PROCEEDINGS

OF THE

ROYAL SOCIETY OF EDINBURGH.

VOL. IV. 1858–59. No. 49.

SEVENTY-SIXTH SESSION.

Monday, 22d November 1858.

DR ALISON, Vice-President, in the Chair.

The following Council were elected :—

President.

SIR T. MAKDOUGALL BRISBANE, BART., G.C.B.

Vice-Presidents.

Sir DAVID BREWSTER, K.H.
The Very Rev. Principal LEE.
The Right Rev. Bishop TERROT.
Dr CHRISTISON.
Dr ALISON.
Professor KELLAND.

General Secretary,—Professor FORBES.

Secretaries to the Ordinary Meetings,—Dr BALFOUR, W. SWAN, Esq.

Treasurer,—J. T. GIBSON CRAIG, Esq.

Curator of Library and Museum,—Dr DOUGLAS MACLAGAN.

Councillors.

Dr THOMAS ANDERSON.
Rev. Dr HODSON.
ROBERT CHAMBERS, Esq.
JOHN RUSSELL, Esq.
JOHN HILL BURTON, Esq.
DAVID STEVENSON, Esq.
WM. THOS. THOMSON, Esq.
Dr ALLMAN.
The DUKE of ARGYLL.
ANDREW MURRAY, Esq.
Dean RAMSAY.
Dr GEO. WILSON.

Monday, 6th December 1858.

PROFESSOR KELLAND, Vice-President, in the Chair.

1. Opening Address. By Professor Kelland.

During the vacation, I had looked forward with confidence to the pleasure of listening to-night to an address from one of the ablest experimenters and most vigorous writers that this Society has ever numbered amongst its members,—Sir David Brewster. And when, a short time since, I learnt that I had been indulging an ill-founded expectation, and that the duty of opening the session was to fall to my own lot, I experienced something more than disappointment. For, in addition to my imperfect knowledge of the past history and present position of the Society, is the fact that I had made no preparation, either in the way of collecting materials, or of providing a reserve of time, for drawing up an address. I must therefore come before you with an apology. I must crave your forbearance should some of the remarks which I make appear trite and unworthy of the occasion,—should others be traceable to what I have said elsewhere,—should all be found crude and lower in tone than beseems the position in which your kindness places me.

The primary topic in such an address must be one suggested by the first glance which the eye takes around the room on every opening session—the record of the changes which death has effected in our body. The list of members deceased within the year is, I regret to say, unusually large, comprising no fewer than two honorary, and fifteen ordinary Fellows. Amongst these are names of note, —such as those of Lord Dunfermline, the Lord Justice-Clerk Hope, and Lord Handyside,—men whose distinguished professional career has brought them prominently before the public, and the tribute to whose memory is recorded on broader pages than issue from this place. There are others, whose walks in life, and scientific pursuits in particular, brought their doings more directly under our notice, —such as Dr Fleming, Professor Gregory, Mr Jamieson Torrie, Mr Tod, Mr Jardine, and Mr Morries Stirling.

In selecting some of these for a few brief remarks, I trust it may not be inferred that I deem the others little worthy of notice. A

sketch of the labours of Dr Fleming has already been laid before the Society. A brief notice of Professor Gregory has been drawn up by Dr Alison, and he has come here to-night to present it to the Society in person. Time and opportunity have been wanting to me to collect extensive information respecting Mr Tod and Mr Jardine; whilst in the cases of Mr Jamieson Torrie and Mr Morries Stirling, I have had the advantage of the kind assistance of Dr Balfour, Dr Christison, and Mr Andrew Coventry.

Suffice it to say, that Mr Tod was for no less than twenty-nine years Secretary to the Royal Scottish Society of Arts, the duties of which office he discharged with such efficient and ready zeal as to have rendered himself ultimately the centre and moving power of that Society, by every member of which he was highly and deservedly esteemed. On our own meetings he was a regular attendant; but he reserved his active energies for the Society to which his tastes and his official position more directly attached him. As a disinterested patron of youthful inventors, as a friend to every unfriended projector, his loss will be severely felt.

