

sea is readily understood. If any such exist it must be confined to the lower part of the berg, to that part which has, at one time or other, moved on the floor of the ice-cap.

The icebergs, when they are first dispersed, float in from 200 to 250 fathoms. When, therefore, they have been drifted to latitudes of 65° or 64° S., the bottom of the berg just reaches the layer at which the temperature of the water is distinctly rising; and it is rapidly melted, the mud and pebbles with which it is more or less charged being precipitated to the bottom. That this precipitation takes place all over the area where the icebergs are breaking up constantly, and to a considerable extent, is evident from the fact of the soundings being entirely composed of such deposits; for the Diatoms, *Globigerinæ*, and Radiolarians are present on the surface in large numbers; and unless the deposit from the ice were abundant it would soon be covered and masked by a layer of the exuvia of surface-organisms.

EXPLANATION OF THE PLATES.

PLATES I. & II.

A *Globigerina* and an *Orbulina*, with the radiating processes entire.

PLATE III.

Figs. 1 & 2. *Pulvinulina*. Figs. 3 & 4. Rhabdoliths. Fig. 5. The new Diatom.

November 30, 1874.

ANNIVERSARY MEETING.

WILLIAM SPOTTISWOODE, M.A., Treasurer and Vice-President, in the Chair.

General Boileau, for the Auditors of the Treasurer's Accounts on the part of the Society, reported that the total receipts during the past year, including a balance of £693 13s. 5d. carried from the preceding year, amount to £5726 3s. 3d.; and that the total expenditure in the same period amounts to £5451 11s. 5d., leaving a balance at the Bankers of £236 18s. 8d., and £37 13s. 2d. in the hands of the Treasurer.

The thanks of the Society were voted to the Treasurer and Auditors.

The Secretary read the following Lists :—

Fellows deceased since the last Anniversary.

On the Home List.

Neil Arnott, M.D.	Prof. John Phillips, LL.D.
Rev. James William Bellamy, B.D.	Sir John Rennie, Knt.
Sir William Fairbairn, Bart., LL.D.	The Right Hon. Sir George Rose,
Prof. Robert Edmond Grant, M.D.	Knt.
Sir William Jardine, Bart.	Edward Smith, M.D.
Edwin Lankester, M.D.	Major-Gen. Sir John Mark Fre-
David Livingstone, LL.D.	deric Smith, R.E., K.H.
Sir James Ranald Martin, C.B.	Edward Hamilton Stirling.

On the Foreign List.

Louis Agassiz.	Philippe Gustave de Pontécoulant.
Anders Jonas Angström.	Lambert Adolphe Jacques Que-
J. B. A. L. L. Elie de Beaumont.	telet.
Peter Andreas Hansen.	

Withdrawn.

Prof. Charles Piazza Smyth.

Change of Name and Title.

Alexander Robert Johnston *to* Campbell-Johnston.
 Right Hon. Sir John Pakington, Bart., *to* Lord Hampton.

Fellows elected since the last Anniversary.

Edward Viscount Cardwell, F.G.S.	John Eliot Howard, F.L.S.
Isaac Lowthian Bell, F.C.S.	Sir Henry Sumner Maine, LL.D.
W. T. Blanford, F.G.S.	Edmund James Mills, D.Sc.
Henry Bowman Brady, F.L.S.	Rev. Stephen Joseph Perry,
Thomas Lauder Brunton, M.D.,	F.R.A.S.
Sc.D.	Henry Wyldbore Rumsey, M.D.
Prof. W. Kingdon Clifford, M.A.	Alfred R. C. Selwyn, F.G.S.
Augustus Wollaston Franks, M.A.	Charles William Wilson, Major
Prof. Olaus Henrici, Ph.D.	R.E.
Prescott G. Hewett, F.R.C.S.	

The Treasurer (for the President) then addressed the Society as follows :—

GENTLEMEN,

It has been represented to me that, the Royal Society being now, after eighteen years of temporary accommodation, settled in quarters of which

we hope to retain undisturbed occupation for some generations to come, an account of the present position of the Society in respect of our more important possessions, foundations, and functions, and our relations to the Government, would not only be generally acceptable, but might even be required of me by that large and increasing class of Fellows who live far from our doors. This class now numbers as nearly as possible one half of the Society, few of whom can be even occasional attendants at our Meetings; and if to this class of absentees be added the large number of residents within the metropolitan district whose avocations prevent their attending, it will not surprise you to hear that (as I have ascertained by careful inquiry) a very large proportion of our fellow Members know little of the Society's proceedings beyond what appears in our periodical publications, nor of our collections, nor of the tenure under which we occupy our apartments under the Crown—and that many have never heard of the funds we administer, whether our own or those voted by Parliament in aid of scientific research, nor of the fund for relief of the necessitous, nor of the gratuitous services rendered by the Society to various departments of the Government.

Unlike the great Academies of the continent, the Royal Society has never published an Almanack or Annuaire containing information upon its privileges, duties, constitution, and management. Particulars on these points are for the most part now accessible to the Fellows only by direct inquiry, or through the Council Minutes; and these, to non-resident Fellows, are practically inaccessible. In my own case, though I have long been a resident Fellow and had the honour of serving on your Councils for not a few years, it was not until I was placed in the position I now hold that I became aware of the number and magnitude of the Society's duties, or of the responsibility these impose on your officers.

It is upwards of a quarter of a century since an account of the foundations that then existed and the work the Society then carried on was published in Weld's valuable, but too diffuse, '*History of the Royal Society.*' These have all been greatly modified or extended since that period; and many others have been added to them; so that the time has now arrived when a statement of the large funds applicable to scientific research which the Society distributes, the conditions under which these are to be applied for, and other particulars, might with advantage be published in a summary form and distributed to the Fellows annually.

Finance.—After the financial statement made by the Auditors, you will, I am sure conclude that there is no cause for apprehension in respect of the Society's funds or income; and when to this I add that the expenses of removal from the old House, including new furniture, amount to £1300, and that the volume of Transactions for the present year will contain eighty-six Plates, the largest number hitherto executed at the

Society's cost within the same period, you will also conclude that there is no want of means for providing illustrations to papers communicated to us for publication.

The landed property of the Society, as stated in the printed balance-sheet now before you, consists of an estate at Acton, in the neighbourhood of London, and an estate at Mablethorpe, Lincolnshire; each yielding a good rental. The Acton estate, at present on lease to an agricultural tenant, is planned to be let as building land, for which it is favourably situate, and will thus become increasingly valuable.

