Burying-ground, one at Malone, recently opened, one at Holywood, one at Newtownbreda, one at the Knock, and one at Drumbo, making eight in all. They had heard that the acreable extent of the eight grave-yards did not exceed thirty acres. The quantity might be more or less, but if they took the population of Belfast and the districts in which those burying-grounds were situated, they found they had only thirty acres of ground for the 200,000 of the population. He did not know whether Dr. Browne had any idea of what was the proper acreable extent for burying-ground, but at all events they must all shudder at the picture he had that evening presented to their notice.

The Rev. Mr. Steen expressed his opinion of the excellence of Dr. Browne's paper, and the great importance of the subject he had discussed. After all that could be done by public bodies, with the view of improving the sanitary state of a community, there was still something over and above that required to be

done. If they had houses and streets formed according to the best plan, there was still something beyond that to be done in the way of improving the tastes of the lower classes. Sanitary regulations would not be carried out unless they instructed the people upon the great advantages of fresh air, and upon the evils of sleeping with the bed-room closed; and what was worse than all, drawing the curtains round their beds and breathing again and again the air around them. Every time they inspired and respired they deteriorated the air, and that should be impressed upon the people.

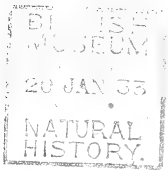
Mr. James M'Adam, sen., said, he never listened to a paper that afforded him more delight and instruction than the one they had heard that evening. It was one of the best he had ever heard within their walls. Mr. M'Adam then alluded to what he called anomalies on the subject of drainage in connexion with the low situations of towns and cities, and said, if they looked to the cities in several parts of the world they would find that whilst the sewerage was very bad the sanitary condition of the people was tolerably good. He expressed his belief that there was not a better ventilated town in the empire than Belfast, and said, that in some parts, particularly in that in which he resided, there was too much ventilation. In reference to Dr. Browne's views on the influence of sunlight as productive of sanitary good, Mr. M'Adam mentioned Italy, where there was a beautiful atmosphere, as an illustration to show that the people there were not so long-lived as in some other countries less favourably circumstanced. Again, in Holland, where the country was in a low situation, they did not hear of epidemic disease; but, however, most of the Dutch towns were penetrated by canals. He merely brought forward these things as anomalies, without opposing the subject of sanitary improvement. Mr. M'Adam concluded with some remarks on the subject of drainage.

The Rev. John S. Porter expressed his opinion, that the medical profession of Belfast deserved the gratitude of the community for their disinterested advocacy of sanitary improvement, and stated, that some of the clergy of Belfast had also exerted themselves, in 1849, when there were public prayers for the abatement of the cholera, with the view of directing public attention to the matter. Mr. Porter concluded by moving a vote of thanks to Dr. Browne.

Mr. JOHN HANCOCK, of Lurgan, in seconding the motion, made some remarks on the subject of Dr. Browne's paper, and mentioned, that under the late Act for the Government of Towns by Commissioners, there were ample powers for carrying out sanitary arrangements; and that Lurgan, where he resided, was at present experiencing the benefit of sanitary improvement.

The motion was carried unanimously.

After some furthur remarks from other members, including the chairman, in reference to subjects embraced in Dr. Browne's paper, the proceedings were brought to a close.



PRINTED AT "THE BELFAST DAILY MERCURY" OFFICE.

LECTURE

BY

SIR JAMES EMERSON TENNENT.

Last evening, as announced by the Council of the Natural History and Philosophical Society of Belfast, a lecture was delivered in the Corn Exchange, by Sir James Emerson Tennent, on "The Habits of Wild Elephants, and the Modes of Capturing them, in Ceylon." The doors were thrown open at half-past seven, and immediately the large apartment was entered by a most fashionable assemblage, consisting of the gentry of the town and adjoining locality. Ladies, as usual on similar occasions, when scientific subjects are to come under consideration, formed a considerable proportion of the audience. At a few minutes after eight o'clock, the hour fixed upon for commencing the lecture, a burst of applause indicated that our learned townsman had entered the room. Shortly afterwards he ascended the platform, and was again greeted with applause. Robert Patterson, Esq., one of the vice-presidents of the society, took the chair.

Mr. Patterson said—Ladies and gentlemen, my valued friend, Dr. Stevelly, is President of the Belfast Natural History and Philosophical Society for the present year, and as such it would have been his duty and his pleasure to have taken the chair this evening. He had been absent from home for some time; he is now just returned, and I regret to say that in the return he took a cold, which has affected him so much that he is unable to be with us this evening. I have a note from him expressing his great disappointment; and in his ab-

cation noticed was that of Mr. Wildman Whitch

sence, as one of the vice-presidents, it is my duty to take the chair. I feel it a very high honour to be called on to preside, and I entertain great pleasure, indeed, to occupy the chair when we are to have a lecture such as that which now awaits us. It is unnecessary to introduce my friend Sir James E. Tennent to a Belfast audience—an audience by whom he is so well known and so highly esteemed, so that I shall say no more but leave him to comence his lecture.

Sir J. Emerson Tennent then proceeded to read his discourse, which we understand is a portion of a work on the East from his versatile pen, soon to be published, and the materials for which he collected during his residence in Ceylon as Government Secretary. He began by remarking, that in selecting the subject he had been mainly influenced by the fact, that while our literature abounds in descriptions of the elephant in a state of captivity, we have no notice of his habits in a state of nature. Historians and travellers of all ages, from Pliny down to the tourists of the present time, have astonished the world by accounts of the docility when tame, but the information is meagre that is given of its disposition and habits in its native forests. The most favourable opportunities have been afforded for observation to the hunters and sportsmen who pursue them, but on looking over their journals, the reader will find only puerile descriptions of breakfast, or accounts of wanton cruelty, while about the elephant himself he is presented with little or no information whatever. He (Sir James) was fortunate enough, during his residence in Ceylon, to have many facilities for learning the habits of the elephant, and he availed himself of them, not merely to note the results of his own observation, but to record the experience of men who, while engaged in the formation of roads and conducting of surveys, had been enabled to notice the habits of elephants under the utmost possible variety of circumstances; and, in fact, his subject this evening must be limited to selecting such passages as illustrate the conduct of wild elephants during the process of capture. From ages immemorial the natives of Ceylon have been in the habit of capturing elephants and exporting them to the continent, and we have records of this traffic from the tim

of the Romans. The elephant is a peaceable animal; his trunk is too delicate an instrument to be used for offence and although upon emergency he can punish an adversary, and gore him with his tusks, as he experiences difficulty in rising them above the level of his head, it is impossible for him to wield them as the deer does his antlers or the buffalo his horns. His wants lead to no rivalry with the other denizens of the forest, and, contrary to the prevailing opinion, he (Sir James) was convinced that the elephant lives on terms of amity with all other beasts, and, with the exception of man, his only enemy is a fly. Contrary, also, to the prevailing opinion, that the elephant delights in the sun, he seems impatient of light; he seeks the shade by day, and devotes the night to his recreation and indulgence in the luxury of the bath. This was not altogether unconnected with the structure of his eye. His vision is weak, and he relies more on his sense of smell and on his ear than on his sight, which is liable to be contracted by the dense foliage; and his range of sight does not rise above the level of his head. This accounts also for his extreme caution. On one occasion an officer of his (Sir James's) acquaintance was chased by an elephant which he had wounded. He was overtaken in the dry bed of a river, and the elephant had his foot raised to crush him, but his forehead having been touched by the tendrils of some climbing plant, he was seized with fright, and fled, leaving the officer hurt, indeed, but with no bones broken. The perfection of their sense of smell compensates in some degree for their deficiencies of sight. By means of it they are not only warned of the approach of danger, but they are enabled to reassemble with rapidity and adopt precautions for their common safety. They have a variety of noises or calls, one of which, the trumpet call, which is produced by blowing through their trunks, has given to that feature the name it bears. The noiselessness with which an elephant moves is also remarkable. When suddenly disturbed they rush off with a great noise, crashing through the jungle, and in a moment it ceases, the hunter thinks that the animal has suddenly stopped within a few yards of him, but further search will disclose that he has stolen away, leaving

even the foliage undisturbed behind him. A herd of elephants is one family, and similarity of features can be traced in families with ease. In one herd, consisting of twenty-one individuals, the trunk of each presented the same formation, long and of the same breadth throughout, not tapering to a point; in another instance the eye of each of thirty-five animals in one kraal was of the same colour. An elephant, if he becomes separated from his own family, is not allowed to connect himself with another. To such a height is this exclusiveness carried, that when an individual, who had been detached in this way, was driven into an enclosure with others, he sought protection among the herd, and was repeatedly driven off by heavy blows from their trunks. Elephants in this condition are more daring than others; and one has been known to watch, even in daylight, the reapers when cutting the rye harvest, and, walking in among them, take up a sheaf of rye, and retire to eat it in the woods. The belief of the Cingalese is, that these elephants become morose by living apart and in solitude. Another belief is, that being males, and having lost their females by death or capture, they are separated till they have made out new alliances. Of the herd, one member is appointed leader. He is generally a tusker; he is obeyed with the most implicit submission, and the devotion and loyalty exhibited towards him are remarkable. In one instance a tusker was wounded; his herd placed him in their midst, and supporting him with their shoulders, they bore him away in safety, others covering his retreat to the forest. The learned lecturer here read an extract from a communication which he had received from Major Skinner, who was for some time engaged in opening a road through the interior. The writer described the occurrence as having taken place in the dry season, when the animals concentrate in the vicinity of the water tanks. In a district of several miles, there was only one of those tanks, about five hundred yards square, and Major Skinner stationed himself on a beautiful moonlight night, when objects could be discerned with nearly as much facility as by day, on its margin, having ascended an overhanging branch of a tree. He waited for nearly two hours, and at length a large elephant, evidently the

leader, advanced from the forest with extreme caution. Not a movement was to be heard, and the huge vidette after advancing some 3,00 yards across the open space that intervened between the water and the forest, stood still to reconnoitre. He then advanced some yards farther, again stood still, and again advanced cautiously as before, till his feet stood in the water. He did not drink, but again returned to the forest and reappeared with five others, whom he posted as patrols. This done he went back, and on his reappearance was accompanied by a herd of eighty or a hundred, which he led across the open ground into the water. On reaching this the herd abandoned themselves to the enjoyment of the bath. They rushed into the tank, and Major Skinner says, in his description of the scene, that such a mass of animal life he had never before witnessed. It seemed to him that the huge animals would drink the tank dry; and considering the caution that had been observed, and the care with which the leader had acted, nothing, he says, will ever convince him that their movements were not guided by rational perceptions. With the view of testing their sense of hearing, after gazing on the scene for some time he broke off a small bough, and instantly the herd took to flight, the smaller calves being carried along between the shoulders of the cows. Coming to the modes of capturing elephants, the learned lecturer then said, that the professional elephant hunters of Ceylon display the greatest acuteness and daring in their pursuit. So keen is their glance that while running at top speed they will detect on the dry grass the impression of an elephant's tread at a great distance, they will perceive by a leaf which may have fallen from the elephant's mouth the direction of his flight, and the smallest broken branch will arrest their attention. If at fault they fetch a circuit like a setter; and as it is necessary, from the elephant's keen sense of smell, to approach him against the wind, when it is so still that the direction of the current of air cannot be discerned, they suspend a gossamer film to detect it. If they have confidence in the sportsman by whom they are accompanied, they will even approach the elephant and slap him on the quarter to make him turn, so as to expose

his forehead to the bullet. Two of them will undertake to catch an elephant. Should there be no tree, one of them will allow himself to be pursued, while the other will torture the animal from the rear. The elephant then turns round on his assailant, and the first of the hunters at this moment entraps one of the fore feet in a noose, and each of the other feet being noosed, the capture is complete. They then run up a shelter, and in front of it erect a hut for themselves. The elephant has a horror of smoke and fire, and in a few weeks his spirit becomes subdued. He is then removed to the sea side, and in this the ingenuity of his captors is most remarkably displayed. The rope is not removed from his leg till he arrives at the coast, and after having been kept there till whatever wounds may have been inflicted on the leg are healed he is shipped in a barge half filled with leaves, which is brought up to the level of the wharf, and conveyed across the narrow strait that separates Ceylon from the Continent of India. The process of shipment is very tedious, and often occupies an entire day. Sir James then described the mode of entrapping, as observed by himself during his residence in Ceylon. A strong enclosure of stockades is made in the heart of the forest; this is connected with a second enclosure containing a pool of water or a rivulet, and this with a third which terminates in a funnel-shaped passage. The elephants are brought up to the entrance of the enclosure by a cordon of men who surround them with guns and flambeaux, and driven in, when they are secured by ropes and picketed in the neighbouring jungle. The description which Sir James gave of his route to the Elephant Kraal, on the Alligator River, thirty-five miles North-West of Kandy, was one of the finest pieces of landscape painting in words that we have heard from the lips of any speaker or lecturer. He described the country over which he traversed with the party of the Governor, as covered with the leaves of the rose-coloured lotus. Their *cortége* was quite oriental in its character. The ladies were borne in palankeens, and the young of the party were carried in chairs raised on poles and covered with leaves and foliage. They crossed the sandy beds of

several rivers, and passed through forest glades, the trees festooned by convolvulus flowers and orchids, and the air filled with glittering insects and birds of bright foliage. They found, on coming to the kraal, a a cool and enjoyable structure prepared for their reception, formed of branches and thatched with leaves, and including kitchens, stables, and store-rooms, all run up by the natives in the space of a few hours. The stockade was concealed as much as possible. The trees of which it was formed were about twelve inches in diameter, and rose twelve or fifteen feet above the surface of the ground; supports were added to prevent their giving way to the pressure from within, and cross-beams were tied across, made fast with ropes of rattans and flexible climbing plants, which are called jungle ropes. This space was some 300 feet in length, and about half that in breadth. The preparations were completed by making a stage for the accommodation of the governor and his party on some adjacent trees. The learned lecturer then described in minute detail the preparations for driving home the elephants. Three herds had been surrounded by the natives, who formed a cordon around them with fires, at which watchmen were stationed around a circumference of about 2 miles. On the day fixed for the capture, they heard a beating of drums and tom-toms, and a discharge of muskets. The elephants rushed now to the one side and again to the other, endeavouring to force the line, but at length the crashing of branches showed that the herd was coming nearer, and the leader immediately bursting from the jungle rushed towards the stockade. He had reached within some yards when he suddenly stopped, and in spite of the hunters rushed back, leading the herd to their original position. This unexpected movement the head-man accounted for by stating, that as the leader of the herd approached the kraal a wild hog burst from the thicket and crossed his path, and as the elephants hold that animal in extreme abhorrence he turned back.—The hunters generally requested, that as the fires would have more effect after dark, and as the herd was now in a high state of excitement the further proceedings might be postponed till night. This was acceded to, and at the appointed hour,

the roll of a drum, followed by the discharge of a musket, gave the signal; the fires were lighted, and the herd approached at a rapid pace. Their leader emerged in front of the kraal, paused for an instant, and then rushed impetuously for the open gate. The hunters rushed to meet him with flambeaux, and the herd stopped in terror. Their terror, when they found themselves within the enclosure, was sublime. They hurried around the kraal, but saw themselves environed by fire; and, on whatever side they approached, they were met by discharges of muskets. Then they would burst off in another direction, and, when repulsed, they returned to their resting place in the centre of the kraal. Only one herd out of the three that were surrounded had been as yet entrapped, and while the governor and his party retired to their bungalows, watches were set and the cordon was strictly kept. Sir James then described the process of noosing the wild elephants in the kraal. It was effected by mahoots, who rode into the circle on tame elephants, one of which he described as a most accomplished decoy, who evidently took the greatest pleasure in the sport. One of the mahoots, a wiry little man, seventy years of age, who had gained great reputation in this perilous undertaking, was accompanied by his son, a young man equally renowned for his courage. The decoy moved silently towards the herd, stopping now and then to crop a bunch of grass. As she approached the leader moved forward to meet her, and moved his trunk caressingly over head. She then drew herself up slowly beside him, and her rider endeavoured to noose him, but he turned. The decoy instantly perceived the danger of her rider, and protected him by placing herself between them. The leader having been noosed, the decoy, to whose collar the rope was attached, pulled him towards a tree, her companion assisting. When secured the anguish of the wild elephant was extreme. Rangain (the son of the old man who was slightly wounded) then advanced to the stage of the governor for the accustomed largesse, and was rewarded with a shower of rupees. The others were captured in the same manner. The attitudes of the elephants when captured were extraordinary. One especially stretched himself

out at length, his fore legs projected in front and his hind legs stretched out behind; his trunk he coiled up like a watch spring, and then uncoiled to its full extent. He moaned piteously and the tears rolled incessantly from his eyes. Of this herd one was a very young calf, with a bolt head, covered with light brown hair, It trotted after them in every charge, and not only her own mother, but all the other females of the herd caressed her with their trunks. The little creature kept by her mother's side till she was drawn to the fatal tree; it tried to tear away the noose, but being beaten off by the noosers, it retreated slowly all the way, and coming up to the rest of the herd, placed itself before the fore legs of a female who caressed it fondly with her trunk. Another young elephant was most vociferous, and when the noosers were obliged to secure him, he made the most extraordinary contortions with his lithe and pliant body. The attendants brought him food, and he ate and roared simultaneously. (Laughter.) All at once he became silent, the natives said it was a sign of his approaching death, and in this conjecture they were correct, as his body was immediately covered with swarms of black flies, of which not one had been previously discernible. The herd being secured the natives appeared in great numbers. From one to two thousand had assembled, the women with bronze cupids in their arms, and the girls in the picturesque native costume—a scarf drawn around the waist, and then thrown over the shoulder. The elephants were many of them still struggling, but the sounds of a Kandyan flute produced a most striking effect. They stretched their heads in the direction of the sounds, their moanings immediately stopped, and they spread out their ears to drink in the plaintive sounds, which instantly soothed them. The whole scene was as variance with the representations made by some sportsmen, that elephants are treacherous, and revengeful; their every movement was indicative of innocence and timidity, their attitudes were graceful, their grief was touching, and their low moanings went to the heart. It would not have been tolerable had they been captured by unnecessary pain, or had they been reserved for torture hereafter. (Loud applause.) The eloquent

and learned lecturer then described the escape of another herd, and the successful capture of the third. He narrated an interesting anecdote of a young elephant, which had been sent to his house at Colombo. This little animal was an especial favourite of the servants, by whom he was allowed to range over the offices. He attached himself especially to the coachman, but his favourite resort was the kitchen, where he got his daily supply of milk and plantains. When he (Sir James) would be walking in the grounds, he would walk up, and, twining his little trunk around his body, would lead the way to the fruit trees. He was sometimes permitted to enter the dining-room, and he soon found his way to the side-board; on one occasion, when unnoticed by the servants, he made a clean sweep of the wine-glasses and China, in his attempt to get at a basket of oranges. (Laughter.) For this and similar pranks he was sent away, and he now takes his turn of public duty in the department of the commission of roads. The lecturer concluded amid applause.