Of Mr Jardine all I can collect is, that he possessed keen intelligence and great mathematical powers. In his early career he is said to have given promise of the highest eminence, attracting the attention of Professor Playfair, to whom he was under deep obligations. I possess a copy of a book presented to him by the author—the Supplement to Legendre's "*Théorie des Nombres.*" The testimony, even to this extent, of so distinguished a man as Legendre, is no small matter. Mr Jardine appears to have been too easily satisfied with the position which his professional skill as a civil engineer secured him, to admit of his using the exertion requisite for figuring in a broader sphere. His attainments, however, were by no means limited to a knowledge of his profession.

Fifty years ago, when geology was not a common study, Mr Jardine laboured in that field; but the fruits of his labours were, so far as I know, communicated only to his friends. It was a merit even to study amongst the rocks in those days; when the country-people were not accustomed, as they are now, to meet with gentlemen converted for the time into stonebreakers. Professor Sedgwick tells a story of his arriving late, hammer in hand, and groaning under a load of specimens, at a little inn in some remote district, and of the worthy Boniface bringing out in turn each of his

children from its bed to have a look at the "daft" man. I am reminded of this story by what I have been told of Mr Jardine. When Professor Jameson was on his first visit to Arran, collecting materials for the mineralogy of the island, he on one occasion arrived, after nightfall, at a public-house near Loch Ranza, and asked if he could obtain some refreshment and a bed. The reply was, "Aye, aye, ye may hae some refreshment, but for a bed ye maun e'en lie down beside that man on the table." To Jamieson's no small delight and astonishment, "that man" was his friend Jardine, sound asleep, after a hard day's geologizing amongst the hills.

Thomas Jameson Torrie, Esq., Advocate, evinced in early life a fondness for natural science, which, under the able tuition of his uncle, Professor Jameson, resulted in his becoming an excellent mineralogist and geologist. He was also distinguished in Botany. He became a member of the Plinian Society in 1824, and was elected President of that Society in 1827. He contributed papers to the Society, and proved himself a zealous student of natural science. In 1828 he joined the Wernerian Society, and became ultimately associated with Dr Neill in the secretaryship. Owing to his retiring habits, Mr Torrie did not appear much in public, either as a speaker or as a writer. He did much, however, to encourage science, by the ample collections which his independent fortune enabled him to accumulate. He had travelled extensively, and was well acquainted with the geology of Europe. To the loss of science, he was attacked, whilst in the vigour of life, by rheumatism, brought on by exposure. The attack was succeeded by partial paralysis, which affected both his powers of memory and his speech. Hence it happened that for many years, whilst warmly interesting himself in all that was doing in natural history, his own participation in the labours of scientific progress was effectually stopped. He was much beloved by an extensive circle of friends.

Mr John Davy Morries Stirling, was son of Captain Morries, of the Royal Navy, and nephew of Major Davy, a distinguished officer, who perished in captivity in Candy in Ceylon, after the well-known fatal expedition against that capital early in the present century. Mr Morries was educated in Edinburgh for the medical profession, and graduated in 1831, after having given great promise as a student. Both before and after graduation he showed a pre-

ference for chemical inquiry, and manifested an aptitude for original research. To him is due the discovery of one of the neutral crystalline proximate principles of the vegetable world, *elaterine*, the active ingredient of *elaterium*, which was also made known by the late Mr Hennell of London about the same time. Subsequently, the first appearance of the malignant cholera, in 1832, attracted his ardent mind,—at the time a subject of universal and intense interest,—and thus, for a period, the practice of his profession became the object of Dr Morries' life; and he settled in London as a physician. Circumstances soon led him, however, to give up that pursuit; and marriage with a lady of property, sister of the present Mr Stirling of Kippendavie, occasioned a change of name, and the abandonment of all professional objects. Not long after his marriage Mr Morries Stirling took up his residence in Norway, where he remained several years. The account of the discovery of the admixture of metals, on which was founded his patent iron, and several other patents, which have been successfully worked, I owe to the kindness of Mr Andrew Coventry. When residing in Norway, Mr Stirling devoted his time to field-sports, in which he engaged with great enthusiasm. Hunting, shooting, and fishing occupied his days whenever it was possible to get abroad. But, as the weather was not always propitious, he was sometimes kept within doors. On these occasions, he tried his hand at the construction of the implements used in the field. On one occasion, he was astonished to find the fish-hooks, which his experiments had produced, to possess wonderful toughness, quite different from anything he had previously turned out. With a true philosophic spirit, he set about diligently to search out the cause. Had he done anything unusual? Was there any element, either of matter or of manner, to which he might attribute his success? He could discover none. But his man, on being questioned, remembered that they had stirred the molten metal with a tin spoon. On this hint, he repeated the experiment, and the result was the patent iron, which consists of a mixture of iron with tin or some other metal. To this he has added other patents of great value. And here permit me to offer a word of caution to our younger Fellows. The principle of division of labour seems almost to be a law of nature—it is certainly a law of society. The genius which evolves a scientific invention is rarely, very rarely indeed, combined with that genius which can turn it to