The subject of the tenure under which the Society holds the apartments we now occupy was brought up on a question of Insurance. That question has been satisfactorily settled by reference to the Treasury; but it may still be worth while briefly to state the facts which the Council considered as furnishing valid grounds for appealing against the requirement to insure, and for at the same time requesting an assurance that the permanence of our tenure is in no way weakened by our removal to this building. These are:—that when the apartments in Somerset House were originally assigned to the Society by command of George III., they were granted “during the pleasure of the Crown without payment of rent or any other pecuniary consideration whatever;” that the Society was not required to insure either in Somerset House or old Burlington House; that when the Society removed at the request of the Government from Somerset House, and accepted temporary accommodation in Burlington House, it was under the written assurance of the Secretary of the Treasury, addressed to the President of the Society, that the claims of the Society to “permanent accommodation should not be thereby in any respect weakened;” that in the debate on the estimates in 1857, the Secretary of the Treasury stated, in his place in Parliament, that “the Society could not be turned out of Somerset House without its own consent,” and that “it was entitled to rooms by Royal grant.”

To this appeal the Lords Commissioners returned a satisfactory answer; and their letter, dated October 27th last, assures us “that there is no intention on the part of the Treasury to alter the terms on which the Royal Society holds its appointments under the Crown; the conditions of the Society's tenure will therefore be the same as those on which it occupied rooms in Somerset House, and was subsequently transferred to Burlington House.”

While feeling it my duty to lay these details before you, I must accompany them with the assurance that nothing has occurred during this correspondence to disturb the unbroken harmony that has existed between Her Majesty's Government and the Royal Society ever since our occupation of apartments under favour of the Crown.

On every occasion of change of quarters the Society has received abundant proofs of the regard shown by the Government for its position,

requirements, and continued prosperity; and there is, I am sure, every disposition on the part of the Government to recognize the fact that the privileges conferred on the Society are fully reciprocated by the multifarious aid and advice furnished by your Council in matters of the greatest importance to the well-being of the State.

The practice of electing Fellows of the so-called privileged class whose qualifications were limited to accident of lineage or political status, has been viewed with grave dissatisfaction by many, ever since the election of ordinary Fellows was limited to fifteen. The Council has in consequence felt it to be its duty to give most careful attention to the subject, which it referred to a Committee, whose report has been adopted and embodied in a bye-law.

The privileged class consisted, as you are aware, of certain Royal personages, Peers of the Realm and Privy Councillors (Statutes, Sect. IV. cap. 1); and they were balloted for at any meeting of the Society, after a week's notice given on the part of any Fellow, without a suspended certificate, or other form whatever.

The Committee reported that it was desirable to retain the power of electing, as a "privileged class," persons who, while precluded by public duties or otherwise from meeting the scientific requirements customary in the case of ordinary Fellows, possessed the power and had shown the wish to forward the ends of the Society, and recommended that the class should be limited to the Princes of the Blood Royal, and members of Her Majesty's Privy Council. And with regard to the method of election, they recommended that a Prince of the Blood Royal might be publicly proposed at any ordinary meeting, and balloted for at the next; that, with regard to a member of Her Majesty's Privy Council, he might be proposed at any ordinary meeting by means of a certificate prepared in accordance with Chap. I. Sect. 3 of the Statutes, membership of the Privy Council being the only qualification stated—the certificate being, with the Society's permission, suspended in the meeting-room till the day of election, which should fall on the third ordinary meeting after suspension.

Having regard to the eminent services to the State which have been rendered by Privy Councillors, and to the fact that all Peers who do render such services are habitually enrolled on the list of Privy Councillors, it was believed by the Council that the effect of thus limiting the privileged class would be that the doors of the Society would remain open to all such Peers as desire and deserve admission, but who have not the ordinary qualifications for fellowship; while all such Peers as might appear with claims which compete with those of ordinary candidates would prefer owing the fellowship to their qualifications rather than to their birth.

The Council hopes that by this means the so-called privileged class

will be reinforced, and that statesmen who may have considered themselves ineligible through want of purely scientific qualifications, or who have hesitated to offer themselves from the fear of interfering with the scientific claims of others, will in future come forward and recruit our ranks.

A passing notice of the manner of proposing candidates for the ordinary class of fellowship may not be out of place. Theoretically this is done by a Fellow who is supposed to be a friend of the candidate, is versed in the science on which his claims are founded, and is satisfied of his fitness in all respects for fellowship. It is most desirable that the Fellow who proposes a candidate should take upon himself the whole duty and responsibility of preparing the certificate, should sign it first, and himself procure the signatures of other Fellows in whose judgment of the candidate's qualifications the Council and the Society may place implicit confidence. It is unsatisfactory to see attached to a candidate's certificate an ill-considered list of signatures, whether given from personal or from general knowledge ; and the happily rare practice of soliciting signatures and support, directly or indirectly, by the candidate himself, cannot be too strongly deprecated. For obvious reasons the President, Officers, and other Members of Council have hitherto during their periods of office abstained from proposing a candidate of the ordinary class or from signing his certificate, but have not withdrawn their signatures from certificates sent in before they took office. The Council and Officers will probably not feel the same objection to signing the certificates of candidates of the privileged class, as these will not be selected for ballot by the Council, but will be elected by the Society at large at their ordinary meetings.

In carrying on the business of the Society the Council is much indebted to Committees appointed annually for special purposes, or to whom an occasional question is referred. The annual appointments include the Government-Grant, the Library, the Soirée, and the Acton-Estate Committees. The temporary Committees of the past year have been the Circumnavigation, the Transit-of-Venus-Expeditions, the Arctic, the House, the Brixham-Cave, the Privileged-Classes, and the Davy-Medal Committee. Besides these there are two permanent Committees, the Meteorological and the Scientific-Relief, to which fresh Members are appointed as vacancies occur. From these designations it will be understood that some of the Committees have been occupied with questions connected with the Government service, while others have devoted themselves exclusively to the business of the Society.

I shall now mention such of the labours of these Committees as seem to be most worthy of your attention.

The *Meteorological Committee of the Board of Trade*, as it ought to be called, discharges in all respects the most arduous and responsible duties of any, controlling as it does the whole machinery of the British

Government for the making, registering, and publishing of especially oceanic meteorological phenomena throughout the globe.

The primary purpose for which this and all similar offices were established, was the acceleration of ocean passages for vessels by an accurate investigation of the prevalent winds and currents. In other words, their great object is to aid the seaman in what Captain Basil Hall called "one of the chief points of his duty"—namely, "to know when to find a fair wind, and where to fall in with a favourable current." The first impulse to the formation of an Office for this purpose was given by the late General Sir J. Burgoyne, who in 1852 started the idea of land observations to be carried out by the Corps of Royal Engineers.

Shortly afterwards our Government corresponded with the United-States Government on the subject of cooperating in a scheme for land observations, which was followed by a suggestion on the part of America that the operations should be extended to the sea.