Mr. Geo. C. Hyndman then said, although it is not customary in our society, to propose a vote of thanks to the reader of a paper, being a member, this is an occasion when we may depart from the custom; and I now move that the thanks of this meeting be given to Sir James Emerson Tennent for the interesting lecture he has given us.

Mr. James M'Adam said, I have great pleasure in seconding the vote of thanks which Mr. Hyndman has proposed. I should mention that our society, some of the oldest members of which are now present, have great pleasure in hearing Sir James on the present occasion. It is a great many years since he gave us a paper, and I never heard him to greater advantage. He has been for many years absent from Belfast, and he has, by his literary labours, done himself and the town great dignity. Latterly he has turned his attention to scientific pursuits; but especially to the members of our society and to the Belfast Museum he has been most liberal. We have, through his kindness, received a number of most valuable specimens, which are highly appreciated, and which all who visit the museum must have great pleasure in inspecting.

Mr. Patterson said, he thought it quite unnecessary, formally, to put such a motion to the meeting. It was one, he was certain, in which every individual present cordially concurred, and he was sure he would only speak the sentiments of all, if he said that the motion was adopted with acclamation. (Applause.)

Sir J. E. Tennent returned thanks. I would, he said, be paying a bad requital for the patience with which you have listened to me, were I to inflict a speech in addition to a lecture. I will only acknowledge the courtesy which suggested the motion. The only reward that I can have is, the hope that my attempt to amuse, if not to instruct you, has not been altogether unsuccessful. (Applause.)

It may be here added, that on the platform were arranged some very large tusks, and on a side-table a large head of a female elephant, both the gift of Sir James to the Natural History Society. The head of the elephant is part of a complete skeleton; and, apart from the great size, some importance is attached to it from the fact that the animal, which was employed in the public works in Ceylon, was some sixty years old when the English got possession of that colony. She contracted a disease in '48 or '49, when she must have attained the age of 120, and was mercifully shot—the ball passing through the centre of the forehead. The skeleton is the only complete one extant of an elephant which had reached that age. It may also be stated that the shot which deprived this venerable animal of life was fired by Mr. Layard, the brother of the explorer of Nineveh.

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BELFAST

Natural History and Philosophical Society.

THE thirty-sixth session of this Society was opened on the 29th October, 1856, when the President, Dr. Stevelly, Professor of Natural Philosophy in the Queen's University, delivered an Address on his taking the Chair. He gave a slight sketch of the early history and objects of the Society, paid a tribute of well-merited respect to the memories of the late Captain Graves and Captain Crozier, of the Royal Navy, and alluded to some of the motives which had induced the members of the original Natural History Society to extend the sphere of its objects so as to embrace the subjects of the physical science in general. He then pointed out the importance of wide-spread Associations for the advancement of science, and proceeded, in conformity with a wish expressed by some members of the Society, to give a few examples of these advantages, selected from communications made to the British Association at its late meeting at Cheltenham. These exemplifications embraced a sketch of the Address of the President of the Association; also, the discourse, delivered by Colonel Rawlinson, on the Rock Inscriptions of Chaldea and Persia, and their vast importance, as so amply confirming the historical statements of the Holy Scriptures, and the light they threw on some parts of them, and on some points of profane history which had been previously obscure or misunderstood. The next communication noticed was that of Mr. Wildman Whitehouse, in which he had established, by experiments performed with an instrument devised by himself, that the law which regulated the retardation of galvanic currents along extended wires was not, as some from theory had maintained—namely, that of the squares of the distances, which, if true, would render the laying of telegraph wires across the Atlantic a hopeless project, with

any moderate regard to commercial success; but that he found that retardation to increase very little beyond the simple proportion of the length of the wire. The communication of Mr. Bessemer, on a new method of manufacturing malleable iron from cast iron, without any fuel, and with much less expenditure of time and labour than in the present processes, was then noticed, and the principles on which it was founded explained, and the process shewn and illustrated by large drawings, prepared for the occasion by Mr. James Thomson, Civil Engineer, one of the members of the Belfast Natural History and Philosophical Society. In conclusion, Dr. Stevelly thanked Sir James Emerson Tennent, in the name of the Society, for the very interesting and instructive lecture lately delivered by him, on "The Elephants of Ceylon." He pointed out the advantages of such a Society as the one over which he now presided, especially now since knowledge and merit have been made tests of fitness for civil and military appointments; and he alluded to and explained some late regulations of the Council of the Society, by which it was hoped and expected that the value and public interest of its proceedings would be much increased.

At a public meeting, held on the 5th November—Dr. Stevelly, President, in the Chair—Dr. Wyville Thomson read a paper on some more modern geological changes, embracing descriptions of the action of glaciers; and, also, of the drift beds on the shores of the British Islands, enclosing shells of an Arctic character, proving the existence of a colder climate formerly in this part of Europe.

At a private meeting, 19th November, 1856, Dr. Dickie read notes on the Homologies of Insects. It was at first shewn that a plan regulates the structure of their whole external framework; that it consists of a series of similar pieces, each composed of certain elements; and that these are variously modified in different parts of the body. Attention was more especially directed to the arrangements in the caudal portion of the body, with special reference to stings and ovipositors. Some views on this subject were discussed, and remarks made on the homologies of these organs. Dr. Dickie concluded by stating the results of his own observations, and the conclusions arrived at—somewhat different from those usually held.

After Dr. Dickie's paper,

Mr. Robert Patterson called the attention of the Society to a splendid specimen of the *Actinia Dianthus* of Ellis, *A. plumosa* Müller, which, by the kindness of Edmund Getty, Esq., he was enabled to exhibit. It was taken near the entrance of Belfast Bay, by Hugh Gray, a Groomsport pilot, who was so much struck by its beauty, that he sent it to Captain White, Harbour-master, who very considerately forwarded it to the Conservatory, at Queen's Island. The occurrence of the species in this neighbourhood had long been known, specimens having been dredged by Mr. Getty, and recorded by the late Mr. Thompson, in his "Natural History of Ireland." Figures of the animal given by Müller, Johnston, Dalyell, and Landsborough were exhibited, and compared with the living animal, which was displayed in a vase of pure sea water. It did not possess the variety of hue noticed by some authors, but was of a salmon colour, differing only in the intensity of the tint in different parts. Its size much surpassed the ordinary dimensions attained by the species. A couple of days ago, when Mr. Patterson first saw it, the stalk was about nine or ten inches long, nearly three inches in diameter, and the expanded disc about five or five and a half inches across. This evening, he had measured the diameter of the disc, in the presence of Mr. Templeton and Professor Dickie, and found it to be seven and a half inches, the stalk having diminished in length and increased in breadth. It was attached to the shells of two living oysters, with which it still remained in connexion. Four young actinias were around the base; and, during the forenoon of that day, a mass of gemmules had been produced; thus giving hopes that this species, justly called by Müller "*Actiniarum pulcherrima*," the loveliest of the sea-anemones, might be perpetuated in the marine aquaria on Queen's Island.

At a private meeting, on 3d December—Dr. Stevelly in the Chair—Mr. J. J. Murphy read a paper on Longitude and Clock Time.

Dr. Stevelly read, afterwards, a paper noticing the dispute respecting the Rotation of the Moon on her Axis in the Period of a Month.

BELFAST MUSEUM.

Last evening, W. J. Ffennell, Esq., Commissioner of Fisheries (Ireland) delivered an address to the members of the Belfast National History and Philosophical Society in the Museum, on the subject of the Irish Fisheries. The attendance was not large, but the leading members of the Society were present. The chair was taken by Dr. Stevelly, President, who briefly introduced

Mr. Ffennell. In opening his discourse, Mr. Ffennell referred to the late inquiry held by him and his colleague, Mr. Barry, in Belfast, which excited very considerable interest at the time, as was evidenced, not only by the number of persons who attended, but by the classes of the witnesses who gave evidence. During that inquiry he had some conversation with a gentleman who holds a most distinguished position in the Natural History Society, and the result was a request on that gentleman's part, and a compliance on Mr. Ffennell's, to deliver this address. Calling attention to some points which he thought of much importance as bearing on the development of the fisheries of the country, he considered, he said, that Natural History Societies ought to direct their inquiries especially to this matter, and thereby serve a double object, for while they gratified their taste for natural history, they would be engaged in researches from which much good might result to their fellow-countrymen, and the national wealth be increased—a consideration which he felt was one not to be undervalued by the members of that society residing in a place remarkable for the good sense of its inhabitants, by whom it had been raised to one of the highest positions among the towns of the kingdom. He thought that natural history societies had not hitherto devoted sufficient attention to the importance and value of the edible fishes; and referring to the late Mr. Thompson, whose name had been deservedly revered in that society, he said he would be sorry that any man should think that he would be disposed to utter a sentence derogatory to his worth. He had only had the pleasure of meeting him on one occasion, and he much regretted that he had not enjoyed that pleasure oftener. But naturalists seemed to confine their investigations too much to the classification of different species of fishes, and it appeared to him (Mr. Ffennell) that something more was required. He referred to the report of the Fishery Commissioners in 1836, which he characterised as very able, comprising a mass of information of the most valuable character, and he recommended the society to place it in their library, if it was not there already. The first part of that report was on deep sea fisheries. The second, on salmon fisheries, was not half so valuable or so satisfactory; in fact, the commissioners, after three or four years of very la-

borious exertions, were obliged to declare, with reference to the remedial measures for the development and protection of the Irish fisheries, that, in the absence of any knowledge with respect to the natural history of the fish, they could give no opinion. The plain way of putting it was, "we know nothing at all about it, and there is no one who can tell us." This, he thought, should stimulate the Belfast Natural History Society to redeem the country from such a reproach, and as it was with this view that he came before them, he was afraid that he would not be very popular. He had no intention of being censorious, and he did not mean to find fault with this society; but he had reason to find fault with other societies that they devoted themselves to knocking off little stones which are of little or no value, while there was the great salmon, the turbot, the plaice, the sole, and other fishes which are all of the utmost importance, and respecting which a fishery commission, after sitting three years, ended by declaring that they had no information. Since that commission sat it had been ascertained by the researches of Mr. Shaw and others that certain small fish, which, in Scotland and elsewhere, are known by a variety of names, were young salmon, and immediately the Government passed an Act of Parliament for the protection of these fish. That Act was passed in 1842, and it was curious to contrast it with an Act of the Irish Parliament passed in the reign of Queen Elizabeth, in the year 1569. Mr. Ffennell here read the Act, which prohibited persons from allowing herds of swine to feed on the salmon fry on the banks of rivers where the tide ebbed and flowed. Every one now knew that it was not where the tide ebbed and flowed the salmon deposited their spawn. It was quite in the opposite direction. The Act goes on to state, that from the first day of March to the first of September, any one of her Majesty's subjects could seize pigs so feeding and convert one half to his own profit, giving the other half to the Crown. After the passing of that very absurd Act in the reign of Elizabeth, it was only in the year 1842 that they obtained the Act for the protection of salmon, consequent on the information laid before the Government, and he wished that other naturalists would go and do likewise with respect to other fishes, in regard to which we are in total obscurity. The laws in force respecting the protection of fish were, some general and positive, and others partial and local, and it was the latter which they were called on to apply in this locality lately. Heavy penalties were attached to any person who might violate them. Passing to a description of the more valuable fishes, Mr. Ffennell said, that plaice which abounded in this district was a most valuable fish; and after describing Belfast lough, and giving its soundings, he said that they devoted the greater part of their time to inquiries respecting plaice during their late visit to Belfast. They received very conflicting testimony; the trawlers of Carrickfergus said that plaice do not spawn in trawling ground,

they spawned in foul ground, where there could be no trawling; and the line fishermen, on the other hand, stated that it is in trawling ground that they do spawn. It was most desirable that this question should be determined. Without having investigated the matter fully he inclined to the opinion, that the fish deposited their pea in the gravel which collects between the rocks, where the agitation of the water is prevented form disturbing it; and he was always disposed to adopt anything that is founded on the sagacity and instinct of animals of this kind, because they had so many well-known instances of their wonderful labour to get to places where their spawn will be safe. He then referred to the artificial propagation of salmon and trout, stating that he had reared some in his own office in the Custom-house, and that there is not the least difficulty in the matter, as he had no doubt any of the members who tried would find. After stating some of the evidence given on the occasion of the late inquiry, to show the ignorance that prevailed respecting the spawn of plaice and other fish, he proceeded to speak of soles, which, he said, were taken by bait at Bundoran—a most unusual circumstance. They were not much afflicted with soles in Belfast Lough, and if they were, they would find it very difficult to prevent trawling, and perhaps would be less inclined. It was curious that soles were found in abundance in the Waterford River, above the confluence of the Nore and Barrow at Cheek Point, finer and fatter than those taken at sea. The same was the case in the Kenmare River, and the gentry in the latter place were most unwilling that trawling should be prevented, because their soles are so fine that they could not do without them. He suggested, that as there were many extensive mill-ponds about Belfast some of this fish should be obtained, and an experiment tried as to their suitability in the fresh water. On the subject of the oyster fisheries, he said, it was a branch of the Irish fisheries which deserved the most serious consideration, because all, or nearly all, the beds had been greatly exhausted and the supply diminished, while the increase of steam-boats had given great facilities for their transit to the best markets. The Legislature, in order to remedy this, had given power to grant licenses by which any party forming an oyster bed may have his property therein established. Many inquiries were made on this subject by practical naturalists, and he (Mr. Ffennell) had answered some printed queries sent to him by the British Association for the Advancement of Science having reference to it. There were some places where oysters fructified, but do not fatten; and other places where they fatten, but do not fructify. The causes of this are not known, and it was very creditable to those endeavouring to propagate oysters that they were not deterred from their undertaking, and did not choose to wait until some philanthropical naturalist will have shed light on the matter. In some positions their shells are formed rapidly; in others the

growth is slow. They found oysters conveyed by the tide to great distances from the beds, and adhering to the sides of vessels in the docks; and, on one occasion of his visit to Dundrum, Mr. Young called his attention to some oysters which had been brought by the tide into the bath, and there adhering to the stones and growing. This was not an unusual occurrence, but there was a great deal of obscurity about oysters. The commissioners had the power of granting licenses, without any expense to the applicants, by which certain places, intended for forming oyster beds, were made private property; but these people were only groping in the dark, taking places in a great measure by chance, and it was a matter of the greatest importance that naturalists should direct their attention to the subject with a view of clearing up the difficulties that exist. After some remarks on oyster spawn, and the necessity of having rock or shells in the beds to which the young could adhere, Mr. Ffennell said, in order to show the value of oyster fishery, that he had been called upon not long since to settle some dispute between the Arklow oyster fishermen and an English purchaser, and that in the space of one month the sum of eight thousand pounds was paid for oysters from the Arklow beds alone. That was a fact which he thought ought to stimulate research on the subject. He had not come there merely to amuse or to entertain them. He came as a blunt practical man, at the suggestion of his friend, Mr. Patterson, having warned that gentleman beforehand that he would read them a lecture. (Laughter.) He would not refer to the Inland Fishery at that late hour of the evening; but he promised that the information he possessed would be at the disposal of the society; and that if, at any future time, they desired it, he would be happy to come down from Dublin and spin them a yarn on the salmon fisheries; but he could not promise that he would not tire them. Mr. Ffennell exhibited, as a curiosity, a zinc flask, which had been taken from the stomach of a ling. It was securely corked, and contained two glasses of brandy when taken out.