profitable account. A tightly-strung mind, capable of working out scientific truths, is hardly able to sustain the rough shocks which it meets with in the commercial world. Mr Stirling found his patents, successful as they were in some respects, a constant source of annoyance, under which his sensitive frame gave way. Others profited: he suffered. *Sic vos non vobis.*

The names o the other ordinary members deceased are,—Sir David Hunter Blair, Bart.; James M. Hog, Esq. of Newliston; William Murray, Esq. of Monkland; John Sligo, Esq. of Carmyle; Dr John W. Watson; and William Wood, Esq.*

Of foreign members, we have lost M. Von Hammer the Orientalist, and Müller the Physiologist.

Little remains to be added to complete the past year's history of the Society. The papers read at our ordinary meetings have presented the usual diversity of subject; embracing Mathematics, Physics, Chemistry, Natural History, and Archæology. Nor am I aware that their value has been below the average; but, from the circumstance that several of the most important papers were incomplete, combined with the fact that shorter papers are now more generally condensed into our Proceedings than was the case formerly, the annual addition to our Transactions this year contains but one paper. That paper is by Mr Stewart, and is of unquestionable merit. I have great pleasure in learning that Mr Stewart is continuing his researches on radiant heat,—a branch of experimental science which owes so much to members of this Society, and the papers on which alone suffice to stamp our Transactions with lasting value. I ought to add, that Mr Stewart has been selected by the Council to take charge of the reduction and printing of the "Makerstoun Magnetical and Meteorological Observations," at the joint expense of Sir Thomas Brisbane our President, and of the Society, with which work he is progressing rapidly and satisfactorily. Having thus briefly touched on the occurrences which make up the history of the Society during the past year, I will venture on a few general remarks.

I have no fear that the principles which should regulate such associations as this are likely to be much misunderstood or widely

* Whilst I write, there reaches me intelligence of the death of two other ordinary members—Lord Haddington and Mr Alexander Adie, both at an advanced age.

departed from. Still, a few words on the subject may not be inappropriate to the occasion. There are two errors which we must carefully guard against in our practice:—the one, that of imagining this room to be a place proper for the exposition of old truths,—in other words, as in any sense a lecture-room; the other, that of regarding our Society as, to any large extent, a combination of force, a union of physical and pecuniary appliances wherewith to attack problems and institute experimental researches which could not readily be dealt with by individuals. It is quite true that most of the old learned societies were established with a view to one or the other of these objects. The Academia del Cimento, for instance, was founded for the purpose of instituting experiments on a scale which no individual philosopher of that age durst have ventured on single-handed. So, too, of the Royal Society of London. The writings of Bacon had just opened a wide vista to the eye of the investigator of nature, and from this cause, amongst others, men's minds were beginning to entertain hankerings after new forms of truth. To the eye of the philosopher, who sees in the retardation and gradual dispensation of knowledge the hand which retains the shower until the seed has lain its full time in the earth, the phenomenon is neither startling nor inexplicable, of men hurrying to and fro under the influence of some excitement, whose determining period is in the future. The old Royal Society was assuredly composed of men drawn together by strange unearthly longings, the interpretation of which must be sought for in the subsequent quarter of the century, when the "Principia" and strict experimental philosophy had come in. The pages of Birch indicate plainly enough what was the object of that Society at its first formation. They reveal to us the fact, that the streams of truth had stagnated so long amongst the marshes of the Middle Ages as to have become altogether polluted, so that an individual thirsting for its waters found himself utterly suffocated, utterly helpless, in attempting to search out the pure descending rill. Impelled by this feeling of inability, men clung to each other, held firmly hand to hand, and thus united marched on. We may smile at the apparent frivolity of many of their earlier papers, but they convey their lesson notwithstanding. Their first President, Sir Robert Moray, on the day of his first election, 6th March 1661, gives in a marvellous paper, in which he tells his hearers, that the drift-wood cast ashore on the Western Isles