The correspondence was referred to the Royal Society, which warmly approved the scheme of sea observations, but saw many difficulties in carrying out that for the land. The Brussels Conference followed in 1853, when representatives of most of the maritime nations assembled and adopted a uniform plan of action. Soon after this, Lord Cardwell, then President of the Board of Trade, established the Meteorological Department of that office, and placed the late Admiral FitzRoy at the head of it—the Royal Society, at the request of the Government, supplying copious and complete instructions for his guidance, which were drawn up mainly by Sir Edward Sabine. Admiral FitzRoy's zeal and his great labours are known to all; he worked out the system of verifying and lending instruments, planning surveys, registering observations, publishing results; and, lastly, himself originated the plan of predicting the weather, and establishing storm-signals at the sea-ports along the coast.

On Admiral FitzRoy's death in 1865 the Royal Society was again consulted as to the position and prospects of the Office. Its Report, which did not differ materially from that of 1855, was in 1866 referred to a Committee, composed of a representative of the Board of Trade, of the Admiralty, and of the Royal Society. This Committee supported the previously expressed views of the Society, and suggested the placing of the Office under efficient scientific superintendence; upon which the Society, in the same year, was requested by the Government to undertake the superintendence of what had been the Meteorological Department of the Board of Trade. To this request the Council of the Society so far acceded as to nominate a Committee of eight Fellows (subsequently increased to ten) to undertake the entire and almost absolute control of the Office; and a Parliamentary grant of £10,000 per annum was provided to maintain it.

This is in brief the history of the connexion between the Royal Society and the Meteorological Office on the one hand, and between the Office and

the Government on the other. It is a very anomalous position, and has been greatly misunderstood. It has led to the misconception on the part of some that the Society controlled the Office, and by others that the Government (Board of Trade) controlled it, and by more that the annual grant of £10,000 is made to and in support of the Royal Society, or of its own objects, whereas the grant is paid direct to the Director of the Office as soon as voted. The Society's action is confined to the selection of the Committee, which superintends the Office, while the Board of Trade, leaving to the Committee the details of their operations, exercise only a general control. The labours of the Committee are entirely gratuitous, and no part of the £10,000 is touched by them or by the Royal Society.

I believe there is no parallel to such an organization as this in any other department of the Government. It has its advantage in securing to the Office absolute freedom from that disturbing element in the public offices, that their heads are chosen partly on political grounds and change with every Government, and its disadvantage in wanting the support of direct Government authority and prestige. Hitherto, owing to the care of the Committee, which meets almost weekly, to the zeal and efficiency of the Director (who is also Secretary to the Committee) and of the Marine Superintendent, it has worked well. Into its working it is not my purpose to enter; its efficiency and value are fully acknowledged by the public. No more practical proof of this can be cited than the general desire, supported by memorials presented to Parliament, for the restitution of the storm-signals, which were discontinued after Admiral FitzRoy's decease, on the ground of their trustworthiness having been called in question. It is no little testimony to the foresight of that zealous officer that they are not only now reestablished and in full working order at 100 stations on the coast of Great Britain, but that the very warnings issued from Paris to the coast of France by the Government of that country are actually sent to Paris from the Meteorological Office in London. The same warnings are transmitted along the whole European coast, from Norway to Spain; and the system has been extended to Italy, Portugal, and Australia.

The Kew Observatory, which is used also as the Central Observatory of the Meteorological Committee, is supported by a grant from that Committee, and by the munificence of our Fellow, Mr. Gassiot, who has settled on it a fund which produces about £500 a year for the carrying on of observations chiefly magnetical.

The Circumnavigation Committee.—The scientific results of the 'Challenger' Expedition have far exceeded our most sanguine anticipations. The Temperature Survey of the Atlantic may, as Dr. Carpenter informs me, be truly characterized as the most important single contribution ever made to Terrestrial Physics, presenting as it does the whole thermal

stratification of an oceanic area of about 15 million square miles and with an average depth of 15,000 feet. Nor are the results of the Pacific Survey less important. Some of these were laid before you at our meeting of the 26th inst. in Prof. Wyville Thomson's "Preliminary Notes on the Nature of the Sea-Bottom in the South Sea," which reveal the existence of hitherto unsuspected processes of aqueous metamorphism at great depths in the ocean, and throw an entirely new light upon the geological problem of the origin of "azoic" clays and schists.

Valuable papers on new and little-known marine animals have been contributed to our Transactions and Proceedings by Mr. Willemöes-Suhm, Mr. Moseley, and other members of the Civilian Scientific Staff of the 'Challenger,' and a Number of the Journal of the Linnean Society is devoted to the Botanical observations and collections made by Mr. Moseley during the course of the voyage.

Transit-of-Venus Committee.—Upon the representation of your Council, Her Majesty's Government has attached naturalists to two of the astronomical expeditions sent out from this country to observe the approaching transit of Venus. The stations selected were the two most inaccessible to ordinary cruisers, and at the same time most interesting in regard to their natural productions—namely, the island of Rodriguez in the Mauritius group, and Kerguelen's Land in the South Indian Ocean.

The objects and importance of these appointments were laid before the Government in the following statement:—

"It is an unexplained fact in the physical history of our globe, that all known oceanic archipelagos distant from the great continents, with the sole exceptions of the Seychelles and of a solitary islet of the Mascarene group (which islet is Rodriguez), are of volcanic origin. According to the meagre accounts hitherto published, Rodriguez consists of granite overlaid with limestone and other recent rocks, in the caves of which have been found the remains of recently extinct birds of a very singular structure. These facts, taken together with what is known of the Natural History of the volcanic islets of Mauritius and Bourbon to the west of Rodriguez and of the granitic archipelago of the Seychelles to the north of it, render an investigation of its natural products a matter of exceptional scientific interest, which, if properly carried out, cannot fail to be productive of most important results.

"As regards Kerguelen's Land, this large island (100 by 50 miles) was last visited in 1840, by the Antarctic Expedition under Sir James Ross, in midwinter only, when it was found to contain a scanty flora of flowering plants, some of which belong to entirely new types, and an extraordinary profusion of marine animals and plants of the greatest interest, many of them being representatives of north-temperate and Arctic forms of life.

"H.M.S. 'Challenger' will no doubt visit Kerguelen's Land, and

collect largely ; but it is evident that many years would be required to obtain even a fair representation of its marine products ; and though we are not prepared to say that the scientific objects to be obtained by a naturalist's visit to Kerguelen's Land are of equal importance to those which Rodriguez will yield, we cannot but regard it as in every respect most desirable that the rare opportunity of sending a collector to Kerguelen's Land should not be lost."

I may further state as a matter of great scientific interest, that Rodriguez contains the remains of a gigantic species of land-tortoise allied to those still surviving in some other islands of the Mauritian group, and that the nearest allies of these are the gigantic tortoises of the Galapagos Islands in the opposite hemisphere of the globe, as one of our Fellows, Dr. Günther, has shown in a paper read last Session to the Society. Very valuable collections of these fossils have been made by Mr. Newton, the Colonial Secretary of Mauritius, during a brief stay which he was enabled to make in Rodriguez ; but the materials are far from sufficient for obtaining all the information we want.