Mr. Patterson read the inscription on the flask for the audience. It was as follows:—

"Royal Irish Fishery Company. This flask, containing two glasses of ardent spirits, was found in the stomach of a ling, caught off Brandon Head, in February, 1849, and was presented by James E. Stockford, Esq., LL.D., director, and W. Andrews, Esq., director, to W. J. Ffennell, Esq., in testimony of esteem and of their sense of the services rendered by him as a Commissioner of Fisheries."

A most interesting conversation then followed on the subject of Mr. Ffennell's address, which our space will not permit us to report. Rev. J. Scott Porter, Mr. Hyndman, Mr. James M'Adam, sen., Mr. Patterson, Dr. Dickey, Mr. Herdman, and Dr. Browne, took part in the conversation, after which a vote of thanks was passed to Mr. Ffennell, and the proceedings terminated.

PROCEEDINGS

OF THE

BELFAST

Natural History & Philosophical Society.

21st Jan., 1857.

PRIVATE MEETING.

Dr. Dickie, Vice-President in the chair.

Mr. Wm. Simms, jun., read a paper on "Forest Trees and the progress of Artificial Planting." A sketch of the history of artificial planting in Great Britain was first given, showing its gradual progress from the time of Henry 8th to the present century, and alluding to the successful attempts which, in several instances, have been made in modern times to cover barren and exposed districts with thriving woods, and in which skill and perseverance have been amply rewarded. Some of the effects of trees on climate were then mentioned, particularly their beneficial influence on the supply of water in warm countries, and their usefulness in colder regions as a shelter from piercing winds.

Some details respecting the trees most generally met with in Great Britain were next entered into, and the paper concluded with an account of several of those which have been recently introduced.

February 4th.

PRIVATE MEETING.

Dr. Stevelly, President, in the chair.

Dr. Dickie exhibited specimens of Aphanizomenon flos-aquæ Linn, from Lough Enagh, near Londonderry. The waters of the lough were highly coloured by this remarkable plant, which occurred in the greatest profusion. The specimens were collected in October last, 1856. Remarks were also made on the different cryptogamic plants, which have been recorded as giving a colour to salt and fresh waters in different parts of the world.

Mr. Joseph John Murphy read a paper on tornadoes and waterspouts, explaining the theory propounded on that subject by Professor Espy of America.

Air is not heated by the direct rays of the sun, but by contact with the heated earth. When heated, air expands and ascends; but the ascending power of a column thus heated is not great, except when the weather is warm and the air contains much watery vapour, so that an ascending column of air carries up a large quantity of watery vapour with it, which is condensed, forming a dense cloud, as soon as it arrives at a

height where the cold is sufficiently great. The condensed vapour gives out its latent heat, which is taken up by the surrounding air, and expands it, causing it to ascend. The ascending current thus produced is often very powerful, producing a partial vacuum at the surface of the earth, so that a violent wind rushes in to fill up the vacuum. Such a storm is called a tornado. A waterspout is a dense mass of cloud formed at the centre of a tornado.

February 18.

PUBLIC MEETING.

Dr. Stevelly, President, in the chair.

Alexander Graham Esq., of Capellie, Renfrewshire, read a paper on "The Agriculture of the Ancients." He traced the progress of agriculture, and pointed out its connexion with civilization, reviewing in succession the husbandry of Palestine, Egypt, Greece, and Rome, and referring to that of China. He showed that many of our agricultural operations were practised by the ancients, such as draining, the management of manure, the steeping of seeds, the protection of the plants from insects, the examination of soils, &c. He proved the antiquity of turnip cultivation, and also of deep draining—of reaping machines, which are recorded as having been used in ancient Gaul, where the oxen were yoked to them in the same manner as horses are attached to such machines of late invention: the words of Palladius were quoted to prove this fact. A number of other interesting statements were brought forward, showing that many of our modern inventions, that are regarded as perfectly novel, had been brought out many centuries ago, and had been put thoroughly in practice.

March 4th.

PRIVATE MEETING.

Dr. Dickie, Vice-President in the chair.

Mr. Thomas Malcomson read a paper on some rare Irish Birds. He noticed that a specimen of the Rose Pastor (*Pastor Roseus*) had been killed near Belfast, in the year 1855—and that in the same year an adult Hoopoe (*Upupa Epops*) had been shot at Armagh, and another at Comber, County Down. Within the last three years, three specimens of the Bittern (*Ardea Stellaris*, have been obtained in the North of Ireland—one by Lord Clermont, Ravensdale Park, and two from Lough Neagh. Mr. Malcomson noticed, also, a curious instance of the eggs of the Meadow Pipit (*Alauda Pratensis*) having been destroyed by the Cuckoo.

Mr. Alex. Montgomery read a paper on the recent volcanic eruption in the island of Hawai, Sandwich Islands, and which lasted for a period of six months. The highest mountain in that island is Mauna Loa, which attains an elevation of 14,000 feet. It is considered the greatest volcano on the globe, having a crater with a maximum breadth of four miles, the top of the mountain

being more than twelve miles in circumference, and at 2,000 feet below the summit, the mountain has a diameter of twenty miles. At the distance of about 20 miles from its crater is another volcano, Kilauea, about 8,000 feet in height, which for some years past has been in a state of activity. In May, 1855, it became very active, but gradually subsided without any eruption. In August, 1855, there was observed, on the Western slope of Mauna Loa, a bright light like a brilliant star, at an elevation of about 12,000 feet, and which rapidly increased in brilliancy. At this locality a number of cones were formed in a line down the side of the mountain, beneath which the lava stream could be plainly observed, but the lava did not come to the surface, until after it had completed a course of ten miles, flowing for that distance through subterannean passages, as shown by the throwing up of cones and jets of fire. In the month of October, it had reached to within ten miles of the port of Hilo, having in the interval completed a course of 65 miles, with a breadth varying from 3 to 10 miles, and a depth of from 3 to 300 feet. The appearance of the stream was awful, resembling a fiery river, and it continued flowing until February, 1856, when its lower portion became suddenly solidified, and its onward progress was stopped, although a fresh supply of lava was continually emerging from its source, which added fresh layers in height to the mass. The lava comes out from an opening in the side of the mountain, and is derived from the crater, which does not overflow, but its contents sink lower as the eruption proceeds. These eruptions are not accompanied with any earthquake, neither does the volcano discharge any showers of cinders, as is the case at Vesuvius.

This paper elicited a number of most interesting remarks from Gordon A. Thomson, Esq., who had personally visited the Sandwich Islands a few years ago. He had ascended Mauna Loa, and he gave a graphic description of its crater, and of the fiery lakes contained within its circumference, which present volcanic phenomena the most awfully sublime and interesting that are to be observed on the surface of the earth. He had brought home from their islands an extensive collection of specimens of volcanic productions, which are now deposited in the Belfast Museum.

Mr. A. O. D. Taylor, one of the secretaries, announced a valuable addition to the library, namely, the "Memorials of Watt," a work which was issued last year under the superintendence of the Watt Club of Scotland, and a copy of which John Gray, Esq., of Greenock, secretary of the club, had now presented through Mr. Taylor to the museum. The best thanks of the society for this gift were ordered to be tendered to the secretary of the Watt Club. The book is beautifully illustrated, and contains many particulars regarding the celebrated Watt, never before published.

BELFAST

Natural History and Philosophical Society.

PRIVATE MEETING, WEDNESDAY EVENING, 22D OCT., 1857.—The Chair was taken by Geo. C. Hyndman, Esq., one of the Vice-Presidents.

Mr. PATTERSON exhibited six specimens of the migratory locust *(Locusta migratoria)*, taken in Belfast or its vicinity, and mentioned that another had been taken, that forenoon, at Holywood, County Down. The Lecturer, after remarking on the ravages of locusts, as recorded by ancient writers, adverted to the injuries they had occasioned in different parts of the Continent of Europe, and to their appearance in these Kingdoms at various times, in numbers sufficient to cause serious injury in some districts, and excite no inconsiderable alarm. In general, however, only a few individuals make their appearance; they have come at different periods, and have, on examination, been found to be of distinct species. Their occurrence having been noted, and, in some instances, the insects described, a record has eventually been obtained of so many as twenty-three distinct species having been captured in these Kingdoms. The present species has, this Autumn, been widely scattered, and specimens of it have been occurring for a period of about two months. They become inert at the approach of cold weather; and, as they do not propagate in these latitudes, no alarm need be felt at their visit. Two in the speaker's possession had each lived for a fortnight, being fed on vegetables: grass seemed to be the favourite food. It was supposed that the great heat and long duration of fine weather, this season, may have induced some locust swarms to extend their migrations farther North than usual, and that high winds may have carried some detached individuals to other latitudes. Specimens of the same species had been taken near Belfast, in 1846 and 1849, and were then in the Society's collections.

Mr. Patterson then read some notes on the "Bottle-nosed whale" *(Hyperoodon Butzkopf)*, killed in Belfast Lough, on the 22d September, 1857. On the day after the capture, he had been enabled, by the kindness of the late Mr. Edmund Getty, to visit the guard-ship to

which the whale was then moored, and had the gratification of hearing the particulars of the capture from the men by whom it had been accomplished. On this occasion, he was accompanied by Mr. Richard Allen, of the Harbour Office, Assistant-Engineer, who had hoped to have been then able to take the dimensions of the hyperoodon, but it was found impossible to do so with the necessary correctness. On the animal being brought up to town for exhibition, the measurements were taken, and were found to agree very closely with those of the one taken at Cultra, in 1845. That one had been carefully measured by Mr. James Bryce, and the particulars published by the late Mr. W. Thompson. Some of these measurements were announced for the purpose of comparison :—

	1857.		1845.	
	Ft.	In.	Ft.	In.
Length in a straight line from snout to tail, ...	20	5	20	4
Do. measured along dorsal curve, ...	22	6	23	4
Greatest height, ...	4	3	4	6
Girth, ...	11	0	11	6
Breadth of head on a line from eye to eye, ...	2	9	3	0
Length of rostrum, ...	1	2	0	11
Length from point of snout to eye, ...	3	6	3	1

The whale of 1845 was a male ; the present was a female. In the course of the last eight years, three of this rare species have been taken in Belfast Bay, and all of them either in September or October. The stomach contained a large number of the beaks of cuttlefishes, which were exhibited to the meeting. The present whale had been weighed carefully before being cut up ; its weight was two and a half tons ; the quantity of oil it yielded ninety gallons. Two teeth only were discovered in the lower jaw ; in this respect differing from the speciman of 1845, the skull of which was then upon the table. A photograph of the animal, as it lay on the vehicle by which it was carried to the yard, had been taken by one of the members of the Society, Wm. J. Young, Esq., and was exhibited to the meeting.

Dr. DICKIE remarked, that two teeth were found near the anterior part of the jaw of the hyperoodon. A section of one of these, when examined under the microscope, shewed only two substances : in the centre, dentine, and, on the outside, a thin layer of cement.

Mr. HYNDMAN stated, that he had requested Dr. Ritchie to send him the contents of the stomach of the whale, which had been kindly attended to, and they were found, as he had anticipated, to consist solely of the beaks of cuttlefishes, which were exhibited to the meeting, and were in considerable numbers. On comparison with the few authentic specimens in Mr. Hyndman's collection, these were found to belong to different species from his. The one that was most abundant was

longer and more sharp-pointed than that of *Loligo vulgaris;* a few resembled specimens that were taken from a whale killed at Waterford many years ago, whilst the others could not be identified. It was remarkable that these beaks seemed not to have been acted upon by the digestive process, their points being sharp, and their slender sides very little broken. Among them were two worm-like animals, which were examined by Dr. Dickie, and determined by him not to be intestinal worms, as at first supposed, but the larvæ of some insect. How these came into such a situation it is difficult to say.

PUBLIC MEETING, NOV. 4.—Dr. Stevelly, President, in the Chair.

Dr. ANDREWS read a paper on "The Manufacture of Stearic Acid, and other analogous bodies employed for illuminating purposes." After a short sketch of the history of candles, from which it appeared that they were, probably, in partial use in the time of the Romans, and were certainly well known in the Anglo-Saxon period of our history, Dr. Andrews proceeded to describe the fine discoveries of Chevreuil, regarding the chemical composition of the fatty bodies, and the important applications which have followed from them. Under the term fatty bodies, chemists include, not only the solid and liquid animal fats, but, also, the fixed vegetable oils. From the researches of Chevreuil, these bodies consist, it appears, of a peculiar sweet principle, called glycerine, combined with certain fatty acids, some of which are solids, others are liquids, at the ordinary temperature of the atmosphere. By boiling a fatty body with an alkali, the glycerine is set free, and a combination formed between the fatty acids and the base. On heating the latter with a strong mineral acid, the fatty acids separate, while the mineral acid unites to the base. The fatty acids thus obtained are subjected to very strong pressure between iron plates, first in the cold, and afterwards with the application of heat. This effects a separation of the oleic acid, which is a liquid, from the solid acids—such as the stearic and margaric. A more recent process consists in decomposing the fats by means of strong sulphuric acid, and afterwards subjecting the products to distillation in a current of strongly-heated steam. Reference was, also, made to the peculiar form of wick required for candles prepared from stearic acid, to the processes now employed to prevent the crystallisation of the acid by which the use of arsenic in the manufacture has been superseded, and to the different oily and fatty bodies now used in the preparation of composite candles.

PRIVATE MEETING, NOVEMBER 18.—Dr. Stevelly in the Chair.

Mr. THOMAS MALCOMSON read a paper on "The Habits

and Haunts of the Irish Eagles," as noticed by him in the Counties of Cork and Kerry. He mentioned two breeding places of the golden eagle (*Aquila chyrsäëtos*), one of which, at Mangerton, called Coom-na-gappal, has been occupied by this species for many years, and is still frequented by it. The hill called the Eagle's Nest was visited, last Spring, by a daring boatman, looking for eggs, and he found upon it the remains of former old nests that were composed of bones and sticks. Mr. Malcomson stated that the spotted eagle (*Aquila naevia*), was but rarely found in Ireland. The white-tailed or sea eagle (*Aquila albicilla*), occurs more frequently, and he mentioned that there was a breeding place of this species at Gougane Barra.

Mr. J. J. MURPHY afterwards read a paper on the climates of Northern latitudes. Mr. Murphy began by stating that the chief cause which modifies climate over limited areas is the difference of various places in height above the sea level; but the most widely extended influences are those of the unequal distribution of sea and land. The sea is the great mitigator of the extremes of climate, moderating the heat of low latitudes and the cold of high ones, the heat of Summer and the cold of Winter. Other modifying circumstances were referred to, such as the direction of the ocean currents, the clearness or cloudiness of the sky, and the effect of snow in preventing the escape of heat from the earth. The warmest part of the Northern Hemisphere, in proportion to its latitude, is the British Islands. The coldest is Eastern Siberia, where, in our own latitude, ice is used during the Winter instead of glass, and the subsoil never thaws even in Summer; yet corn ripens and trees flourish. The coldest part of the entire globe, however, is, probably, near the South Pole.—*(From "The Northern Whig," of Nov.* 17, 1857.*)*

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BELFAST

Natural History and Philosophical Society.

SURGEON BROWNE ON THE SUPPLY OF WATER TO BELFAST.