of Scotland is incrusted with multitudes of little shells, having within them little birds perfectly shaped, supposed to be barnacles. "The bird in every shell that I opened," he says, "as well the least as the biggest, I found so curiously and completely formed, that there appeared nothing wanting as to the external parts for making up a perfect sea-fowl; every little part appearing so distinctly, that the whole looked like a large bird seen through a concave or diminishing-glass, colour and feature being everywhere so clear and neat. The little bill like that of a goose, the eyes marked, the head, breast, neck, wings, tail, and feet formed; the feathers everywhere perfectly shaped," and so on.

We may smile, I say, at this tendency to interpret natural phenomena by the aid of a vigorous imagination, but we must admit that it was better than that stolid uninterpretativeness which preceded it; and, at any rate, it ended in the clear day of truth which the next generation saw in full blaze. The object of an association at such a period was, from the nature of the case, union of minds and hands in questioning nature. What could one man hope to do by his own intellect, by his own resources? Accordingly, we are not astonished to find that the primary objects which men proposed to attain by union in those days were natural instruction, and assistance in common inquiry. The Society's minutes of the period abound in the language of entreaty. Every man who had a chance of getting at information was earnestly called upon to avail himself of it. And we are not to condemn men, through the application of our superior enlightenment, because, like the Florentine academicians, they made it a rule to believe everything possible until the contrary could be proved. They were justified, I think, in ordering fresh hazel rods to be produced, "wherewith the divining experiment was tried and found faulty." And we cannot blame them because, when the Duke of Buckingham had presented the Society with a piece of a unicorn's horn, they proceeded to try its virtues in retaining within a charmed circle a poor spider, which, however, contrived to run away spite of their repeated efforts.

Now, our circumstances are very different from theirs. Physical science is not, as it was then, a dreamy mystery, struggling for life in the breasts of a few speculative philosophers. It has made itself eyes in the telescope, arms in the steam-engine, wings in electricity. It is a living thing. Men may now rest on science itself for support,

and not on each other. It is only extreme cases of views pushed beyond the ideas of the age,—of views anticipatory of the future of science,—that seem to demand the support of societies. We may admit respecting some of the generalizations of Faraday and Owen, for example, that had they emanated from some remote, unheard of country-side, they would have made no immediate impression, and would have fairly seen the day only in the next generation as singular foreshadowings of doctrines then familiar. But these are exceptions, not the rule.

Neither is combination now, as of old, essential to the prosecution of experimental research. Societies, in their corporate capacities, are no longer searchers after truths. They leave that work to individuals. Not only are we not called on to unite in the prosecution of experiments, but it rarely even happens that we are called on to lend pecuniary aid to such objects. It is possible that this Society may have been too restrictive in its grants for the prosecution of experiments; but assuredly this is an error in the right direction. A Society like this should never, as it appears to me (but I, of course, give my individual opinion only), by its funds undertake researches which may either prove of doubtful value on the one hand, or form an honourable incentive to individual energy on the other. The only reasonable grounds on which I can imagine grants of this kind may be legitimately founded, are these three:—The reduction of experiments already made; the repetition or examination of old experiments; and the continuation of researches which have been presented to the Society and approved by them. And that the Society, through their Council, have practically recognised these principles will appear, when I mention that the grants which have been made during the last twenty-five years have been limited almost exclusively to the purchase of magnetical and meteorological apparatus, and to the reduction of the observations made at the Makerstoun Observatory, at the Calton Hill, and at Mr Adie's residence.