In accordance with your Council's recommendation, the Treasury sanctioned the appointment of four naturalists—three to Rodriguez, and one to Kerguelen's Land. Those sent out to Rodriguez are:—Mr. I. B. Balfour, son of Prof. Balfour, of Edinburgh, F.R.S., who, besides being educated as a botanist, has worked as a field geologist in the Geological Survey of Scotland ; he is charged with the duties of botanist and geologist ; Mr. George Gulliver, son of one of our Fellows and a pupil of Professor Rolleston, in Oxford, who goes out as naturalist ; and Mr. H. H. Slater, who has had great experience as a cave-explorer, and who will devote his attention especially to the collection of fossils.

The Kerguelen's-Land duties are undertaken by the Rev. A. E. Eaton, M.A., a gentleman most favourably known as an entomologist, and who had made very important collections in Spitzbergen, which he visited for the purpose of studying its fauna and flora. These gentlemen had, by the last accounts, all proceeded to their destinations.

Committee of Papers.—The strength of the Society being represented by its publications, the Committee of Papers is the one whose functions are unquestionably the highest and most onerous, as they are the most closely scrutinized by the Fellows and the public.

Every member of the Council is included in this Committee, which meets after almost every Council-meeting ; and no part of its duties is at present performed by a subcommittee. It appears to me to be very doubtful whether this arrangement, even if the best, can last, owing to the greatly increased number of papers now communicated and their augmenting bulk, and to the value of their contents being less easily estimated as the subjects of scientific research become more specialized. As it is, in the majority of cases but few of the members present can

judge of the merits of many of the papers ; and it is not easy after a protracted Council-meeting, and one occupied with promiscuous business, to fix the attention of a large Committee upon subjects with which but few members present may be familiar. It is true that the Committee is aided in all cases by the written opinions of careful and impartial referees, and by the special attainments of our Secretaries, and that it is most desirable that the sometimes divergent opinions of these should be weighed by others as well as by experts in the subjects of the papers. But for all this a Committee of the whole Council is not necessary ; and though I should not be disposed to advocate a return to a system once pursued of resolving the Committee into subcommittees charged with special subjects, I think it possible that some other plan may meet the difficulties of the case and relieve our overburthened Council of much labour. A possible plan for relieving both the Council and the Committee, while securing as careful a scrutiny of the Papers as we now have, would be a division of the labours of the Committee, and an addition of extra members to its number, chosen from among the Fellows, who should continue in office throughout the Session. This, or some plan of the kind, would have the advantage of engaging more of the Fellows than at present in the affairs of the Society ; and I feel sure that so responsible a position as that of Extra Member of the Committee of Papers would be accepted with pride by those Fellows who are most competent to discharge the duties.

It seems convenient to refer here to suggestions that have been made to me as to the expediency of breaking up our Transactions or Proceedings, or both, into sections devoted to Physics and Biology respectively, or even subdividing them still more. This separation has been advocated on the ground that science has become so specialized that no scientific man can grasp all its subdivisions, that the mixed publications are cumbersome and difficult to consult, and that private libraries are now overburthened with the publications of Societies, of each of which a small part would suffice for all their possessors' wants. There is no question that this, if now an evil, will soon become intolerable ; for our publications increase rapidly in number of contributions, and in their bulk. There are, however, so many considerations to be discussed before any system of relief can be adopted, that I confine myself to stating the subject as it has been urged upon me.

The Society's Library now comprehends 36,270 volumes and 10,000 tracts, the most considerable collection of scientific works in the possession of any private body ; and in respect of Transactions and Proceedings of Scientific Academies, Societies, and Institutions, I believe it is unrivalled among public bodies.

A complete Catalogue of the Scientific Books, MSS., and Letters, which I regret to say is unaccompanied by any historical or other information regarding the Library, was printed in 1839. Another Catalogue

of the Miscellaneous Literature and Letters was printed in 1841; and there is also a manuscript Catalogue of Maps, Charts, Engravings and Drawings, numbering upwards of 5000.

For some years past the Library Committee, indefatigable in steady endeavour, have greatly increased the value and efficiency of our Library; and in 1873, previous to leaving old Burlington House for our present apartments, it ordered a rearrangement of the whole, and the preparation of a new Catalogue, which is being proceeded with as fast as the current duties of the officers will permit.

In the mean time the Catalogue of Transactions and Journals is printed for working-purposes, and will be added to until such time as the general Catalogue is ready for press.

The collection of Oriental MSS. presented by Sir William Jones in 1792, and added to by his widow in 1797, was largely consulted by several of the distinguished foreigners who assembled at the Oriental Congress in London last September. From conversation with some of these gentlemen, I learnt that the collection contains many documents of the greatest value and rarity, together with some that are unique; and it may be worth the consideration of the Council, whether they would not be more useful if transferred to, or deposited in, the India Office or some other Oriental Library, where they would be consulted to greater advantage than here? At present they occupy part of the room devoted to our Archives.

The two most noteworthy additions to the Library during the past year have been:—the MSS. on logic and mathematics of our late fellow Professor Boole, presented by his widow; and Dr. Fayrer's collection of 47 original drawings of the poisonous snakes of India, which are of interest in connexion with his and Dr. Brunton's experiments on snake-poisons, printed in our 'Proceedings.'

The apartments devoted to the Library afford space for 20 years' addition at the present rate of increase; they are remarkably commodious; and those who assembled at our Soirée last spring and saw them for the first time lighted up and decorated, will consider with me that they are not only a noble suite of apartments, but that they are in keeping with the purposes and the high position of the Society.

You are aware that the Council resolved that the Catalogue of Scientific Papers should be continued through the decade 1864–1873. This work is now progressing under direction of the Library Committee, who have had charge of the undertaking from the commencement. The necessary funds are granted by a vote of the Council; and we may hope, in the course of the coming year, that the seventh volume of this important work will be ready for publication. And we confidently trust that the Government will extend its liberality by printing this as it did the former volumes of the series. The total outlay upon the six volumes already published (which comprise papers published between 1800 and 1863)

has been £8936 12s., of which £3720 15s. 6d. (the cost of preparation) was defrayed by the Society, and the rest (the cost of printing, paper, and binding) by the Treasury; against which must be set the proceeds of sale, repaid to the Treasury in occasional amounts, the last within the present year, making a total of one thousand pounds.

The number of copies of the Society's Transactions distributed gratuitously to Institutions and Individuals not Fellows of the Society is now 209, and of the Proceedings 325.

House Committee.—The great labours of this Committee in connexion with the removal into the apartments we now occupy had not terminated at the beginning of the past Session; and various matters have still to be attended to. That the arrangements the Committee has made have given satisfaction to the Fellows at large has been amply acknowledged. We are, indeed, greatly indebted to them for the knowledge, experience, and time all so freely given in our service, as also to the knowledge of our requirements and the practical views of our Assistant-Secretary, upon whom fell the duty of suggesting the best disposition of the apartments throughout this large and commodious building. Lastly, I would beg your permission to record the services of the eminent architect, Mr. Barry, who has throughout shown the greatest regard to our position and requirements, and but for whose professional ability enlisted in our service we might have found ourselves as ill as we are now well accommodated.