In the course of a very able lecture to the members of the Natural History Society—Professor Stevelly, LL.D., in the Chair—on Wednesday evening, on "The Supply of Water of Towns, considered in its domestic, sanitary, and commercial relations,"

Surgeon Browne, R.N., said—Having now, Mr. President, ladies and gentlemen, gone thus far into the details of the question I proposed to discuss, and having especially examined the subject in its domestic, sanitary, and commercial relations, I shall now inquire how Belfast stands as regards the quality, quantity, and source of its water supply. Is it badly supplied? Can the supply be improved? If so, what are the available means? and is there an urgent necessity for immediate action in the matter? These questions are of importance to each of us; they can be severally answered; they demand our serious attention, as they relate to what materially affects the comfort, health, and prosperity of the entire community; and, moreover, whether men will or no, force themselves upon the consideration of every thinking man. The first question, then, is Belfast badly supplied with water? leads us to consider its present sources of supply, and the quantity and quality of its water. There are two sources from which this town has, for several years, had its water supply,

to which, of late, from an unfortunate, but seemingly unavoidable necessity, a third has been added. The first of these is what is usually known as the "old works," consisting of springs and the result of surface drainage of cultivated lands in the neighbourhood of Strandmillis, Lester's Dam, and Fountainville, with one or two other small tributaries. The second is what is styled the "new works," the waters of which are derived from lands, pasture and cultivated, situated about two miles to the north of the town, and which form a part of the hilly district which runs in a westerly direction from the Cave Hill. This collecting-ground is about 980 statute acres in extent; but, to 240 of these acres alone has the town an unquestionable claim. Of the remaining 740 acres, which are above what is known as "Carr's Glen overfall," the town receives the flood-water only—or, more properly, that which escapes from the water-course which leads to the manufactories in the neighbourhood; consequently, it has been estimated that, in favourable seasons—that is, when large quantities of rain fall in a limited time—the town may get one-third of the product of the 740 acres referred to, while, as we know, in dry years, scarcely any is obtained. The third supply which I have referred to as having been "unfortunately, but of necessity," added to our other sources, is derived from the River Lagan, whence it is raised by steam-pumping, and, at Lester's Dam, is thrown into the old water-course, thence these mingled waters flow to the old reservoir at Bankmore, and are then pumped, by steam-power, into the main water-pipes of the town. This conduit, I may mention, is about three and a half miles in length, and is quite open through its entire extent, being thus subject to trespass, and every species of pollution. This, now, however, that the Lagan's water flows in it, is of less consequence, for it is clear that we must not "strain at the gnat, yet swallow the camel." The waters of the Carr's Glen and Deerpark streams, the collecting-ground of which I have already referred to, flow into the reservoirs, or basins, of the "new works." These basins are three in number, known as the "upper," "town," and "clear-water" basins; from these reservoirs the water flows, by gravitation, into the mains of the town, and could supply, at high pressure, were the quantity sufficient, all the houses on a level with the county jail and Queen's College, and which lie between these public buildings; however, this supply, from its insufficiency, is, of necessity, given to a portion of the houses alone, and is intermittent, being only turned on for a

few hours in some three or four days of the week. The remaining houses of the town are supplied from the old works, at low pressure. Under ordinary circumstances, the waters of the new and old works are thus distinct: but when the steam pump, at the old town reservoir, is going, the otherwise tolerably pure water of the new "clear basin" is mingled with the foul washings derived from the Lagan. From these brief and plain statements of facts, it will not be difficult for any of us to arrive at the conclusion that Belfast is not well supplied with water, that the sources from which this supply is derived, and the method by which it is delivered, are bad and defective, and that neither domestic, sanitary, nor commercial requirements are duly provided for; but, on the contrary, that almost all the arrangements, as regards the sources of supply and method of delivery, are not only very imperfect but singularly expensive—as we ratepayers well know. These points will be more fully illustrated in the consideration of the quantity and quality of our water supply. Now, as regards the quantity, there is not much difficulty in arriving at the conclusion that it is very far below that which has been estimated as a good or sufficient supply for towns—likely not one-fourth of that quantity—but it is not very clear how much water is really afforded daily for the use of the inhabitants, now that the reservoirs are sinking very low, and likely not much drawn from them, and that the Lagan is being constantly pumped into the pipes. Still, we may pretty nearly estimate the entire quantity that can possibly be supplied—pumping of Lagan water included, would be about 980,000 gallons daily, or, for each of 130,000 inhabitants, about 7½ gallons daily, and that for all purposes, domestic, sanitary, and manufacturing. I am not aware of any great error that can be in this estimate. I have taken the entire proceeds that can arise from one source of supply, and I consider that, in ordinary years, the quantity I have specified is rather over than under the mark, nor am I aware how that quantity can be increased, under the existing power of our Water Commissioners; hence I think I am quite justified in arriving at the conclusion which I have no hesitation to pronounce—namely, that Belfast is most insufficiently supplied with water. Having already considered and examined the sources of our water supply, I need not be much tasked to form a judgment upon its quality, and when we have seen that each of these sources is not only liable to serious pollution, but that one—and that, at present, a principal source, too—must, of necessity, be very impure, I cannot but say, that the quality

of our water is decidedly bad. Had we no other data, the evidence of our senses—unless these senses be greatly blunted—would convince each of us that such is the case; but, when we are aware that we are supplied from the Lagan, after it has received the sewage from several populous towns and districts—from various factories and homesteads, and the surface drainage of a large agricultural country—we must be satisfied that the water contains such a vast amount of organic remains, animalcules, and infusorial life that it is quite unfit for human use; nay, more, that the use of it is attended with considerable risk to health, and that, in certain seasons—especially during the prevalence of epidemic disease—dangerous and fatal results may follow. The evidence I have already submitted on this subject—the danger of using filthy water—is so clear and conclusive that I need scarcely say another word on this matter, beyond expressing my own belief that the danger of using a very impure water is not usually sufficiently estimated, and that this is frequently, when perhaps little suspected, the main exciting cause of many intractable, and, it may be, fatal complaints. Having thus briefly discussed the question of Belfast's water supply, and having pronounced it decidedly bad, I am led to the questions, "Can the supply be improved?" and, "If so, what are the available means?" Fortunately for this town, there are, within easy and practicable distances, several sources from which an abundant and pure supply of water can be obtained—few towns, perhaps, are so favourably circumstanced in this respect. There are, at least, four sources from which such supply can be had, and any of them at a comparatively cheap rate, when we look to the ultimate benefits, and when we remember how much has been expended in the supply of Manchester and Glasgow within the last few years. With regard to the individual merits of the several schemes that have been proposed I am not prepared to decide—though, of course, I have formed my own opinion. Any one, however, who wishes for full information on this subject will find, in Mr. Bateman's report to the Water Commissioners, a comprehensive notice of the various schemes for our water supply that he has examined, and a statement of the reasons which led him to recommend the Woodburn River and Sillentober springs as the best. The table of the comparative cost and quantity of the various schemes is well worthy of your best attention. I have arrived now at the last of the questions, relative to the water supply of Belfast, which I proposed to discuss, and, as it is one of great moment at the present

time, it demands our most serious consideration, especially as some difference of opinion has hitherto been expressed regarding it. "Is there an urgent necessity for immediate action in the matter?" If this question be calmly and dispassionately examined, apart from prejudice, selfish interests, and uninformed judgment—if the various statements regarding the water supply of towns, which I have put before you, and which have been taken from reliable sources, be received as true—if the existing condition of our water supply, as I have detailed it, be correct, then I unhesitatingly say that this community should lose no time ere they set earnestly to work in seeking for an increased supply of water, or, rather, for those powers through which alone, in the first instance, that increase can be obtained. But let us, for a moment, reconsider our existing condition. Our sources of supply are palpably insufficient, at all times; in dry seasons, not to be relied on, and one of them is worked at great expense, and then yields a most impure fluid. The water from the new works would be pure, did it not mingle in the town pipes with the filthy stuff from the Lagan. While the water from the new works is supplied at high pressure, the service is intermittent; and is only introduced into a portion of our houses; hence, in many instances, it is not available even for extinguishing of fires. The water from the old works is not only supplied on the intermittent principle, but, being on a lower level, will not rise above the basement storeys of the houses, and then, in addition to this manifest evil, which entails trouble, annoyance, and additional labour to the ratepayers so supplied, the charge for the water is the same as that supplied from the high-pressure source. Our millowners, manufacturers, steam-vessels, and shipping cannot be supplied. In the town of Belfast, we have barely enough water for domestic purposes, hence there is none for essential sanitary requirements; and, whatever little is supplied for the manufacturers' use must be curtailed from that which should be devoted to domestic comfort alone. In cases of fire, to which I have already referred, from the short, intermittent, and partially low pressure supply, a vast amount of property may not only be destroyed, but has actually been often destroyed, before an efficient quantity of water could be obtained; and this state of jeopardy must last so long as we remain in our present most unsatisfactory condition; and hence there is no question that insurance companies will be very cautious in accepting fire risks, and will continue to charge high rates upon all property insured here. In a former paper, as also in this, I referred to the improved

pipe drainage of towns, and pointed it out as the only efficient and safe plan of carrying away the refuse from our habitations, and I then shewed that the introduction of that system of sewerage could only be effected, along with an abundant supply of water at high pressure and continuous service; now, it is clear that, before we can do away with the present expensive, inoperative, and injurious system of great tunnel sewers, which lie beneath our streets, as so many extensive cesspools, at all times loaded with decomposing remains, and poisoning our atmosphere with malarious emanations, we must obtain an improved water supply. Do we wish to lay the dust of summer in our streets, or cleanse effectually the paved surfaces of our courts, lanes, and alleys, in winter, we must have this supply. Do we desire that every house, even the poorest, should have the great purifier in it, as all should have, abundantly and without labour, we must obtain this supply. Do we seek the extended prosperity of Belfast, in its manufacturing and commercial relations, an abundant supply of pure water, introduced upon the most approved principles, is essential; under the present system, progress is retarded, enterprise is checked, and every year manufactures are carried on at an expense which prevents the cheap supply of industrial produce, not allowing us to compete fairly with places better circumstanced, and materially affecting the interests of every one of us, even the most humble in the community. To me it seems almost an anomaly that, in a town whose merchants and manufacturers rank so high for probity, enterprise, and skill, such a state of things could have been permitted to exist. From year to year, they have suffered great inconvenience, and almost incalculable loss, from the want of water—the essential element in most of their produce—yet they do not seem to have made any united movement to remedy this evil, but, on the contrary, have submitted to the dictation of a few active spirits, who have, or, rather, foolishly imagine they have, a personal interest in preventing a further expenditure in procuring a competent water supply. These latter assert there is water enough, or to be had, with our present powers. Assertions are easily made, and are usually most readily hazarded by those who are most ignorant of the question. But assertions will not put Belfast in the position which it should have from all the evidence I have adduced; they will not give our manfacturers the water they so much require; they cannot re-fill our now rapidly-sinking reservoirs, nor can they purify the abominable Lagan, nor obviate the great expense which the use of that unwholesome stream entails. Into the

financial part of the question of an increased water supply I need not go, though I believe I could prove that the sooner we have an abundant supply, the sooner shall we be freed from the present heavy water-rate. A clear financial statement has already been put before the town, and which, prospectively, shews a very gratifying result. My more especial province in this paper was to demonstrate our present necessities, our existing dangers, and the daily increasing jeopardy in which we stand. Action, united action, should now and henceforward be our course until such a service of pure water has been obtained, that every house shall have it in abundance, that every requisite sanitary operation may have an unlimited supply, and that our manufactures shall have all they require, and to spare, at a moderate rate, then, and not till then, will Belfast, as regards its water supply, be in a satisfactory state—that condition, in fact, which every town must be in where domestic comfort, sanitary improvements, and commercial prosperity and progress are duly estimated. (Applause.)

An animated discussion followed the reading of the paper, in which the Rev. J. Scott Porter, Professor Thomson, C.E., Joseph J. Murphy, John Henderson, James MacAdam, Esqrs.; Dr. Hume, Dr. Dickie, and the President took part. Mr. Browne having replied at some length, a cordial vote of thanks was tendered to the lecturer, for the able paper he had submitted to the meeting.—*From "The Northern Whig," of April* 30, 1858.

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BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

At a private meeting, held at the Museum, on the 24th February, 1858—the Rev. Isaiah Steen in the chair—a paper, on the "Tides of the Atlantic and Pacific Oceans," was read by Mr. Thomas Bryce.

Mr. Bryce commenced by remarking that the subject of the tides is a very perplexed one, on account of the number of matters to be taken into consideration—such as ocean currents, winds, and depth of sounding, &c. He then proceeded to shew that the genesis of the tidal fluctuations seems to be the Indian and Southern Oceans, and that, according to the known laws of fluids, the undulation is propagated northward into the Arabian Sea and Bay of Bengal, producing the "Bore" of the Hoogly, and, in the other direction, round the Cape of Good Hope, and, probably, Cape Horn. This theory is supported by the great probability that no other portion of the ocean is sufficiently large to admit of the difference of the attraction of the sun and moon on different points to be felt in a degree adequate to the observed result. In tracing the course of the tide wave up the Atlantic, it was noticed that the *pororoca* of the Amazons seems not to be caused exclusively, as is usually supposed, by the confliction of the tide wave with the vast body of water carried down the river, but, in a great measure, by the existence of opposing shoals. The great expanse of water terminating in the

Carribean Sea and Gulf of Mexico gives a westerly tendency to the advancing tide, which, consequently, strikes the shores of North America, and is deflected nearly at right angles towards southern Europe, producing tides along the western shores of the Continent and all around the British Isles. These were minutely traced, and the probable causes of their anomalies explained. On the question as to whether the Atlantic tides are owing to a propagated undulation or to "stationary undulations," it was observed that no doubt seems to remain that causes are in operation. It was stated that the difference between the height of the Atlantic and Pacific tides was generally ascribed, and correctly, to the greater depth of the bed of the former, and it was suggested that the width of the channel, also, must have considerable effect in the case of a propagated wave. The tides of the Pacific were lightly touched upon, being reserved for a future paper. Besides the foregoing outline, many interesting details were brought forward and discussed.

At a public meeting, 3d March, 1858—Mr. Patterson, V.P., in chair—Dr. Dickie gave a summary of the facts known respecting the development and structure of the teeth of mammalia. The modifications in number, form, structure, &c., and the relations of these to the habits of animals, were illustrated by various examples.

At a private meeting, held on 17th March—Mr. Patterson, V.P., in the chair—Dr. Dickie read a paper on the principles adopted in the classification of the mammalia. Special reference was made to Professor Owen's recently-proposed system, founded on the size and appearance of the brain. Remarks were also brought forward respecting the affinities of the different orders of mammals.

A public meeting was held, on 31st March—Dr. Stevelly, President, in the chair—when Dr. Carlile read a paper on the "Structure and Functions of the Nervous System." He described the nervous system as consisting of fibres and vesicles—the former tubular, with soft contents, forming the parts called nerves, which are the conductors of impressions, from surfaces or other parts to nervous centres, and the conductors of influences, as volition, &c., from nervous centres to the various organs, and named, respectively, afferent and efferent nerves. The nervous centres, as the brain, spinal cord, and various ganglia, are formed of vesicular nervous substance, intermingled with fibrous, and are the recipients of impressions conveyed by nerves from various sources, as the surface of the body and the interior of organs, and the means by which various influences are originated, as volition producing voluntary movement of muscles, and the several modifications of the movements—the vascularity, the sensibility, and the secretions of parts necessary for the due performance of the functions of the animal eco-

nomy, but not controlled or directed by the will. The part of the nervous system called the brain, especially the hemispheres of the brain, appear to be the instrument of the higher mental faculties, as memory, imagination, compounding, and comparing ideas, and reasoning, or drawing conclusions. The cerebellum, or little brain, probably controls and directs muscular movements. Dr. Carlile described the arrangement of the nervous system from the lowest forms of organisation in which it is to be perceived, up to the human being in whom it receives the highest development. A nervous system may consist of a single ganglion or centre, with afferent and afferent nerves, of which an example is afforded in the Aplysia—or of several centres, each with its afferent and efferent nerves, as exemplified in radiated animals as the star fish, and generally in all animals of higher organisation. In all cases in which more than one nervous centre exists, commissures, or connecting cords of nervous substance, pass from one to the other, so as to combine them into a single system, and thus produce individualisation in sensation, and the other functions of the creature. In ascending from the lower to the higher organisations, the principal nervous centres are observed to assume a form and position of concentration in the central line of the body, and acquire the name of brain and spinal cord, or the "cerebro-spinal axis," which, in the vertebrata, is contained and protected in a long canal formed by the skull and spinal column. The brain consists of a number of primitive centres, or ganglia, each of which receives afferent or sentient nerves, as the olfactory, optic, &c., and which are connected with each other by commissures. To these parts are added two others—the hemispheres of the brain and the cerebellum—neither of which receives or gives off any nerve, but is connected by commissures more or less directly with the other parts of the cerebral mass. In ascending in the scale of organisation, the hemispheres of the brain and the cerebellum gradually acquire an augmentation of proportional size, so as in the higher animals, and especially in man, far to surpass in magnitude, and to conceal from view the primary ganglia, in accordance with the higher manifestation of mental power, and of varied movement by which those are distinguished. In man, who far surpasses all other animals in these qualities, not only is the proportionate size of the hemispheres and cerebellum to the other parts of the brain greater than in them, but the interior organisation of these parts is much more complex, and contains a larger proportion of vesicular nervous substance. The nervous system, in all animals, is formed upon the same type, and differs in the highest and the lowest, not in kind, but in degree. Many mental manifestations, accordingly, are common to man, and other animals—both are governed by instincts—both

reason—the extent of mental power appears to have an accordance with the degree of development of the cerebral mass. The connexion which the mind has with its material organ, how an alteration in the physical condition of the nerves and brain can affect the mind, or how an act of the mind can influence the condition of any part of the nervous system, is altogether unknown.

At the public meeting, 28th April, 1858—Dr. Stevelly in the chair—Dr. Browne read a paper on "The Water Supply of Towns, viewed in its Domestic, Sanitary, and Commercial Relations."

The last public meeting for the session was held on 5th May—Dr. Stevelly, President, in the chair—when Dr. Dickie read a paper on "Infusoria in general, with notice of a Fossil Earth, found at Bella Hill, near Carrickfergus." After some general remarks on the Diatomaceæ, sometimes called silicious infusoria, Dr. Dickie described a deposit of such, recently discovered at Bella Hill. This deposit was observed during the examination of an ancient tumulus, by the Rev. Mr. Lee. On examination, it was found to contain about twenty species of diatomaceæ, most of which are known to exist abundantly in the neighbourhood. There were several common species of land and fresh-water shells mixed with this fossil earth, indicating the former existence of a lake. The remains found in the tumulus indicated that it must have been raised about the commencement of the Christian era, and the presence of the diatomaceæ, and shells in its interior, proved that the lake must have been drained by some means, artificial or natural, previous to the raising of the mound. The diatomaceæ found were—Epithemia turgida, E. gibba, E. zebra, E. Hyndmanni, Amphora ovalis, Cocconeis placentula, Campylodiscus costatus, Surirella ovata, Navicula ovalis, N. firma, N. liber, N. patula, N. rhomboides, Pinnularia viridis, P. divergens, P. radiosa, Synedra delicatissima, Cocconema cymbiforme, C. cistula, Somphonema vibrio, S. olivaceum, S. capitatum, S. tenellum, Odontidium mutabile, Denticula sinuata, Orthosira oricbalcea, Mastogloia Grevilii. The shells found in the Bella Hill tumulus were—Lynnæus truncatulus, Planorbis vortex, Helix arbustorum, H. rotundata, Zua lubrica, Clausilia nigricans.