Having now pointed out what are not the objects of such a Society as this, I may be fairly expected to state what I consider those objects to be. They appear to me to consist mainly of these two,—mutual influence and publication.

The end of our intercourse is encouragement and guidance, often even restraint. The history of the world tells many a sad tale of

the waste of solitary strength. Some of the most illustrious names even have suffered from the want of cotemporary corresponding genius. Witness Roger Bacon, Tycho Brahe, Landen. But this is not all. The injury which great men sustain from want of collision is not half so blighting as that which they occasionally communicate. It is the prerogative of a commanding intellect to create for itself a sort of worship, and this worship is the certain cause of the retardation of that branch of knowledge on which it has erected itself. Take Newton. When his philosophy was once mastered by his countrymen, they felt themselves elevated with him to the highest pinnacle of excellence. Here was a system of reasoning which opened all the avenues of human knowledge. They naturally considered that, in order to advance, they had only to pursue the track which he had beaten down. Progress was in their eyes simply extension of what Newton had done, and *as* he had done it. On the Continent there was no such reverence for Newton's name. Of his labours, it is true, men gladly availed themselves; but whilst bowing to his conclusions, they yielded no obedience to his methods. In respect to the Differential Calculus, Leibnitz and his followers had adopted, from the first, an alphabetical notation capable of combining with the other characters which enter into analytical reasoning,—a mode of representation as superior to that of Newton as the plain English of my pen is to the Egyptian hieroglyphics. And what followed? Whilst the continental mathematicians pushed triumphantly through the thickets of science, opening up everywhere districts rich in fertility, the English timidly followed them at a vast distance, contented now to clear away a stump, now to explore a secluded nook which the continental mathematicians in their hasty sweep over the country had passed by unnoticed. Is this to be accounted for by a difference in the genius of the people? I think not. For, since the abandonment of their old methods, since the introduction of improved processes by Peacock, Herschel, and Babbage, our island has produced mathematicians of the very highest stamp, inferior to none of their generation. The simple explanation seems to be, that our countrymen were bound hand and foot in the chains of the beautiful but inexpansible systems of Newton, and rapid progress was to them an impossibility. Nor is Newton the only great man whose influence has been excessive, and to that extent injurious. The very same

thing had occurred in France in the preceding generation; and Newton and the "Principia," actually broke down the evil influence in France which they contributed to erect in England. The seventy years which lie half in the seventeenth, and half in the eighteenth century, constitute the most barren period of French science. A brilliant constellation,—Pascal, Fermat, Mersenne, with Descartes at their head,—had just set, and thick and long-continued darkness followed. The brightness of Descartes had blinded the eyes of science. Need I refer to an earlier period, when a similar influence effectually checked all progress, until Galileo broke the chain which had held the civilized world in bondage for centuries,—a chain which Aristotle, a mighty genius like Newton and Descartes, had bound about his followers. In a minor degree, the same influence has been exerted by Bacon, by Locke, and by others. Now, surely it may be expected that a Society like this, not restricted to men of one science, nor even to men of science at all, but embracing every department of human knowledge, should operate powerfully as a preventive to the recurrence of such evils. The influence of great men is rarely injurious, except at a distance, or after their personal influence has disappeared. It was so in the case of Newton. Contact destroys erroneous impressions,—changes evil into good. Correspondence and cotemporary publication produce much of the same effects. Hence great names always appear in clusters. Hooke and Huyghens, and Leibnitz and the Bernoullis, lived around Newton. It was after his death that his countrymen placed him on a solitary pedestal. Minds, like trees, spring upwards from their mutual shelter. The poet's "lodge in some vast wilderness;" the dreamland of literary leisure is not the soil in which great thoughts thrive. Real science, real philosophy, I had almost said real poetry, comes from the dwellers among their fellow-men,—comes from the smoke of great cities. The heart of man drinks in inspiration from the thoughts which are floating about it. Thus, for example, in the science of optics,—a science which seemed to be exhausted,—Malus and Biot, and Young and Brewster, and Fresnel and Arago, mutually influenced each other, and their influence extended to Fraunhofer and Cauchy, and Wollaston and Seebeck, and Airy and Herschel and Plateau, and Wheatstone and Purkinje, and Hamilton and M'Cullagh, and Lloyd and Stokes; until the list of men raised to enduring fame by a single worn-out science is too long for enumeration.