Funds and Bequests.—*The Donation Fund.* In 1828 our former President, Dr. Wollaston, invested £2000 in the Three per Cents for the creation of a Fund, the dividends from which were to be expended liberally “from time to time in promoting experimental researches, or in rewarding those by whom such researches have been made, or in such other manner as shall appear to the President and Council for the time being most conducive to the interests of the Society in particular, or of Science in general.” There is no restriction as regards nationality; but Members of Council are excluded from participation during their term of office.

To this Fund many liberal additions were made: Mr. Davies Gilbert gave £1000; Warburton, Hatchett, Guillemard, and Chantrey each contributed 100 guineas. From these gifts, and by accumulations, the Fund in 1849 had increased to £5293. With subsequent contributions, and a bequest of £500 by our eminent Fellow the late Sir Francis Ronalds, the total, as shown by the balance-sheet now in your hands, amounts to £5816 1s. 1d. In addition to the balance-sheet already referred to, a detailed statement of grants from the Donation Fund is, in accordance with a resolution of Council, published with the Report of the Anniversary Meeting.

Sir Francis Ronalds died in 1873; his bequest (reduced by payment of legacy duty to £450) was made, as declared in his Will, in recognition

of the advantages he had derived when Honorary Director of the Observatory at Kew, from the sums granted to him out of the Fund to aid him in the construction of his photographic apparatus for the registration of Terrestrial Magnetism, Atmospheric Electricity, and other Meteorological phenomena.

Of the grants made during the past Session, I would especially mention £100 to Dr. Dohrn in support of the Stazione Zoologica at Naples, in which two British naturalists, Mr. Lankester and Mr. Balfour, have recently made a valuable series of observations on marine animals.

Among the others were a grant of £25 to Dr. Carpenter for the purpose of constructing an apparatus to illustrate the theory of Oceanic Circulation in relation to temperature, and £50 in aid of the Sub-Wealden Exploration. In reference to this last, I should remark that, in recognition of the important scientific results which have been obtained from the Sub-Wealden boring (which is now carried to a depth of 1000 feet), and in view of obtaining further assistance from Her Majesty's Government towards the work, the Council authorized me to lay before the Chancellor of the Exchequer such a statement as I should judge appropriate with the object of obtaining a grant from the public purse in aid of the boring.

In pursuance of this resolution, I joined the Presidents of the Geological Society and of the Institution of Civil Engineers in presenting a Memorial, which was most favourably received, and was answered by a promise on the part of the Treasury of £100 for every 100 feet of boring that should be accomplished, down to a depth of 2000 feet.

The Government Grant (of £1000 per annum) continues to be expended with satisfactory results. I must refer you to the report which will be published in our Proceedings for the statement of the grants, making, however, special allusion to Dr. Klein's work on the Anatomy of the Lymphatic system, towards which £100 from this fund was granted, and by means of which copies have been distributed to the best advantage in this country and abroad.

The Scientific-Relief Fund slowly augments, and has been of the greatest service. It is almost unique among charities in costing nothing in the working, and in being inaccessible to direct or indirect canvassing. The amount hitherto expended in relief since its establishment has been £2240, extended to fifty-two individuals or families.

The Gilchrist Trust.—One of the most munificent bequests ever made in the interest of science is that of the late Dr. Borthwick Gilchrist, a retired Indian Medical Officer, well-known as the author of the 'Grammar of Hindostani.'

Dr. Gilchrist was an intimate friend of Dr. Birkbeck, Joseph Hume, Sir John Bowring, and others of the advanced liberals of fifty years ago, and took part in the establishment of the "London University," now University College. He died in 1841, leaving his large fortune to be devoted, after his wife's death, to "the benefit, advancement, and propaga-

tion of education and learning in every part of the world, as circumstances permit," the Trustees having an "absolute and uncontrolled discretion" as to the mode of applying it. The income of the Trust, which is being gradually augmented by the sale of building-lots at Sydney, where Dr. Gilchrist had invested a considerable sum in the purchase of an estate with a view to its ultimate rather than its immediate productiveness, now amounts to about £4000 per annum. The Trustees have created various Scholarships for bringing young men of ability from India and the Colonies to carry on their education in this country; and they have also given assistance to various educational institutions which they considered to have a claim for occasional help from the Fund, such as the Working Men's College in London and the Edinburgh School of Arts; and they have instituted short courses of scientific lectures to working men in London, Manchester, Leeds, and Liverpool.

The Trustees now desire to do something effectual for the *advancement* of learning; and a scheme—subsequently submitted to the Council of the Royal Society—was suggested by Dr. Carpenter, the Secretary of the Trust, as one which seemed to him to be the most effectual for carrying out this object; and it was adopted by the Trustees on his recommendation.

In a letter addressed to myself in June last Dr. Carpenter informed your Council that the Trustees of the Fund had resolved to employ a portion of it in the promotion of scientific research, and empowered him to submit the following liberal proposal to the consideration of your Council: namely, the Trustees propose annually to entertain the question of placing £1000 at the disposal of the Council of the Royal Society to be expended in grants to men of proved ability in scientific research, but who, from their limited pecuniary means, are precluded from prosecuting inquiries of great interest by the necessity of devoting to remunerative work the time they would wish to devote to such inquiries, the Council of the Society to undertake on their part to recommend to the Trustees suitable subjects of inquiry, competent men circumstanced as indicated, and the sum to be assigned in each case. The Trustees desire, further, that the grants should not be regarded as eleemosynary, but rather as Studentships carrying with them scientific distinction, and not as rewards for past work, but as means for work to be done.

Upon this communication (in which you cannot fail to perceive not only an enlightened regard for the interests of science on the part of the Trustees, but, on the part of their Secretary, an accurate perception of the best means of supplying one of the greatest scientific needs), your Council appointed a Committee to report on the proposal. Their labours are already concluded; the proposition has been accepted, but under stipulation for fulfilment of the following conditions by applicants for the grants:—

That the grants should be made for one year only in each case, though subject to renewal.

That the recipients be designated *Gilchrist Students* for the year in which the grants are made.

That no application for grants be received except it has been approved by the President and Council of any one of the six Societies—namely, the Royal, Astronomical, Chemical, Linnean, Geological, and Zoological; and that all applications be submitted to a Committee, consisting of the Presidents of the six Societies together with the Officers of the Royal Society, which Committee shall recommend the applicants to the Gilchrist Trustees.

That a form of application be prepared setting forth the general objects of the Gilchrist Studentships, and the conditions upon which they are conferred.