Dr. DICKIE afterwards read a paper on a recent deposit of wood, shells, &c., discovered by Dr. Rea, at Newcastle, county Down. This deposit is post-tertiary. It contains leaves and pieces of wood of oak, beech, and Scotch fir; also a number of Scotch fir cones. The shells belong to species chiefly littoral, but still existing on the neighbouring shores. They are—Scrobicularia piperata, Cardium edule, Tellina solidula, Littorina littorea, Rissoa ulvae, Patella vulgata, Trochus umbilicatus. — *From "The Northern Whig," of Friday, May* 28.

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JANUARY 19, 1859.—(Private meeting)—Mr. Hyndman, president, in the chair.

Dr. ANDREWS read a paper on the "Metals of the Alkalis and Alkaline Earths:"—In the beginning of the present century, Sir H. Davy discovered potassium and sodium, the metallic basis of the fixed alkalis, and obtained indications of the existence of metals in alumina, magnesia, baryta, lime, and the other earths. This great discovery formed an important epoch in the history of modern chemistry; but it has only been fully completed within the last few years. The discovery of a method of obtaining aluminum in the form of a malleable metal, possessing a high lustre, and scarcely tarnished by long exposure to the air, has been followed by that of calcium, barium, strontium, &c. Magnesium had been previously known. These metals are obtained by decomposing their chlorides while in a state of fusion, by the action of the current produced by a nitric acid battery of six or eight elements. The positive pole is formed of carbon, the negative at which the metal appears of an iron wire of moderate thickness. The little globule of metal, when first formed, is protected from oxydation by the fused chloride. It is afterwards removed quickly, and plunged under naphtha. The following are the properties of some of these metals:—Lithium is silver white, melts at 180° C., and inflames at a point a little higher. It decomposes water, but is less oxydable than potassium or sodium. It is the lightest of all metallic bodies; its density, as compared with water, being only 0·59. Calcium, the basis of lime, has the colour of bell-metal, or of silver alloyed with gold. It may be preserved without change in dry air, but oxydises quickly in moist air. It decomposes water, and has a density of 1·57. Strontium and barium are very similar to calcium, but their densities are greater. Magnesium, of which common magnesia is the oxyde, is a beautiful white metal, which tarnishes very slightly in air. It burns with the emission of an intense light, and decomposes water, very slowly, at the boiling temperature. Its density is 1·7. None of

these metals have yet been applied to useful purposes; but it is probable that some of them will be employed in the arts when their properties are better known, and the methods of preparing them are improved.

FEBRUARY 2, 1859.—(Public meeting)—Mr. Hyndman in the chair.

Mr. THOMAS BRYCE read a paper on "The Currents of the Ocean."—Mr. Bryce began by remarking on the difficulty of the subject, on account of the many things to be taken into consideration—such as evaporation, temperature, saltness; form of coast, trade, and other winds; tides, counter-currents, and other causes. There are three points to be considered:—the facts observed, the causes in action, and the effects. Taking the Gulf stream and the great Polar current as types, it is found that a rapid current of warm water flows from the Gulf of Mexico through the Florida Pass, its breadth thirty-two miles, its depth 200 fathoms, and its velocity four miles per hour. When it has reached Cape Hatteras, it has expanded to a breadth of seventy-five miles, and its depth has proportionately diminished to 114 fathoms, and its velocity to three miles per hour. It then veers more rapidly to the eastward, towards the Azores, its eddyings forming the Sargassum Sea, and then divides into two main branches, one running into the Bay of Biscay, and one along the shores of the British Isles, and it is finally lost in the Northern Ocean. During this course, its temperature varies from 5° to 30° above the water of the ocean. The counterpoise to this is the great Polar, or iceberg-current from Baffin's Bay, which meets the Gulf stream off the coast of Newfoundland, which flows past and under it. What are the causes of these currents? Some have attributed the Gulf stream to the force of the waters descending the basin of the Mississippi; but the force is demonstrably quite inadequate. Others have ascribed it to the force of the trade winds; but that, also, is inadequate, because—1. The action of the winds is superficial; 2. There are no winds to set the Polar current in motion; and, 3. The estimated force of the current is vastly greater than that of the winds. Others, again, have pointed to the tropical heat as the cause, by which the water in the Gulf is expanded, is raised above the surrounding level, and thus flows over the other waters in a stream, which is well-defined, and easily discernible by its indigo tinge, and the line of sea-weed which marks its course. The two latter causes seem to be co-operating; but, probably, there are others—as even the force of gravity and the trade winds combined would seem insufficient—and we are forced to the conclusion that there is a grand oceanic circulation of the heated waters flowing from the tropical to the polar regions in interchange with cold currents in the opposite direction. Among other effects of oceanic circulation were specially mentioned the beneficial results to animal and vegetable life, both by sea and land, arising from the purifying of the waters, by continued

agitation, in connexion with the same process in the atmosphere, and, also, the moderating of climate by the exchange of cool and heated waters. The effect of the Gulf stream in moderating climate, especially in the British Isles, and along the shores of Northern Europe, was also pointed out. Another curious effect noticed was the formation of the Newfoundland and other banks. The heated water of the Gulf stream rapidly melts the icebergs brought down by the Polar current, and the stones, earth, &c., which these icebergs tear away are thus deposited—forming, in process of time, extensive banks. The portions of these banks above the sea level have been fertilised in a remarkable way, not generally known. The Gulf weed is carried by the eddy from the Sargassum Sea into the Caribbean Sea, and through the Gulf of Mexico and the Florida Pass on to the banks. During its course, the vegetable matter gradually decays, as is clearly discernible by the change of colour at different stages, and is finally laid on the rougher debris, forming a fertilising mould.

FEBRUARY 9TH.—(Public meeting)—Mr. Hyndman in the chair.

The Rev. WM. M'ILWAINE read a paper on "Organisation and Life." Mr. M'Ilwaine prefaced his observations by the remark that two of the best instruments for imparting instruction, by lecture or otherwise, were Definition and Division; and he accordingly proceeded to apply these to the subject in hand. The definition of Organisation necessitated one of matter, which was given, and the ordinary school distinction of substance and accidents referred to as useful, though not perhaps philosophically correct, as affording a generalised idea of what matter is. Life was defined as that invisible, though real, existence which causes the distinction between organised matter and that which is inert. The approach to organisation noticed in crystals and other mineral substances was noticed, and distinguished from organised substances. The difference of figure (the former being all right-lined and bounded by plane surfaces) was pointed out; but the possession of organs, and the power of reproduction were stated to be the chief attributes of living substances. The lecturer next adverted to the distinction between vegetable and animal life, the former always requiring inorganised or disorganised matter for its nutriment, and, among other points of difference, decomposing carbonic acid, under the influence of sunlight, and setting free oxygen. The connexion between organised matter and spirit, being the principal one of the lecture, was then entered upon. Whether or not such connexion exists in the case of vegetable organisations is still an undecided question. The traces of sensibility, and even some low approaches to a species of instinct in plants, as in the choice of their *habitats*, and search for nutriment, &c., were slightly touched on, and the lecturer proceeded to confine his view of the subject to animal organisation, as in contact with life or spirit. A surface view of

animated creation led to the widely-marked distinction between those animals in which the vital principle appears to actuate equally the whole mass (as in the cases of the *Foraminifera*, certain *Infusoria*, the *Actinias* and zoophytes), and those wherein the vital principle is centralised, exhibiting itself, as it does, in some parts more than others—these latter being vital organs. This leading distinction was shewn to be pursued still further in the classifications of Aristotle, Linnæus, Hunter, and Cuvier, which were referred to in detail. That of Owen, as being more complete and philosophical, was more fully entered upon. Cuvier's division of the animal kingdoms into the *vertebrata*, *mollusca*, *articulata*, and *radiata*, was next contrasted with that of Owen, the latter being founded on the nervous system. The lecturer proceeded to give a popular idea of nervous tissue, and its distribution in vertebrates and the lower animal existences, as also of the parts and construction of the brain. This prepared the way for Owen's classification of *Mammalia*, entirely founded on the latter organ. The divisions of *Lyencephala*, *Lissencephala*, *Gyrencephala*, and *Achencephala* were afterwards reviewed in detail, and illustrated by diagrams. Some observations were made on the above nomenclature, by Professor Owen, and an improvement suggested. These facts, and the classification referred to, exhibited a continuous chain throughout animated existence, having man above and at the head. The great fact of a connexion and relation between matter and spirit is demonstrable. Further, the *nexus*, or point of contact between these is clearly shewn to exist in the nervous system and in the brain, as the perfection of the latter. This might be viewed as the *adytum* of the material temple—the palace where the superintending and governing spirit gives audience to the senses, and where its mandates are conveyed. Mr. M'Ilwaine pointed out the parallel development on the side of life with that of organisation, marked by the progression of sense :—1. Animals posssessing one sense analogous to touch ; 2. Touch and taste ; 3. Touch, taste, and sight ; 4. Touch, taste, sight, and hearing ; 5. Lastly, those in which smell exists completing the scale. This scale, the lecturer noticed, proceeded from sense to instinct, reason, affection, and, lastly, to the moral sense, which stood highest. Thus were we conducted upwards to the one great Author of Being, whose name and nature are love, and to know whom, in His revealed Word, is life eternal.

23D FEBRUARY.—(Private Meeting)—Mr. Hyndman in the chair.

Mr. PATTERSON read a paper on the injuries done to the turnip crop, in 1858, by the saw fly (*Athalia Spinarum*). He mentioned having received from East Lothian some caterpillars, which were ascertained by Mr. Hyndman to be those of the saw fly. This fly has caused much damage to the turnip crop in these countries, causing often a re-sowing of the crop necessary, at

a considerable expense. Mr. P. spoke of the necessity of instructing the young persons in schools in the country, so that they may acquire such elementary knowledge as would enable them to detect the insects that are injurious to the growing crops, and to learn how the proper remedies may be applied; also, that, in all cases of injury, means should be taken to ascertain with certainty the species of insect causing it, and the remedies tried, so as to have all recorded.

Dr. HODGES stated that insects do not attack healthy turnips, but always those that are diseased, as indicated by their emitting a fœtid odour. He pointed out the disease in this plant, that is commonly called "fingers and toes," which is caused by another insect. In cases of such disease, the soil is found to be deficient in alkalis and alkaline earths; and that in such cases benefit ensues from the application of lime. Many remedies have been tried, but no one is so effectual as picking off the insects, which can be done by children.

Professor JAMES THOMSON exhibited the new galvanometer which was invented by his brother, Professor William Thomson, of Glasgow, a few weeks before the sailing of the Atlantic Telegraph squadron from Keyham Dockyard, in May, 1858, and which was used in the transmission of signals from ship to ship, during the laying of the Atlantic cable, and was afterwards employed in the communication of messages between Valentia and Newfoundland. In this instrument the electric signals transmitted through the submarine cable are indicated by a very fine magnetic needle, about a quarter of an inch long, suspended by a single fibre of silk in the centre of a coil which is placed in electrical circuit with the cable; the minute motions of the needle being made to produce an intelligible effect by means of a ray of light reflected from a very small mirror which is suspended, in attachment with the needle, by the fibre of silk. The signal currents of electricity from the cable traversing the coil cause slight deflections of the fine needle and of the attached mirror. In front of the mirror and close to it there is a lens; and the light of a lamp flame, falling through the lens on the mirror, and being reflected again from it through the lens, falls on a screen, and produces an inverted image of this flame, which moves on the screen in obedience to the motions of the mirror. Thus the motions of the image of the lamp flame on the screen afford the means of reading the electric signals transmitted through the cable—a ray of light which is imponderable, and offers no resistance to the delicate forces of the needle, being substituted instead of any solid elongated index or pointer, such as is used in common instruments, but which could scarcely be moved by the feeble currents passing through a cable of two or three thousand miles in length. For the communication of messages, it is required that, if the European end of the cable is touched by a wire from an electric battery, so as to introduce the subtle influence, the needle must instantly move at Newfoundland. A

single motion gives a simple signal ; and timed repetitions of the simple signal compose words and sentences, till ideas flow through the wire. In ordinary telegraphic operations by wires supported in the air by poles, the signals are transmitted instantaneously, or they are capable of proceeding more quickly than any hand could despatch, or any eye could read them. In ordinary subterranean or submarine wires enclosed in gutta percha, a slight retardation is produced by inductive action of the earth or water outside of the gutta percha. This retardation becomes very serious in so long a cable as that of the Atlantic Telegraph. The most sudden electric shock at one end gives a sluggish, long, protracted current through the other, which, after a quarter of a minute, is still working its way feebly out of the wire. That such would be the case with a telegraphic cable long enough for communication with America, unless made of very extraordinary lateral dimensions—that is, very extraordinary quantities of copper wire and gutta percha per mile of length—had been pointed out as the result of scientific investigations long before the operations of the Atlantic Telegraph Company, and continued experiments on the Atlantic Cable carried on from the time when the Niagara and the Agamemnon, bearing the two halves of the cable, met in Queenstown Harbour, in July, 1857, till the ships again left Keyham Dockyard, in May, 1858, finally shewed that, while seven words per minute had been confidently promised, by practical men, not more than one word per minute was to be had with the ordinary receiving instruments. The long-continued effect at one end, just described as being the result of a sharp signal at the other end, when the communication is through a submarine line of great length and ordinary lateral dimensions, renders it necessary that time enough be given from signal to signal to allow each to shew its effect distinctly at the remote end. Ordinary receiving instruments can only shew fresh signals after being almost perfectly relieved from the residual effects of previous operations; but the new and extremely sensitive galvanometer of Professor Wm. Thomson is capable of distinctly marking a new signal, while still under the influence of tenfold, or twenty-fold, accumulations of undischarged residues from currents which have already told their tale. By this means, messages at the rate of two fully-spelled words a minute, without a doubtful letter, were received through the submerged and failing cable. Had the cable been in fair condition, a still greater speed of transmission of the signals would have been available by the combined use of this instrument along with a new mode of working in the despatch of the galvanic currents from the far end of the cable. The reason why, for so many days after the landing of the two ends of the cable at Valentia and Newfoundland, messages were distinctly read at Valentia while scarcely an intelligible signal was received at Newfoundland,

was, that at the European station, the galvanometer now described was brought into use for reading off the signals, while the party in Newfoundland were labouring to make use of the old kinds of instruments belonging to the company. When, however, the instruments that had been sent out by Professor William Thomson were brought into use on both sides, the communication became easy and rapid ; and, by means of them, it was continued till long after the period when the failure of the cable, by the leakage of its gutta percha covering, had rendered intelligible communications by the ordinary instruments altogether impossible.

2D MARCH.—(Private meeting)—Mr. Hyndman in the chair.

Mr. JAMES HIND exhibited a model of the Gyroscope.

Mr. J. J. MURPHY read a paper on "The Mountain Chains of the World." The object of this paper was to shew that all the greatest mountain chains of the world form one nearly continuous mass, extending from the west of the Spanish Peninsula through Europe and Asia to Behring's Straits, and thence along the west coast of America to Cape Horn ; and most of the other mountain ranges of the world are connected with this, either as branches or as secondary parallel chains.

MARCH 16.—(Public Meeting)—Dr. Dickie, V.P., in the chair.

Mr. MACADAM read a paper on "Drift Formations." He pointed out the occurrence of sand, gravel, and rolled stones, or boulders, not only on the sea coast, but in many parts of the interior of a country. He shewed that such masses were found on the surface of the counties of Antrim and Down, but in Down the local drift, derived from the neighbouring rocks, was found mixed with that of Antrim, while in that county no detached pieces of rock peculiar to Down were to be observed, although foreign boulders resembling those of Scotch rocks were sometimes to be seen, indicating that, when the surface was covered by the sea, there had been currents which had carried masses of gravel to various distances—these currents, therefore, must have come in a direction more or less from the north. He alluded to observations made by Mr. James Bryce, several years ago, and who had fully proved the action of northerly currents formerly in the province of Ulster. He then instanced similar phenomena in Great Britain. In England, there are great masses of drift over many parts of the country, all of which can be traced to their parent rocks in the north. On the Continent of Europe, these phenomena occur on a more gigantic scale ; in the south of Sweden, blocks of rock, and of a large size, occur scattered over the country, which can be traced to have been carried from distant mountains towards the north, and on the opposite, or southern shore of the Baltic, the same erratic blocks are to be seen over a great part of the north of Germany. It has been supposed, that not only currents, but that icebergs have conveyed these in a southerly direction, until, becoming

melted, the stones lying on them fell to the bottom. In Scotland, and other countries, the surfaces of rocks are often found scratched and furrowed, which has been explained by the action of icebergs dragging stones over these rocks; in Switzerland, where glaciers advance progressively, similar phenomena may be seen, and vast accumulations of stones and gravel lie upon the ground, where the glaciers have melted.