Unquestionably a large amount of the influence which is here traceable is due to publication rather than to personal contact. And this fact brings before us one of the most valuable elements of our union. The writings of deep and original thinkers in any science are not likely to be self-supporting. If successful, their success must be slow. It is only a reputation of the highest order that can ensure the sale of heavy thought. Youthful discoverers have no chance of success. In some departments of knowledge, so crushing is this expense of publication, as even to destroy societies. The Memoirs of the Analytical Society, containing papers by the greatest mathematicians of Britain, reached but one volume, of which, probably, not half a dozen copies were ever sold. "The Mathematician," and the "Cambridge and Dublin Journal," have ceased to exist. The advantage of a large society like this is, that it constitutes both the publisher and the public. Thus papers uninteresting to the mass, perhaps even uninteresting to all at the time of their publication, are handed down to future thinkers, where, in a newly turned up soil, they may grow and produce rich fruit. The work of publication is perhaps our greatest work,—perhaps our properest work. The torch of truth is hereby trimmed and passed on from age to age. The great English philosopher describes man as the interpreter of nature. But this is not his characteristic designation; for are not the beasts, are not the birds, are not the very insects, interpreters of nature? It is as the interpreter of man—the interpreter of man's records—that man stands distinguished. Thus reason transcends instinct that its gifts are transmissive and cumulative. Mind does not stand supported by the mind which exists around it,—not simply, not mainly,—there is a higher and a broader support. The minds of the great of by-gone ages live and work in the breasts of their successors. The old Greeks, I suppose, knew this, and embodied it in the fable of Athene, the goddess of knowledge, who sprang into existence, not as a naked, helpless child, but as a grown-up being, clad in complete armour, from the head of Zeus.

Hence the importance of publication. It is at once the food of existing thought and the seed of future knowledge. A society such as ours has some little difficulty, it may be, in rendering its two functions of personal influence and of publication harmonious. Personal intercourse may operate injuriously on publication. It may reasonably be expected to swell our Transactions with unimportant

papers, the contributions of members whose merits are viewed by too friendly an eye. On the other hand, publication may tend to sour personal intercourse. If such papers only are selected as are likely to prove valuable to cotemporary and future thinkers, there is a possibility that disappointment may ensue, and with it ill fellowship. The Council have a difficult duty in this respect, and they act wisely in referring the papers presented to them, in every case where there is the slightest doubt, to parties at a distance, out of the sphere of local influence. The estimation in which our Transactions are held is an evidence at once of the care which is bestowed in the selection of papers, and of the high scientific position of the Society. To you, the existing members, is confided the duty of maintaining that position, and of upholding the character of our Transactions before the world.

2. Account of the Life and Labours of Dr William Gregory. By Dr Alison.

Dr Gregory, at the time of his death, which took place on the 24th of April last, was Professor of Chemistry in the University of Edinburgh, and one of the Secretaries of this Society. He was born on the 25th of December 1803. His father was the late Dr Gregory; for a long time professor of the practice of medicine in the University of Edinburgh. His brothers, James Crawford, who took the degree of medicine in 1824, and died in 1832, and Duncan, who, when he died, was a Fellow of Trinity College, Cambridge, were both so highly distinguished for their talents and acquirements as to be worthy representatives of a family of no small distinction in the science and literature of the country; but, in Dr Alison's opinion, Dr William Gregory was the member of the family who, in our day, had shown the greatest original talent and devotion to science for its own sake. His love of science manifested itself at an early period. He had been present at an introductory lecture by Dr Hope, which was illustrated by striking experiments. Several of these experiments he contrived to repeat by means of a rude apparatus which he constructed for the purpose. From that time he had always before him the object of ambition which he ultimately attained. It was not, however, until he had made his name known throughout Europe as a chemist, as a favourite pupil