That each Student furnish, at the end of the year for which the grant is made, a report of his progress and results, signed by himself and countersigned by the President of the Society through which the application was transmitted.

Simple and acceptable as such a scheme appears, it may prove by no means always smooth in the working. It will be easy to find subjects, and candidates too; but the Trustees must not expect in every case a full annual harvest for what they annually sow, or that some of the seed will not be productive of a crop of good intentions rather than good fruits. Putting aside all the temptations to procrastination that prepayment fosters, there is the fact that every subject of scientific research presents a labyrinth in which the investigator may wander further and further from the main gallery, always following some tempting lateral track leading to discovery, but never either reaching the end of it or getting back to that which he set out to follow.

We must, however, hope for the best results from so munificent an endowment of scientific research, and watch with the deepest interest the progress of an experiment, the means for instituting which, after being urgently called for from the Government and our Universities, are now forthcoming from private resources.

The Wintringham Bequest.—Hitherto this curious bequest has, so far as the Society is concerned, proved alike profitless and troublesome, as will appear from a few particulars of its history.

Sir Clifton Wintringham, Bart., a Fellow and son of a Fellow of this Society, died at Hammersmith, January 10, 1794, and bequeathed £1200 three-per-cent. Consols (payable twelve months after the decease of his wife) to the Royal Society, subject to the condition that within one month of the payment of the annual dividends in each year the President should fix on the subjects for three essays in Natural Philosophy or Chemistry, and submit them to the Society to be adopted by secret ballot. The subjects were then to be advertised in the papers of London, Paris, and the Hague: the essays were to be sent to the Royal Society within ten months of date of advertisement, each author to deliver ten copies; and

the President and nine Members of Council were to choose the best, and then to have made a silver cup of £30 value, to be presented to the successful essayist on the last Thursday in December. In case of failure the dividends were to be paid to the Treasurer of the Foundling Hospital.

Lady Wintringham died in 1805; but the Royal Society heard nothing of the bequest until 1839, when steps were taken to obtain possession of the fund. The Foundling Hospital put forward their claim; legal proceedings were taken, costs being paid out of accumulated dividends; and in 1842 the Royal Society were put in possession of the £1200 stock. Owing to the essential difficulties of carrying out the conditions of the testator's will, the dividends have ever since been paid to the Foundling Hospital.

The Council, desirous that those difficulties should be overcome, have at different times appointed a Committee to examine the question and suggest if possible a solution; but no satisfactory conclusion has yet been arrived at.

The Handley Bequest.—Mr. Edwin Handley, of Old Bracknell, Berks, was a country gentleman, and the possessor of a considerable landed and personal estate in Berkshire and Middlesex. He died in 1843, having bequeathed the bulk of his property, after the decease of his two sisters, to the Royal Society.

The last of these ladies died in 1872, since when certain legal formalities have been complied with, and the claims of the Royal Society to the landed estates under the Mortmain Act have been brought before the Court. In February last the Master of the Rolls decided that "the gifts to the Royal Society, so far as they relate to pure personalty, are good charitable gifts, but otherwise void." The personalty as set forth in the "Bill of Complaint," comprises £6033 7s. 5d. Three-per-Cent. Consols, £1904 17s. 2d. Reduced, and £41 18s. 5d. Bank-of-England Stock.

By the terms of the Will the Society is to preserve the property intact in value, as a Fund Principal, the income of which is to be applied to the rewarding inventions in art, discoveries in science, physical or metaphysical ("which last and highest branch of science," to quote the testator's words, "has been of late most injuriously neglected in this country"), or for the assistance of fit persons in the prosecution of inventions and discoveries. The rewards or assistance are to be granted annually, or after longer periods, to British subjects or foreigners, according to the impartial decision of the President and Council.

The Dircks Bequest.—Mr. Henry Dircks, of Liverpool, and latterly of London, who died in 1872, has bequeathed the residue of his property (about £4000), after payment of debts and charges, to the Royal Society, Royal Society of Literature, Chemical Society, and Royal Society of Edinburgh, in equal shares and proportions, in furtherance of their

several objects. As, however, it is possible that certain claims to the residue under the Bankruptcy Act, dating from 1847, may be set up, we are advised that the estate cannot be administrated without the aid of the Court of Chancery, which has been appealed to accordingly.

The Ponti Will.—Lastly, it is my duty under this head to inform you that our Secretary has received a communication from the Secretary of State for Foreign Affairs, to the effect that the late M. Girolamo Ponti, of Milan, has bequeathed a portion of his immense property to the “Academy of Science of London.” As, however, it does not appear what Society is indicated under this title, and as the relatives of the testator intend to dispute the Will, the Council, as at present advised, will take no steps in the matter. I have further to observe that under the terms of the Will, the Academy of Science will, if it accepts the trust, be burthened with annual duties and responsibilities respecting the distribution of the proceeds which would be altogether inconsistent with the position and purposes of the Royal Society.

The Fairchild Lecture.—This Lecture no longer appears in the annual financial statement of your Treasurer. Though an obvious anachronism and regarded almost from the first with little sympathy either within or without our walls, it should not pass away without a notice from the Chair. In February 1728 Thomas Fairchild, of Hoxton, gardener, bequeathed £25 to be placed at interest for the payment of 20s. annually for ever for preaching a sermon in the parish church of St. Leonard’s on Tuesday in Whitsun week on “the wonderful works of God in the creation, or on the certainty of the resurrection of the dead proved by certain changes of the animal and vegetable parts of the creation.” From 1733 to 1758 most of the lectures were read by Archdeacon Denne, one of the original Trustees, who in 1746 contributed all his lecture-fees to the fund, which, with a subscription raised by the Trustees, enabled them in 1746 to purchase £100 South Sea stock. Subsequently this stock was offered to and accepted by the Society: the transfer was made in 1767; and from that date the Lecturers were appointed by the President and Council. The lectures have been regularly delivered, but of late years to empty pews, under which circumstances the Council, after full deliberation, unanimously resolved that it was desirable to relieve the Society from the Fairchild Trust, and that to this end application should be made to the Charity Commissioners. The regular forms having been gone through, the Trust was transferred to the Commissioners in November last, and thus disappears from our balance-sheet.

The *Croonian* and *Bakerian* Lectures are given annually as usual; and those of this year appear in our Proceedings. These do not diminish in interest and importance.

The Davy Medal.—The Council has accepted the duty of annually awarding a medal, to be called the Davy Medal, for the most important

discovery in Chemistry made in Europe or Anglo-America. The history of this medal is as follows :—

Our former illustrious President, Sir Humphry Davy, was presented by the coal-owners of this country with a service of plate, for which they subscribed £2500, in recognition of his merits as inventor of the Safety Lamp. In a codicil to his will Sir Humphry left this service of plate to Lady Davy for her use during her life, with instructions that after her death it should pass to other members of the family, with the proviso that, should they not be in a situation to use or enjoy it, it should be melted and given to the Royal Society, to found a Medal to be awarded annually for the most important discovery in Chemistry, anywhere made in Europe or Anglo-America.