Mr. R. YOUNG, C.E., read a paper on the Eskars or gravel-ridges of Ireland. He pointed out the general level appearance of the midland parts of Ireland, which are likewise characterised by the occurrence of extensive tracts of bog, and occasionally of marle beds, and particularly by hills and ridges of gravel or drift. These gravel formations are very interesting, and highly deserving the attention of the geologist. Those which are generally of a more detached character, being locally denominated corn gravel hills or Drums, and those of a more ridge-like form being called eskars—a wood having some resemblance to *aosar*, a Scandinavian appellation for similar hills in Sweden. In the bases of the drums are found boulders of mountain limestone of various sizes embedded in a bluish black till, which is sometimes so hardened, as to appear as a solid conglomerate, and to need blasting for removal. Above this till are yellowish sand, and fine limestone gravel and clay with fragments, not rounded, of limestone of various colours, and sometimes of black shale and old red sandstone—all apparently deposited by water in a agitated state, as there is no appearance presented of stratification, except very rarely that there are some beds of sand that are placed conformably to the till. The eskars are well-defined narrow ridges of pure gravel, which is locally called blue water gravel. Their ridge-like form can be traced for many miles, and they often resemble the embankments of a railway—in many places roads have been placed upon their summits, the neighbouring ground being often boggy. They consist for the most part of limestone gravel, with occasional pure sand and sandstone gravel. At their bottoms are generally boulders of a larger size, arranged in beds, having their interstices filled with marly stalagmite, and, upon these beds the smaller gravel and sand are arranged horizontally—sometimes the eskar is all gravel, sometimes of sand. A good example is afforded by a ridge that extends from Maryborough to Tullamore, and which attains a height of sixty feet; others are seen near the Shannon, on both sides of the river, as at Athlone, Shannon Bridge, and Shannon Harbour, running in a north-west direction, and which must have, at one period, been boundaries of a lake, as beds of white marle, with shells, are found in the plain between them; they shew, also, a well-defined horizontal line, running along them, in all likelihood indicating the height of the water of the former lake. These materials, composing the eskars, bear every evidence of there having been brought into their present position by the agency of marine cur-

rents. Marine shells have been found in them at elevations as high as 600 feet above the present sea level. Among these shells the *Nucula oblonga* is of frequent occurrence. We have proofs, over the whole of the earth's surface, of the land having been alternately depressed and elevated; and if we suppose that Ireland had, at one time, been depressed about 1,700 feet below its present level, there would then be presented a number of small islands, consisting of the present mountains, the lower grounds being covered by the sea; indeed, we trace, in corroboration of this, old sea margins on the hills in many places, from which we conclude that there have been several depressions in ages long gone by. We have also proofs, from organic remains, of the climate having been colder, in which there may have been icebergs, that conveyed upon them drift from the small islands, and which, on the melting of the ice, was dropped on the bottom of the sea; as the bottom afterwards became elevated, this drift appeared above the surface, forming the gravel ridges now so remarkable; this drift, when under the sea, would be modified in various ways by currents, and would frequently have upon its summit large blocks deposited by the icebergs, and which blocks are now frequently to be seen lying on the gravel hills. Mr. Young alluded to similar drift phenomena in other countries.

April 6.—(Private Meeting)—J. J. Murphy, Esq., in the chair. Professor James Thomson read a paper on "The Grand Currents of Atmospheric Circulation." It is well known that the atmosphere has great motions of circulation, which are observed at various parts of the earth's surface, as winds blowing in some particular direction more than in others. Of these motions, the trade winds of the intertropical regions and the prevailing west winds of temperate latitudes are the most striking examples. Professor Thomson had proposed a new theory of the phenomena and origin of the great currents of atmospheric circulation, which he had submitted to the British Association in 1857; and the object of his present paper was to communicate to the Belfast Natural History Society an explanation of this new theory, prefaced by an account of the principal theories which had preceded it. The subject had come under the consideration of the Royal Society of London in the latter part of the seventeenth century, when a paper was read attributing the trade winds to a marine plant which, growing in vast quantities, was supposed to turn its face to the sun, and, by blowing its breath in the direction of the sun's motion, was supposed to generate those winds from east to west. Another paper, to the same society, ascribed the trade winds to the vortices of the supposed ether, which, according to the theory of the planetary system proposed by Des Cartes, and at that period much believed in, were supposed to be the agents in sustaining the revolutions of the planets round the sun. The subject of

the trade winds having thus been brought under discussion, a really scientific theory, and one which, so far as it went, is now to be regarded as correct, resulted from the speculations of Halley, the eminent astronomer, and Hadley. This theory may be briefly described as follows :—The air in the equatorial regions being rarefied by heat, ascends to the upper regions of the atmosphere (like as smoke would rise from a fire). It thence spreads outwards in two great sheets, moving northwards and southwards in the upper regions of the atmosphere. In consequence of the withdrawal upwards, by this means, of air from the equator, other air must flow in below from the northern and southern hemispheres to supply its place. But the equatorial regions are moving with a velocity of 1,000 miles per hour, from west to east, by the diurnal rotation of the earth, while the regions of higher latitudes, both north and south, have less velocity, in consequence of their less distance from the earth's axis. Hence the air coming from them towards the equator is constantly lagging behind the earth, or is moving with a less velocity from west to east than the parts of the earth to which it comes ; or, in other words, it blows over the surface of the earth from east to west, while, at the same time, blowing from both hemispheres towards the equator ; and thus, by the combined effects of the rotation of the globe and of differences of temperatures at its surface, the magnificent phenomena of the trade winds are formed. The west winds of the temperate latitudes further are accounted for by the consideration that the air flowing in the upper regions from the equator must carry with it towards the poles, in virtue of the rapid motion which it had when at the equator, a motion from west to east quicker than that of the surface of the earth in the higher latitudes to which it arrives. According to this theory, when applied to the consideration of the actions in temperate and polar regions, we should expect a descent of the air in polar regions, in consequence of the increase of density by cold, and we should expect a prevailing wind from the north-west along the surface of the earth and sea, in temperate and polar latitudes. But Maury, the well-known American meteorologist, has turned special attention to numerous observations, shewing that in temperate latitudes the wind is more towards the poles than from the poles, and has found himself forced into assuming what he admits to appear almost a paradoxical supposition—namely, that, over the temperate and polar regions, the great circulation just described is reversed, and that the air rises at the poles, instead of sinking, and then flows outwards to the tropics, where he supposes the whole sinking to occur. Professor Thomson regards Maury's supposition as being entirely unsupported by the known physical causes of the atmospheric motions, and adopting, as far as it goes, the theory just described as having been worked out by Halley and Hadley, he gives his

theory to the following effect :—The air, having risen to the upper regions of the atmosphere in a hot zone at the equator, will float towards the north and south polar regions in two grand upper currents, retaining, as they pass to higher latitudes, some remains (not abstracted by friction and admixture with the currents below) of the rapid motion of about 1,000 miles per hour, from west to east, which they had in moving with the earth's surface at the equator. The air in the polar regions will have a prevailing tendency to sink from the upper regions towards the surface of the earth, in consequence of its increased density, caused by cold, and will flow in lower tracts of the atmosphere towards the equator, still retaining its eastward motion in advance of the earth brought with it from above, and continuing to retain it until, by friction and impulses derived from the earth's surface, the tendency in advance is exhausted. Then, in moving on towards the equator, from the zone or belt, in which its motion in advance is exhausted, it will, of course, commence to move as the trade wind, with a motion in arrear of the earth, or from east to west, as already described. The position of the zone of calms, separating the regions in which the winds from west to east ought to prevail from those in which the trade winds from east to west ought to prevail, is necessarily determined by the dynamical condition that a prevailing motion from west to east, in polar and temperate latitudes, must occur in such force, and over such an extent of the earth's surface, as may exactly suffice to communicate, by blowing in advance of the earth such a torsional force to the earth as shall balance the opposite torsional force communicated to the earth by the trade winds blowing backwards relatively to the earth's motion. In continuing the explanation of his theory, Professor Thomson refers to a suggestion which had been offered by Mr. Joseph John Murphy, in this society, about two years ago, and which he adopts as being correct and valuable. It was that, as a consequence of the prevailing west winds of polar and temperate latitudes forming a circular gale or vortex round the pole, a diminished barometric pressure should be expected in polar regions, and that a decided diminution had been found, by numerous observations, to occur round each pole, and especially round the southern, where there are fewer irregularities of lands and mountains to interfere with steady motions of the atmosphere. He then proceeds to explain as follows the phenomena of the winds blowing in temperate latitudes more to the poles than from the poles, and which had forced Maury into his paradoxical scheme of circulation. There must be a thin lower stratum of atmosphere in the latitudes of prevailing west winds (or those higher than about 30°), which is retarded by friction and impulses on the earth, in reference to the rapid vortex motion from west to east of the mass of air above it, and flows towards the poles to supply the partial vacuum in the central parts of that vortex due to the centrifugal force of its revolu-

tion. The movements of the air in this lowest stratum constitute the observed winds of the extratropical regions, and have been mistaken by Maury and others for one out of *two* supposed currents—from the equator, and towards the equator. But it now appears that, in temperate latitudes, there are *three* currents at different heights; that the uppermost one moves towards the pole, and is part of a grand primary circulation between equatorial and polar regions; that the lowermost moves also towards the pole, but is only a thin stratum forming part of a secondary circulation; that the middle current moves from the pole, and constitutes the return current for both the preceding; and that all these three currents have a prevailing motion from west to east in advance of the earth. The middle current or return current for both the others, while on the one hand continually meeting with retardation by friction and impulses derived from the earth's surface, partly by occasional impulses on the earth's general surface, or on mountain tops, and partly by admixture with portions of the under current which has already met with like retardation, does on the other hand continually receive from above fresh accessions of rotatory motion in advance of the earth; the atmosphere above bringing with itself from equatorial regions, continual fresh supplies of this forward motion. Thus the middle current has always a more rapid motion of rotation than the stratum close to the earth, and has, therefore, more centrifugal force tending to make it move towards the equator. Then the force due to cold in polar, and heat in equatorial regions, aided by this centrifugal force, causes the middle current to move towards the equator; while, for want of so much centrifugal force, the lower current flows towards the regions of diminished pressure in the centre of the great vortex, that is, towards the poles.

A living specimen of the snowy owl (*Strix nyctia*) was exhibited to the meeting, which had been captured during a drifting snow in February, near the house of John G. Allen, Esq., Collin, near Ballymena. It had been wounded in the wing and eye, but had been carefully kept alive. The late Mr. W. Thompson has recorded the occurrence of this bird, in the county of Antrim, on 28th March, 1835; but it has not since been noticed. On 23d December, 1837, there was one shot at Scrabo, county of Down, which is preserved in the Belfast Museum.

PROCEEDINGS

OF THE

BELFAST

Natural History and Philosophical

SOCIETY.

APRIL 13.—(Public Meeting)—Mr. Patterson, V.P., in the chair.

The Rev. Dr. M'COSH read a paper, comprising "a sketch of a Tour on the Continent of Europe, with remarks on the lower and higher Educational Institutions in Prussia." Dr. M'Cosh began with giving a brief account of a journey which he had made in the previous summer. He had entered the Continent at Hamburg; visited Kiel; remained some time at Berlin, inspecting the educational institutions; proceeded thence to Wittenberg and Halle, at which latter place he made himself acquainted with the system pursued in the university, and in the famous Orphan House School; gone from that to Leipsic and Dresden; passed through the Saxon Switzerland to Prague, where he visited the university, and thence to Vienna, where he also visited the university, and made himself acquainted with the system of upper schools set up in Austria; dived thence into Styria, where he visited the famous cave of Adelsberg, and saw the *Proteus Anguinus* of the dark caverns; gone on to Trieste; crossed the Adriatic to Venice; and travelled through Lombardy, past the Lakes Como, Lugano, and Maggiore, into Switzerland, where he remained some time enjoying the scenery, and visiting some of the universities, such as Zürich; and found his way home, passing through Basle and Heidelberg, where

he remained some time, and attended lectures at the university, by Bonn, where the university session was breaking up, and thence through Belgium and Holland. Dr. M'Cosh gave an account of interesting interviews which he had with eminent men, such as Baron Von Humboldt, and the eminent botanist, Braun, and with distinguished metaphysicians, such as Trendelenburg, Erdmann, Ulrici, Schenkel, and, also, with the Chevalier von Bunsen. He also spoke of a meeting of the Academy of Sciences at Berlin, which he attended, and where many eminent men were present. But he dwelt chiefly on the educational institutions of Prussia. He gave an account of the famous reformatory school near Hamburg, conducted by Dr. Weichern. In regard to the lower schools he had become a convert to the system which requires that every child be educated. He entered the country with all the strong prejudices of a Briton against compulsory education. But, inquiring most anxiously among the thoroughfares and byelanes of the great cities of Germany, he could not discover those idle, outcast children whom he had been in the habit of seeing every day in the streets of the large towns at home. In Prussia, and he believed now in nearly all the German States, every child must be in the course of receiving instruction at home, or in public or private schools. If the parents cannot pay for instruction, a provision is made for its being done by the district or state. Where parents are able, but not willing, the fee is taken from the father's earnings. The compulsion is not felt by the people. They know that the child must be educated, and at once take the necessary steps. Many were the complaints which he heard from the people when he got into their confidence as to their Governments, but he never heard them utter a word against their school system, because it required universal education. Ragged schools are unnecessary in Prussia, for the whole children are swept off the streets, and are busy receiving useful instruction in the schools—as the rule, children must be in the course of receiving instruction from the age of six to fourteen. Exceptions are allowed in the case of children engaged in public works, but then they must have a certain amount of knowledge before they enter, and they must continue to attend evening classes and Sunday schools. In Prussia, the proportion of the whole populationattending schools is about 1 in 6·7, whereas in England it is only 1 in 12, and even in Scotland, only 1 in 7. Dr. M'Cosh then gave an account of the great middle

schools of Germany. These are divided into two classes, the Gymnasium and the Real Schule, in the first of which the chief attention is given to languages and literature, and in the second to science and literature. Having received authority from the Education Office in Berlin to visit any school in Prussia, he inspected a sufficient number to enable him to judge of the system, which, in respect of the thoroughness of the organisation, and of the accuracy of the instruction conveyed, is worthy of all the commendation which has been bestowed on it. Indeed, it is the *one* thing which we should (after somewhat modifying it and putting it more under local management) borrow from Germany and carry out in this country — in England, where the old endowed schools do not supply the want; in Scotland, by elevating and widening the burgh schools; and, above all, in Ireland, where the need is still more felt, by reforming the old endowed schools, and substituting new ones. In Prussia, the children enter the preparatory schools (Vor Schule) at about six years of age ; continue there about three years, and, at the age of nine or ten, they enter the upper schools, either in the classical or scientific departments, as their parents may select. The course of instruction in the Gymnasium and Real Schule continues eight or nine years, and embraces not only the branches taught in our grammar schools or academies, but those taught in the first years of our university courses. He was astonished at the number of pupils in attendance, as well as the minutely accurate character of the instruction imparted by a set in each school of able and learned professors. In Berlin there is a number of such schools ; at one of them he found an attendance of about one thousand learning the higher branches, and at others there is an attendance of six or seven hundred. At Wittenberg, with a population under ten thousand, he found that there were no fewer than 280 boys from the town and neighbourhood learning classics. Halle is a town with less than thirty thousand inhabitants, and yet it has 550 learning classics, and 450 the higher branches of science. In Prussia there are attending schools as follows :—

	Boys.	Girls.
Elementary Schools, ...	1,322,747	1,292,736
Middle Schools, ...	44,786	52,123
Higher Burgh Schools, ...		23,845
Pro Gymnasien, ...		2,944
Gymnasien,...		35,013

It is a most interesting circumstance that similar upper schools—classical and scientific—are being planted all over the various States of Austria, and, on visiting that country, he found them in a state of great activity, and well supported. When he surveyed this state of things all over the German States, and found it fast extending into Switzerland, he regretted that the divisions of sects and interests in this country was so hindering the progress of a higher education. Dr. M'Cosh concluded with giving some account of the university system, which is remarkable for the great number of professors and the great division of labour among them, and in the particular, specific, and thoroughly searching and minute character of the instruction given. He objected, however, to the want of discipline exercised over the students by the authorities.

APRIL 20.—(Private Meeting)—Mr. Patterson, V.P., in the chair.