On Sir Humphry's death the service of plate became the property of his brother, Dr. John Davy, F.R.S., who, in fulfilment of Sir Humphry's intentions, bequeathed it after the death of his widow, or before if she thought proper, to the Royal Society, to be applied as aforesaid. On the death of Mrs. Davy the plate was transferred to the custody of your Treasurer, and, having been melted and sold, realized £736 8s. 5d., which is invested in Madras guaranteed railway stock, as set forth in the Treasurer's balance-sheet. The legacy duty was repaid to the Society by the liberality of the Rev. A. Davy and Mrs. Rolleston.

The style and value of the medal, and the steps to be taken in reference to its future award, are now under the consideration of the Council, and will, I hope, be laid before you on the next Anniversary. The acceptance of the trust has not been decided upon without long and careful deliberation, nor without raising the question of the expediency of recognizing scientific services and discoveries by such trivial awards as medals, and of the extent to which the awards entrusted to our Society are depreciated by their multiplication. My own opinion has long been that some more satisfactory way of recognizing distinguished merit than by the presentation of a medal might be devised, and that the award might take a form which would convey to the public a more prominent and a more permanent record of the services of the recipients, such as a bust or a portrait to be hung on our walls, or a profile or a record of the discovery to be engraved on the medal, which might be multiplied for distribution or sale to Fellows and to foreign Academies. In short, I consider awards of medals without distinctive features to be anachronisms ; it is their purpose, not their value, which should be well marked ; and the question is, whether that purpose is well answered by their being continued under the present form.

Instruments.—The small but remarkable and, indeed, classical collection of instruments and apparatus belonging to the Society, and for which there was no accommodation in old Burlington House, was, on our migration from Somerset House in 1857, by order of the Council, deposited in the Observatory in the Kew Deer-Park, near Richmond, then under the control of the British Association.

The instruments have been now for the most part brought back and placed in our Instrument-Room, and will, I hope, at no distant period be accessible to the Fellows.

On the motion of General Smythe, seconded by Mr. Francis Galton, it was resolved—"That the thanks of the Society be returned to the President for his Address, and that he be requested to allow it to be printed."

I now pass to the presentation of the Medals.

The Copley Medal has been awarded to Prof. Louis Pasteur, one of our Foreign Members, "for his researches on Fermentation and on Pebrine."

Prof. Pasteur's researches on fermentation consist essentially of two parts:—the first part, in which he enters exhaustively into the examination of the products formed in this process; and the second, in which he takes up the question of the cause of fermentation.

Previous observers had noticed the production, in solutions of sugar which had been fermented, of substances other than the two commonly recognized, alcohol and carbonic acid; but it remained for Pasteur to show which were essential, and which were occasional products. In the series of able papers contributed to the '*Comptes Rendus*' and to the '*Annales de Chimie et de Physique*,' he proved conclusively that succinic acid and glycerine were always found in fermented solutions of sugar, while lactic acid and acetic acid, although occasionally present, were not always so. He also showed that, in addition to these substances, a part of the sugar was converted into cellulose and fat.

The study of the products formed during fermentation opened the way to the second part of the research, viz. the cause of fermentation.

It had been found that certain solutions, when exposed to the air, soon became full of living organisms; and Pasteur's experiments led him to support the view that these organisms originated from the presence of germs floating in the air. He found that no living organisms were developed if care were taken to destroy completely all those which might be present in the solution, and if the solutions were then carefully sealed up free from air. Nor was it necessary to exclude the air, provided that pure air, free from germs, were admitted. By passing the air through red-hot tubes or through gun-cotton before reaching the solutions, he found that the development of organisms, in such boiled solutions, did not take place. An exception to this was noticed in the case of milk, which required to be heated to a higher temperature than the boiling-point of water at atmospheric pressure. Pasteur showed that this was connected with the alkaline reaction of milk, for in all cases in which the development of life was prevented by heating to the boiling-point of water, the solutions

had a faintly acid reaction—but that when this was neutralized by carbonate of lime, the solutions then behaved like milk.

Prof. Pasteur also examined the gun-cotton through which the air has been passed; and he found, among other things, certain cells to which he attributed the power of causing the growth of organisms in solutions. By sowing some of these cells in solutions which previously had remained clear, and finding that such solutions speedily became turbid from the growth of living organisms, it was proved that the air which had passed through the gun-cotton had lost its property of causing the development of life in solutions because the germs which the air contained had been stopped by the gun-cotton.

The result of the second part of the research may be thus summed up:—

1. No organisms are developed in solutions if care be taken to prevent the possibility of the presence of germs.

2. This negative result does not depend upon the exclusion of oxygen.

3. The matter separated from ordinary air is competent to develop organisms in solutions which previously had remained unchanged.

Not less important were the results of Pasteur's experiments respecting the chemical functions of the ferment.

It had been held that the entire ferment was in a state of putrefactive decomposition, and induced a similar decomposition in the sugar with which it was in contact.

In corroboration of this view, it was stated that ammonia (a product of the decomposition of albuminous substances such as those present in the ferment) is always found in liquids which are undergoing fermentation.

Pasteur proved that the ammonia in fermenting liquids diminishes in quantity in proportion as the process advances, and that the yeast-cells increase and grow while forming complex albuminous substances at the expense of the ammonia and other aliments which are supplied to it. He found that, in addition to ammonia and sugar, the cells require mineral substances, such as phosphates and other constituents, such as are present in the organism of every healthy and growing yeast-cell.

In short, he proved that those conditions which are most favourable to the healthy growth and development of the yeast-cells are most conducive to the progress of fermentation, and that fermentation is impeded or arrested by those influences which check the growth or destroy the vitality of the cell.

The above results are but samples of the fruits of Pasteur's long series of researches in this subject. Many and many an able investigator had worked in the same field; and such were the difficulties they encountered, that Dumas himself recommended Pasteur not to waste his time in working at so hopeless a subject.

To the biologist, two of Pasteur's researches are of very great interest and importance. He has shown that *Fungi* find all the materials needed for their nutrition and growth in water containing an ammonia salt and

certain mineral constituents, and devoid of any nitrogenized organic matter; and he has proved that all the phenomena presented by the destructive silk-worm epidemic, the *pebrine* (even the singular fact that it is hereditarily transmitted through the female and not through the male), are to be explained by the presence of a parasitic organism in the diseased caterpillars.

The medal was received for Prof. Pasteur by the Foreign Secretary of the Society.

The Rumford Medal has been awarded to Mr. J. Norman Lockyer, F.R.S., "for his Spectroscopic Researches on the Sun and on the Chemical Elements."