Mr. HYNDMAN gave an account of the proceedings of the Dredging Committee nominated by the British Association, with a grant of money in aid of their investigation. These operations were chiefly carried on by Dr. Dickie, Mr. Waller, and himself, who, at different times during the summer, explored the coast and channel from Ballygalley Head to the south of Donaghadee, extending their researches into sixty fathoms water off the entrance of Belfast Bay. On the 23d June a steamer was engaged and brought from Belfast by Mr. Patterson, accompanied by several other gentlemen, when the Turbot Bank, off the Gobbins, and the deep water adjacent were examined. Lists of the various species obtained have been made out for publication. Of these the most interesting were two species of *Brachiopods* added to the Irish Fauna, *Argiope cistellula*, hitherto only found off the Isle of Skye and Zetland, and a new species *Terebratula capsula*, so named by Mr. J. Gwyn Jeffreys, and identified as the same found lately at the Channel Island along with *Argiope*. These specimens were shewn to be peculiarly interesting both to geologists and zoologists, from their being among the few living representatives of a tribe that formerly existed in great numbers, but have become extinct. Several other shells were also noticed as being found dead on the Turbot Bank, which are not known as living nearer than the coasts of Norway and Greenland, giving rise to an interesting inquiry as to the origin of these shells—different opinions prevailing whether they are to be considered as living on our coasts, or as fossils washed out

of some submerged glacial formation. Specimens and drawings were also exhibited of a minute Madrepore, found among the shell sand, which was forwarded to Mr. Gosse, and found to be a new species, named by him, after Dr. E. Percival Wright, *Sphenotrochus Wrighti*. Among the zoophytes sent to the Rev. Thos. Hincks, of Leeds, were several new species, and one which was identified with *Lepralia Woodiana*—a fossil of the Crag.

Professor JAMES THOMSON described a method of self-recording messages by the electric cable.

MAY 25.—(Annual Meeting of Shareholders)—Mr. Hyndman, President, in the chair. The following report was read :—"In the report of the Council of the Belfast Natural History and Philosophical Society, made last year to the shareholders of the Belfast Museum, it was mentioned that there was but little to communicate, and upon the present occasion a similar statement may be made, the last twelve months having been even more uniform than previous years—so steady has been the course of the society since the time of the last annual meeting. There have been six public and six private meetings, at which communications were made of a very interesting character; indeed, the Council have great satisfaction in reporting that the papers of the past session were fully equal in importance to those of any previous years. The subjects discussed were as follows :—Oct. 6, 1858.—(Public Meeting.)—Comets—Rev. Isaiah Steen. Nov. 3.—(Private Meeting.)—Principles of Town Drainage—Mr. J. J. Murphy. Nov. 17.—(Public Meeting.)—The Marine Aquarium—Mr. Patterson. June 19, 1859.—(Private Meeting.)—The Metals of the Alkalies and Alkaline Earths—Dr. Andrews. Feb. 2.—(Public Meeting.)—Currents of the Ocean. Mr. T. Bryce. Feb. 9.—(Public Meeting.)—Organisation and Life—Rev. W. M'Ilwaine. Feb. 23.—(Private Meeting)—The injuries to the Turnip Crop by the Saw Fly, in 1858—Mr. Patterson. An Instrument for shewing Weak Signals by the Electric Cable—Professor J. Thomson. March 2.—(Private Meeting.)—The Gyroscope—Mr. James Hind. Mountain Chains of the World—Mr. J. J. Murphy. March 16.—(Public Meeting)—Drift Formations—Mr. MacAdam. The Eskars of Ireland—Mr. R. Young. April 6.—(Private Meeting)—The grand currents of Atmospheric Circulation—Professor J. Thomson. April 13.—(Public Meeting.)—Tour in Germany, and Educational Institutions of Prussia—Dr. M'Cosh. April 20.—(Private Meeting.)

—Results of Dredging in Belfast Lough—Mr. Hyndman. In accordance with the custom of late years, a course of popular lectures on geology was delivered before Christmas by Mr. MacAdam, one of our secretaries. They were extremely well attended, and excited much interest. The proceeds were, as usual, devoted to the benefit of the funds of the Museum. The specimens in the Museum are in the same good condition as stated in the last annual report. Donations of objects of natural history are always being presented, and the library receives a constant gradual increase from the donations of books contributed by our correspondents and friends. The Council have to report that the Thompson Collection of Irish Birds, in the Museum, has been placed upon new stands. For so far, they are unable to report any progress as to the arrangement of a typical collection, which had been suggested on a former occasion. During the past session the Museum has had a considerable increase of visiters from the country, owing to arrangements having been made with the local railway companies for admitting, at a reduced rate, persons travelling by their excursion trains. The Museum was opened as usual on Easter Monday, when there was a large attendance of the working classes. On this last occasion, the Council have the high gratification of stating that not the slightest damage was done to any part of the property. In last year's report, the death of Mr. Getty, one of the trustees of the Museum, was recorded. A gentleman was chosen to be his successor at the last annual meeting of shareholders; but, owing to a legal technicality, the appointment was not finally completed. The necessary steps can, therefore, be taken on the present occasion. The only remaining topic to bring before the shareholders is the proposal lately made by the Government, to render institutions like ours liable to local taxation. The bill was, however, for the present withdrawn from before Parliament, but it is possible it might be again introduced in another session. Our Museum is at present free from such burthens, but, should a new law be enacted abrogating the one under which it is now exempt, the Council fear that additional income could not be obtained for paying so large a taxation as might be imposed on the Museum, and that it might have the effect of greatly crippling, if not nullifying, the usefulness of our establishment. In conclusion, the Council are desirous of impressing generally upon the shareholders the importance of making known as widely as possible the objects of our society,

and the advantages afforded to its members by the use of the Museum and library, and the privilege of attending the meetings. Our society is now in a prosperous condition, but this condition can only be continued by a constant renewal of active coöperators, who will shew the same interest in its progress and welfare as those who now take a prominent part in its management. There are always, from various causes, fluctuations in the list of members every session, and in order to keep up the numbers and to increase its usefulness, the Council invites, as recruits, those of our fellow-townsmen who are desirous of cultivating scientific tastes, and of upholding the character which Belfast has obtained for superior intelligence, and for forwarding the diffusion of useful knowledge."

After the reading of the report, Wm. Bottomley, Esq., was appointed a trustee of the Museum, in the place of Edmund Getty, Esq., deceased. Thanks were returned to the officers for their valuable services during the past year; and, also, to Mr. MacAdam, for the course of lectures on geology which he delivered before Christmas, for the benefit of the Museum funds. The treasurer's report was then received and adopted.

The following Officers and Council were elected for the ensuing twelve months:—President—George C. Hyndman. Vice-Presidents—Dr. Andrews, Dr. Dickie, R. Patterson, Dr. Wyville Thomson. Secretaries—Jas. MacAdam, A. O'D. Taylor. Corresponding Secretary—Robert MacAdam. Treasurer—John Grattan. Librarian—Rev. Isaiah Steen. Councillors not in office—Wm. Bottomley, John Grainger, Thomas Malcomson, J. J. Murphy, James Thomson.

DONATIONS.

Captain Goddard—Several Indian birds.

R. Davison, Esq., M.P.—A white chaffinch.

R. Warren, jun., Esq.—A long-tailed duck and a sanderling.

Dr. Cunningham—A white mole.

Mr. Wm. Darragh—Three Indian birds; a specimen of White's thrush; and a rare variety of Irish bat (*Vespertilio noctula*).

Major Kean, 59th Regiment—Specimens of the water chestnut (*Trapa bicornis*), from China.

James MacAdam, Esq.—Several minerals.

G. C. Hyndman, Esq.—Four spears, bow and arrows, dish, Kava bowl, basket, &c., from the Penryhn

Islands; a stone hatchet and a flint arrow head, from Australia.

W. Carmichael, jun., Esq.—An ancient Irish hatchet.

Wm. Simms, jun., Esq.—A specimen of shrew (*Mygale Pyrenaica*).

Geological Survey of India—Their Memoirs.

Literary and Philosophical Society of Liverpool—Their Proceedings.

Academy of Natural Sciences, Philadelphia—Their Proceedings.

Royal Dublin Society—Their Journal.

Imperial Geological Institute, Vienna—Their Journal.

Cornwall Polytechnic Society—Their Report.

John Miller, Esq., Geelong—Transactions of the Philosophical Institute of Victoria.

Dr. Wilde—Catalogue of Antiquities in the Royal Irish Academy.

Society of Antiquaries—Their Proceedings.

Geological Society of London—Their Journal.

Queen's College Commissioners—Their Report.

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PROCEEDINGS
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7TH March, 1860—Private Meeting—Mr. Hyndman, President, in the chair. Dr. Andrews read a paper on "Recent researches regarding the properties of some of the Chemical Elements."

After briefly referring to ozone, which is generally supposed to be an example of allotropy in a permanent gas, the lecturer proceeded to describe the remarkable changes which heat produces in sulphur and phosphorus. At 226°, sulphur melts into a thin liquid, which, if allowed to cool, changes back to common brittle sulphur; but, if the temperature of the melted sulphur be raised to about 400°, it acquires a red colour, and becomes so thick that the vessel may be inverted without allowing it to escape. On being now allowed to cool, the sulphur is obtained in a modified form, as a soft solid, capable of receiving the impression of a mould, and so adhesive that it may be drawn out into fine threads. It is even insoluble in the bisulphurel of carbon, which is an excellent solvent of common sulphur. At the end of a few days, this modified sulphur becomes nearly restored to its original condition. Phosphorus presents a still more remarkable instance of allotropy. The modified variety is prepared by exposing ordinary phosphorus for some hours to a temperature of 450°, in an atmosphere of carbonic acid or nitrogen. It is a red, opaque substance, with a resinous fæture, and suffers no change in the air. After briefly adverting to the three well-known modifications of carbon—viz., the diamond, plumbago, and charcoal, the lecturer proceeded to state that the elements, boron and silicon, had also been recently obtained in three distinct modifications, analogous to the three modifications of carbon. Boron, for example, has been prepared in crystals with a lustre equal to that of the diamond, and, of such hardness, that it scratches that gem and may be used in powder to grind and polish it. Another variety is soft and unctuous to the touch, like ordinary plumbago; and a third resembles some of the forms of charcoal. The method of preparing these forms of boron was described. The lecturer concluded with some general observations on the subject of allotropy.

14th March—Private Meeting—Mr. Hyndman in the chair. Mr. Joseph John Murphy read a paper on "The Power of Man to modify Climate."

The means of modifying climate, which are within man's power, consist of two classes. One of these is by planting trees in such positions as to afford shelter from particular winds: a change which is often extremely beneficial to vegetation, as well as agreeable to the human inhabitants.

The other is by altering the character of the surface; and this, in the climates of Europe and North America, is to be chiefly done by draining swamps, and clearing forests; changes which increase the warmth of a country, and consequently lessen the rain-fall. Seas and lakes produce coolness in summer by their evaporation; and, if not very shallow, they give out warmth in winter which they have stored up in summer. Swamps act in the same way in summer, by producing cold through their evaporation; but, in winter, they have scarcely any effect at all. The result of a swampy condition of the surface is thus to lower the temperature.

The effect of forests is the same. That of vegetation, and especially forests, which are the most luxuriant forms of vegetation, is to produce cold, by reason of the evaporation which goes on actively from the leaves by day, and the great quantity of heat they radiate by night. Whatever produces cold increases rain-fall, and it is well known in North America, India, and other countries, that the rain-fall lessens when the forests are cleared away.

But dry and hot countries, such as those which lie south and east of the Mediterranean, are to be improved by the opposite methods: by irrigating fields and planting trees. Of this kind of change, also, we have instances. The flow of water in the brook Kedron, near Jerusalem, has, of late years, increased in volume and regularity, owing to the planting of groves about its sources, and the rain-fall of the little barren island of Ascension, in the South Atlantic, has been considerably increased, by means of planting—not trees, for they could not have lived—but herbaceous plants, suited to the arid volcanic soil.

Mr. Henry Burden read a paper on "The terms employed in Science."

He urged the necessity for considering this subject in the present advanced state of science, particularly with regard to those departments which are called natural and experimental. Popular writers, in order to render their works more agreeable to their readers, were often negligent of accuracy of expression, and were liable to propagate loose, and often erroneous, notions concerning facts and principles. The distinction was pointed out between the language of science and that of literature;

elegance of style not being admissible into the former, unless combined with precision and accuracy. The grand distinguishing peculiarity of the language of science is, that it is concerned with what is unadorned —in this language words ought to be truly the instruments of thought, and be under the control and guidance of the governing intellect. In order that terms may have due precision, it is essential that each be accompanied with a definition distinctly expressed, and such as is assigned to it by popular assent or custom. This may be difficult to do in every case, but it should not be omitted with respect to terms that are important or of frequent occurrence. It is also to be considered that, in moral and political science, there is the utmost necessity for strict definition, a word having one meaning in the science itself, and often a different meaning in common language. This source of fallacy Bacon has treated of in his "Novum Organum," under the head of Idola Fori. The essential nature of a common term is a representation of an idea formed by a process of abstraction, and its function is to present to the mind a sketch of the objects designated by it collectively, and which must be supplied in detail by present observation, or by the memory or the imagination. An inappropriate name cannot be given, unless the term is something more than a mere sign, unless, in fact, a portion of the definition is included in the term itself. Arbitrary signs, like those used in mathematics, assert nothing as to their real meaning; but x y z—plus a definition of these symbols—do assert something, and just what is contained in the definition itself. In all cases where these symbols are employed, there must be a definition to express what they mean, so as to avoid error or ambiguity. A derived term ought to contain a portion of the nominal or of the real definition. But, at best, no single derived term can express in itself the whole of the definition. We must, therefore, have the term, plus the definition. It has been hitherto customary to attach names, constructed from existing words, mostly Latin or Greek, implying attributes of the thing signified. Now, however, our notions of objects may be modified by the discovery of new properties or relations; the term previously used to denote an object is often permitted to remain for a long time unaltered; therefore, whatever part of the definition is contained in the etymological meaning of the term, remains, also, unchanged. It frequently happens that, in the original invention of a term, a certain characteristic of an object may have been regarded as the most important, which may have been afterwards proved to be merely accidental; and, as no alteration has been made, an erroneous expression of a fact will be preserved in the language. Take the terms, oxygen, verteb a, poly-

gastrica, and many others as instances of this, so that in many cases we must modify or reject altogether a term's etymological meaning. In the course of reading, a new scientific term may be met with; if we rely upon its etymological meaning we shall be often led astray, and if we disregard this meaning, and refer to that deduced from the context, where is the advantage of this derivation? This derivation often misleads, and leaves erroneous impressions which are difficult to be afterwards eradicated from the mind. The nomenclature of science is also constantly undergoing changes, and this disadvantage would be greatly avoided were it customary to make use of arbitrary symbols. The etymological meaning of many terms passes through many stages from their creation, each being more distant from the original signification, until at length they become quite inappropriate. It has been adduced as an argument in favour of derived terms, that, although the etymological may not agree with the existing meaning, yet that the former often throws additional light on the signification. The study of the various changes of meaning, through which a derived term has passed, may be highly interesting, and be very useful in tracing the history of a science. In fine, it may be proposed that, where practicable, it is best to make use of arbitrary signs or symbols, and, when not so, to give names expressing some circumstance connected with the time or place of discovery, with the name of the discoverer of an object, or with the originator of a new theory.

28th March—Public Meeting—Mr. Patterson, V.P., in the chair.

Dr. Dickie read a paper on the "Natural History of Man."

The subject was treated strictly as a question in natural history. The forms of head and face, of colour, &c., were examined in detail. The whole evidence was shown to prove unity of species or descent from one parentage, and the views of authors respecting the varieties of the one species were also discussed.

April 25, 1860—Public Meeting—Mr. Patterson, V.P., in the chair.

A paper on the "Occurrence of the Hairy-armed Bat (*Noctula Geisleri*) in the County Antrim," by Professor J. R. Kinahan, M.D., F.L.S., of Dublin, was communicated by the chairman.

The claim of this species to rank as British has rested hitherto on a solitary specimen in the British Museum. This was found among Leach's collections; but whether he had procured it in England or in Ireland was not known. Under these circumstances, the capture of two specimens at Belfast and its vicinity was a fact of some interest. One was taken about twelve years ago, at Belvoir Park, the seat of Sir Robert Bateson, Bart. The

other, which was exhibited to the meeting, was now in the society's collection. It had been knocked down with a fishing-rod, by a mechanic, in July, 1858, in Blackstaff Lane, Belfast, and was taken immediately to Mr. Darragh, curator of the Belfast Museum. Under his care, it lived for about ten days, and, though shy at first, became tame, and fed readily. To him we are indebted for being able to record the occurrence of both these interesting specimens. The paper, which was drawn with great care, after a comparison of one of the Irish specimens with that in the British Museum, contained full details of the specific distinctions, and accurate measurements of the several parts. This species constitutes an addition to the general synopsis of the Irish bats, which Professor Kinahan had laid before the Natural History Society of Dublin, April 18, 1859.

Mr. Grattan read a paper upon "The Oxy-Hydrogen Light and Microscope." After explaining and illustrating some of the ordinary properties of light, Mr. Grattan proceeded to detail the arrangements requisite for burning with safety the mixed gases of oxygen and hydrogen, and to exhibit the effects of the heat thus produced, such as the combustion of iron, the fusion of platinum, and the intense incandescence of lime. The object was accomplished simply by collecting the gases separately in cubical zinc boxes cased with wood, from which they could be displaced at pleasure, under a uniform and equable pressure, by means of a continuous stream of water supplied from a common source, the gases being conducted separately to a blow-pipe, in which only they were permitted to mingle just as they were about to pass out. All possible risk of explosion was thus avoided, and one of the most powerful artificial lights placed at our disposal; indeed, the intensity of the light produced when the oxy-hydrogen jet was directed upon a cylinder of lime was such as to compel those not far removed from it to shade their eyes from its intolerable glare. The method of adjusting this light to the microscope having been next explained, Mr. Grattan concluded by exhibiting upon a transparant screen—the prismatic spectrum—a few photographic pictures, and some interesting microscopic objects.

20th June — Annual meeting of shareholders—Mr. Hyndman, President, in the chair.

The usual statement of the treasurer's account was laid before the meeting, and some matters of business discussed.

The following report of the Council, for the past twelve months, was then read:—

The Council of the Natural History and Philosophical Society, in their present report, have to record that the same uniformity and regularity have characterised the proceedings of the last session, as distinguished those of several previous.

The following papers have been read :—

2d Nov., 1859—Mr. T. Malcomson, on "Some rare Irish Birds." Mr. William Simms, jun., on "The Chinese Yarn."

16th Nov.—Professor Wyville Thomson, on "The Geology of the Arctic Regions."

7th Dec.—Dr. David Walker (late surgeon of the Fox yacht), on "The Arctic Regions."

21st Dec.—Mr. J. J. Murphy, on "The Scientific Career of Humboldt."

18th Jan., 1860—Dr. R. Steen, on "The German Universities."

1st Feb.—Mr. John Grainger, A.M., on "A Visit to Canada."

15th Feb.—Mr. Hyndman, on "The Report of the Belfast Dredging Committee for 1859." Mr. J. Templeton Grimshaw, on "Some rare insects observed lately in the vicinity of Belfast."

7th March—Dr. Andrews, on "Recent Researches Regarding the Properties of some of the Chemical Elements."

14th March—Mr. J. J. Murphy, "On the power of Man to modify Climate." Mr. H. Burden, "On the Terms employed in Science."

28th March—Dr. Dickie, "On the Varieties of the Human Species."

25th April—Mr. Grattan, "On the Oxy-Hydrogen Light and Microscope."

The council have to remark that for one of these papers the society is indebted to a gentleman who is not a member—namely our townsman, Dr. Walker, who made a valuable communication on the Arctic Regions, containing much interesting information obtained during the expedition in the yacht Fox, commanded by Captain M'Clintock.

The collections of specimens in the Museum remain in the same order as before, and the number of visitors to it have been considerable; and it is expected the interest to view it by strangers will continue on the increase. On last Easter Monday the attendance of the working classes was very large, the small fees for admission amounting to the aggregate sum of nearly 37*l*.

In the report of last year the council impressed upon the shareholders of the Museum and the members of the society the great importance of making known as widely as possible the peculiar objects for which our Museum has been established, and the advantages it offers to those who may embrace them. In a population like that of Belfast, it is most desirable that such an institution should be preserved in full efficiency; and, in such an increasing community, the council have great hopes that many individuals may join their ranks, and persevere in that cultivation of natural and physical science which is the characteristic of the present age,

and which has been so conducive in advancing the cause of civilisation and refinement.

DONATIONS TO THE MUSEUM RECEIVED DURING THE LAST TWELVE MONTHS.

A. Wylie, Esq., colonial geologist—skin of a large antelope, from Africa; Dr. Kinahan, Dublin—a native specimen of the lesser horse-shoe bat (Rhinolophus Hipposideros); C. Langtry, Esq., Dromadaragh—a Canada goose; Mr. William Darragh, Museum—specimens of Richardson's Skua gull and the American scaup, also a lemon sole; R. Patterson, Esq.—two specimens of Sirex gigas, found at Holywood; Rev. E. O'Meara, Dublin—two specimens of nebria complanata, from county Wexford; Mr. Hagan, Whitehead—an ammonite; Mr. Bradley—a black bream from Newcastle, county Down; Dr. J. M. Barnett—some shells from Borneo; Robert Gage, Esq.—a ringed guillemot, and a number of birds' eggs from Rathlin; Howard Ferrar, Esq.—a sea serpent from the island of Abdul Kooria; Mr. W. Donnan—an ammonite; James MacAdam, Esq.—some specimens of minerals; Rev. S. Black, Sierra Leone—an African priest's garment; Dr. D. Walker—some Esquimaux dresses; Dr. J. M. Barnett—several works of art from India and China; Mr. S. M'Clurkan, Pittsburg—several military articles found on the site of a battle in Pennsylvania in 1755; G. C. Hyndman, Esq.—a New Zealand war trumpet of shell.

Donations to the library were received from the Academy of Natural Sciences of Philadelphia, Imperial Geological Institute of Vienna, Geological Survey of India, Zoological Society of London, John Lindsay, Esq., Cork; Smithsonian Institution of Washington, Royal Dublin Society, Literary and Philosophical Society of Liverpool, Royal Cornwall Polytechnic Society, University of Christiania, Norway; Geological Society of London.

The following officers were appointed for the session 1860-61 :—

President—James MacAdam, F.G.S.

Vice-Presidents — Thomas Andrews, M.D., F.R.S.; Robert Patterson, F.R.S.; George Dickey, M.D.; Professor James Thomson, C.E.

Secretaries—A. O'D. Taylor, John Grainger, A.M.

Corresponding Secretary—Robert MacAdam.

Treasurer—J. J. Murphy.

Librarian—Rev. Isaiah Steen.

The remaining members of council being Wm. Bottomley, John Grattan, G. C. Hyndman, Thomas Malcomson, Professor Wyville Thomson.

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PROCEEDINGS

OF

THE BELFAST

Natural History and Philosophical

SOCIETY.

Reprinted from the Daily "Northern Whig" of 21st February, 1861.

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

1860.—November 7.—Public Meeting—James MacAdam, Esq., F.G.S., President, in the chair. The Rev. Isaiah Steen read a paper entitled "A General Survey of the Heavens," in which he gave a condensed view of the present state of astronomical knowledge. He mentioned particularly the fifty-nine planetoids revolving round the sun between Mars and Jupiter, the satellites belonging to Saturn and Neptune, which were only lately discovered, and the probability of a planet existing between the Sun and Mercury; also, the present state of our knowledge regarding the new planet Neptune, of the movement of the solar system in space, and of binary and multiple stars. The paper was illustrated by an Orrery, and numerous diagrams.

November 21.—Private Meeting—Mr. MacAdam, President, in the chair. A paper was read by Mr. J. J. Murphy, "On a Phenomenon of the Arctic Winter." There is a peculiar kind of storm during winter in some parts of the Arctic Oceans, during which the temperae ture rises in an extraordinary manner. The reader accounted for this by the action of the wind ripping up the icy covering of the sea, and thus exposing the comparatively warm water under it to the atmosphere.

Mr. T. Malcomson read a paper on "Some Varieties of Native Birds." He exhibited, among others, a rare specimen of a Hybrid, shot near Downpatrick, in December, 1859, and which he considered as between the Tufted Duck and the Pochard (Fuligula Ferina.)

Professor Wyville Thomson read a paper on a new Palaeozoic group of Echinodermata, specimens illustrating which are preserved in the Museum of Queen's College, Belfast. The paper, with illustrative plates, is published in the *Edinburgh Philosophical Journal*, for January, 1861.

Mr. Hyndman read a paper "On the Occasional Colour of the Teeth of Sheep, and the Mineral Constituents of their Food," and which was illustrated by specimens.

December 12. — Public Meeting — Mr. MacAdam, President, in the chair. A paper was read by the Rev. J. Scott Porter, "On the French System of Weights and Measures," and a description of its advantages.

December 19.—Private Meeting — Mr. MacAdam, President, in the chair. Dr. Cuming read a paper on "The Natural History of Malaria." He stated it was generated over a large portion of the surface of the globe, but only in those regions where a high summer temperature prevailed. He detailed the conditions necessary for its production, showing that heat and moisture were indispensable. He reviewed the arguments for and against the theory, which refers its development to the decomposition of vegetable matter; and he related some observations which had been made with regard to the frequency of malarious fevers in connexion with ferruginous soils. He gave an account of our knowledge with regard to the probable nature of the malarious poison drawn from a comparison of its effects with those of other known agents.

January 9, 1861.—Private Meeting—Mr. MacAdam, President, in the chair. Professor James Thomson gave a notice of recent progress in theories and experiments on ice. He briefly recapitulated the chief points of the views put forward by Professors Faraday, Tyndall, Forbes, and himself on the "regelation" and plasticity of ice; and explained reasons in support of his own view that the plasticity of ice is due to liquefaction by pressure at points where the pressure is increased by the forces tending to change of form, and recongelation in new positions of the liquid particles on their escape from the points of increased pressure. He exhibited to the society some experiments out of a series which have recently been contrived by Professor Faraday, with the view, as described by their author, of advancing the investigation of the beautiful points in molecular philosophy, which are involved in the theories of the plasticity of ice, to a farther extent than had previously been done, and even to the extent of exhausting the power of some of the principles assumed in one or more of the chief theories which have been put forward. The main point of these experiments consists in showing that two pieces of wet ice, when brought into contact, will adhere together, even when the effects of capillary attraction tending to produce the actions contemplated under Professor Thomson's theory are completely excluded, and even when, farther, there are forces applied pulling the two pieces asunder instead

of any forces pressing them together. The simplest form of the experiments in question, and one which may easily be repeated, consists in setting cakes or bars of ice to float in water after they have previously been so formed as that they can only touch one another under water, and they may be so far apart at the surface of the water as to be quite free from being drawn together by capillary attraction. Under these circumstances, they will adhere together; and if the edges, where they can touch have been rounded, and if, at one side of the point of contact, forces be gently applied tending to separate them, which may readily be done by two feathers, they are found to roll on one another, being constantly held together by a changing point of adhesion, or by a changing isthmus of ice uniting them at their shifting point of contact. Professor Thomson explained how this experiment instead of being adverse to his theory is, he believed, completely in accordance with it, and confirmatory of it. Professor Thomson also exhibited an experiment which had been contrived some years ago by Professor Tyndall for manifesting very strikingly the plasticity of ice by changes of form in small specimens. Between a pair of boxwood cup-shaped moulds he placed some lumps of transparent ice, and pressed the moulds together in a powerful screw-press, during a few minutes; on opening up the moulds he took from them, instead of the lumps of ice, a transparent cup of continuous ice.

The next paper read was by Mr. James W. Valentine, "On the Glaciers of the Alps." Along the chain of the Alps, from Mont Blanc to the Tyrolese frontier, there are no less than 400 glaciers of various sizes. Some of the largest are 18 to 21 miles long and about $1\frac{3}{4}$ miles broad. It is difficult to arrive at perfect accuracy as to the space of ground they cover, but it is generally estimated at more than 390 miles of superficies. Every year a fresh layer of snow is laid on the top of such mountains as rise above the snow line, and the glaciers are the chief means of carrying this off; at their origin they are snow, and at their lower extremity they are ice; the change is caused by the gradual expulsion of the air from the meshes of the fallen snow, and by the great pressure to which it is subjected. The most curious circumstance connected with glaciers is their continual motion downwards. During each summer a considerable quantity of ice below the snow line is reduced to water, so that, if this waste was not in some way provided for, it will be evident that, in a few

years, the lower portion would entirely disappear. This motion has been for many years known to the inhabitants of the mountains, but the first who made regular observations of it was Hugi, who found that, during the years from 1827 to 1841, his cabin on the glacier of the Aar had descended 1,541 yards in all from its first position. Perhaps the first attempt to account for this motion was that of Scheuchzer, in 1705, who supposed the motion to be caused by the conversion of water into ice within the glacier; the almost irresistible expansion which takes place on freezing was the force which he considered pushed the glacier downwards. M. de Charpentier and M. Agassiz were, for a long time, of the same opinion as M. Scheuchzer, but the experiments of M. Agassiz showed that the body of a glacier is at the temperature of 32 degrees Fahr., and, consequently, there is no interior magazine of cold to freeze the water with which it was supposed to be saturated. This experiment alone proves the insufficiency of the theory, generally known as the "Dilutation Theory." De Saussure's idea, or what is generally known as the "Sliding Theory," is, that almost every glacier reposed upon an inclined bed, and has beneath, even in winter, currents of water, which flow between the ice and the bed which supports it. It may, therefore, be understood that these frozen masses, drawn down the slopes on which they repose, disengaged by the water from all adhesion to the bottom, and sometimes even raised by this water, must slowly descend, following the inclination of the valley or the slopes which they cover. Forbes's Theory, generally called the "Viscous Theory," may be stated in his own brief, but clear, definition. "A glacier," says he, "is an imperfect fluid, or viscous body, which is urged down slopes of a certain inclination by the mutual pressure of its parts." In 1846, Professor Forbes made an important discovery. He found that the portion of the glacier nearest the bed moved most slowly, showing, therefore, that the ice is there retarded by the friction it encounters. In 1859, Dr. Tyndall made a winter excursion to the Valley of Chamounix, in order to make observations on the glaciers. He found, from various experiments on the Mer de Glace, that the glaciers did not move much more in winter than with half the speed of that in summer. The Mer de Glace is considered by most of the guides with whom Mr. Valentine had spoken to advance between 300 and 340 feet a year. The Görner Glacier of Monte Rosa is advancing very rapidly at the present

time; within the memory of man it has swallowed up no less than forty châlets, and covered a considerable space of meadow land. The question which has excited by far the greatest attention with regard to glaciers is that raised by the "Viscous Theory," which ascribes the property of plasticity, or viscosity, to glacial ice, and regards it as the primary cause of glacier motion. Rendu was the first to affirm that a glacier was a semi-fluid body; he was also the first who compared it to a river. "Between the Mer de Glace and a river," says he, "there is a resemblance so complete that it is impossible to find in the latter a circumstance which does not exist in the former." The mass of a glacier was supposed to move down its valleys, in the same manner as treacle, honey, or any soft, pasty substance will move along a trough, the bottom of which is slightly inclined. The greatest difficulty has, until lately, arisen from the absence of all experimental proof, and of the existence of any property in glacial ice which could be designated as plasticity. Glaciers do not long retain their original whiteness. They are always situated in valleys, bounded by mountains, from whose sides avalanches constantly descend, bringing down with them large masses of stone and earthy matter. They are continually loaded with these ruins of the mountains. As the glacier slowly advances, it carries its load with it. Ridges of stones, rocks, and gravel, which have fallen from the adjacent mountains, flank the glacier, and these ridges are called moraines. While advancing, it empties its load of rocks into the valley; sometimes these are heaped up in mounds which, when in front of a glacier, are called "Terminal Moraines," and mark, in a very characteristic and certain manner, the greatest limit of extension which the glacier has at any one time attained. Between Schaffhausen and Bâle, Mr. Valentine had observed the country strewn with gravel and large blocks of stone. Many of these stones are scratched and worn in a manner similar to those found in glacier moraines. One Mr. Ramsay says he found in a vineyard was twenty-two paces in length and nearly equally broad and high, and is said to contain about 17,000 tons of rock. On its flat summit there is a good-sized summer house, with a small garden in which were cherry trees growing. The crevasses which intersect the glaciers are caused by their motion downwards, over their uneven bed. These crevasses are of enormous depth and very irregular. They cut the ice into long prisms and are the chief obstacle in crossing

a glacier. In traversing the Mer de Glace, Mr. Valentine states he had to cross an enormous crevasse twelve or thirteen feet wide, over which a plank not more than a foot broad was thrown. His guides assured him the depth of this crevasse was upwards of 300 feet. Sometimes these crevasses are more numerous at the sides than in the centre, caused by the difference of velocity in motion. But the strangest fact connected with these "Marginal Crevasses," as they are called, is that they are inclined towards the source of the glacier, and not like its centre crevasses, which are inclined towards its base. It is again the swifter motion of the centre which produces this. The beautiful blue colour of the ice, which presents a veined appearance, is said to be caused by the air bubbles (which are distributed so plentifully through the general mass) not existing in the veins, or only in comparatively small numbers there. Professor Forbes considers the ripples in ice are formed in the same manner as those on water. This theory, however, does not seem to be adopted by Dr. Tyndall, who observes:—"No one surely will affirm that glacial ice so closely resembles a fluid as to be capable of transmitting undulations, as water propagates rings round a disturbed point." Out of every glacier, a stream flows caused by the melting of the ice, and these streams, which flow from the glaciers of Switzerland, are the sources of some of the principal rivers of Europe. Mr. Valentine summed up by recapitulating that the idea of a semi-fluid belongs to Rendu, Bishop of Annecy; the proof of the quicker central motion belongs in part to Rendu, but principally to Agassiz; the proof of the retardation belongs to Forbes; and the discovery of the point of maximum motion belongs to Tyndall.

January 23, 1861.—Private Meeting—Mr. MacAdam, President, in the chair. Mr. John Grainger, A.M., read a paper on the recent excavations made in High Street, Belfast. The former topography of the town was illustrated by means of maps, and there were exhibited to the meeting a great variety of coins and domestic implements, illustrating the peculiarities of the time at which they were embedded.

Professor Wyville Thomson gave a description of the "Embryology of the Echinodermata," illustrated by diagrams.