Mr. Lockyer has long been engaged in spectroscopic researches on the sun. His first observations were directed to a scrutiny of the spectrum of sun-spots as compared with that of the general surface, with a view to bring evidence to decide between two rival theories respecting their formation. In the course of the paper in which his first observations were described, and which was read before the Royal Society on November 15th, 1866, he asks, "May not the spectroscope afford us evidence of the existence of the 'red flames' which total eclipses have revealed to us in the sun's atmosphere, although they escape all other modes of examination at other times?"

The spectroscope he then employed proved to be of insufficient dispersive power for his researches, and he was induced to apply to the Government-Grant Committee of the Royal Society for aid to construct one of greater power. This aid was accorded, and the instrument was delivered, though not quite complete, on the 16th of October, 1868. On the 20th his efforts were crowned by the detection of a solar prominence by means of the bright lines exhibited in its spectrum. An account of this discovery was immediately communicated to the Royal Society and to the French Academy of Sciences.

Meanwhile had occurred the total solar eclipse of August 18th, 1868, to observe which various parties had gone out armed with suitable instruments, and especially with spectroscopes, for determining the character of the hitherto unknown spectrum of the prominences; and the firstfruits of their labours had reached Europe, showing that the spectrum in question is one of bright lines. It occurred to Mr. Janssen, who had observed with eminent success the spectrum of the prominences during the eclipse, that the same mode of observation might enable one to detect them at any time, and he saw them in this manner the very next day. The first account of this discovery, which was sent by post, did not, however, reach the French Academy until a few days after the communication of Mr. Lockyer's notice; so that nothing interferes with the perfect independence with which these two physicists established the possibility of detecting the prominences at any time.

A discovery like this opened up a new field of research, which Mr. Lockyer was not backward in exploring. One of the firstfruits of the application of the method was the discovery of a continuous luminous gaseous envelope to the sun, which he calls the chromosphere, of which the prominences are merely local aggregations. Evidence was further obtained of gigantic convulsions at the surface of the sun, which were revealed by slight alterations of refrangibility in the lines, observed in a manner similar to that in which Mr. Huggins had determined the relative velocity of approach or recess of the Earth and Sirius.

The interpretation of spectroscopic solar phenomena required a reexamination in several respects of the spectroscopic features of artificial sources of light. Among these researches special mention must be made of Mr. Lockyer's classification of the lines due to the metals of the electrodes between which an induction discharge was passed, according to their "length," *i. e.* the distance from the electrodes to which they could respectively be traced. This led to the explanation of various apparent anomalies as to the presence or absence of certain dark lines in the solar spectrum, and to the detection of additional elements in the sun, especially potassium, an element which, though so common on the earth and so easily detected by spectral analysis, had not previously been proved to exist in the sun, because the attention of observers had been turned in a wrong direction, as was shown by these researches.

Nor was it only in relation to solar physics that these researches bore fruit. They led to a *quantitative* determination in many cases, by means of the spectroscope, of the proportion of the constituents in an alloy, and afforded new evidence of the extent to which impurities are present even in substances deemed chemically pure.

The Medal was received by Mr. Lockyer.

A Royal Medal has been awarded to Mr. Henry Clifton Sorby, F.R.S., "for his Researches on Slaty Cleavage and on the minute Structure of Minerals and Rocks; for the construction of the Micro-Spectroscope, and for his Researches on Colouring-matters."

The principal grounds on which Mr. Sorby's claims to a Royal Medal rest are the following:—

1. His long-continued study, and his successful application of the microscope to the solution, of problems in petrology.

2. His employment of the prism in conjunction with the microscope for the analysis of the colours transmitted by substances, as well organic as inorganic.

Though Mr. Sorby's labours during the last ten years have been more particularly devoted to observations of the latter class, his work, extending over a period that commenced in 1849, is represented in the Catalogue of Scientific Papers (limited by the year 1863) by no less than 47 memoirs. Among the more remarkable of these must be mentioned the

Reports to the British Association and the contributions to the *Philosophical Magazine* (1853, 1856, 1857), in which he grappled with the subject of slaty cleavage, and helped to establish the explanation that cleavage was the result of greater relative condensation of the material in a direction perpendicular to the cleavage, due in the case of rocks to mechanical compression in that direction—an idea that met with immediate illustration from other experimentalists.

His memoirs on the temperatures and pressures at which certain rocks and minerals were formed (in the *Geological Society's Journal*, 1858), founded on the relative volume of the liquid and vacuous portions of microscopic hollows, or, again, on the character of microscopic substances mingled with the mineral matter he investigated, convinced the geologist that he had to take into account the action of water under high pressures and at high temperatures in explaining the formation of granitoid rocks.

And the refinement of the methods that Mr. Sorby employed for making his rock-sections at Sheffield has made those methods the models sought after by the now large school of Continental and English microscopic petrologists.

His applications of spectroscopic methods to the microscope fall more strictly within the limit of ten years, as they have been worked out since 1867, when Mr. Sorby first described his adaptation of the spectroscope to the microscope, as carried out by Mr. Browning.

The observations he has made with this instrument, and generally by combining optical examination with the use of chemical reagents, have extended over a very wide range—such as the recognition of blood-stains, of adulteration in wine, the means of discriminating among the compounds of certain of the metals, chiefly of zirconium, titanium, and uranium, by the aid of blowpipe-beads—and finally to the elucidation, to a considerable extent, of the causes of the complexity in the tints exhibited by plants in the different stages of development of their annual foliage and flowers.

These are only some of the more important of Mr. Sorby's contributions to science; and they are characterized by an untiring application of the methods of experimental research to a great variety of subjects suggested by a very ingenious and active mind.

The Medal was received by Mr. Sorby.

A Royal Medal has been awarded to Prof. William Crawford Williamson, F.R.S., "for his Contributions to Zoology and Palæontology, and especially for his Investigation into the Structure of the Fossil Plants of the Coal-Measures."

Professor Williamson's contributions to Biological Science were commenced forty years ago, and embrace investigations into the structure of the Foraminifera, the Rotifera, the scales and bones of Fishes, and the fossil plants of the Carboniferous and Oolitic periods. These comprise works of great merit and value, not only on account of their accuracy

and the extent and novelty of the observations which they contain, but by reason of the breadth of view and the philosophical spirit which pervade them.

His labours in Vegetable Palæontology are above all remarkable, being alike laborious, searching, and productive of important results. These are embodied in six contributions (of which the last will soon appear) to the Philosophical Transactions upon the organization of the Fossil Plants of the Coal-measures—and one on the restoration of a Cycadeous tree (*Zamia gigas*) from the Yorkshire Oolite, published in the Transactions of the Linnean Society. These are not only models of laborious research and exact description, but they are illustrated by more than fifty plates, devoted to microscopic analyses of vegetable tissues, obtained by making transparent slices of the fossils. Both the slices and the drawings are made by Prof. Williamson himself, who thus, to his reputation as a biologist, unites those of an accomplished artist and a skilful lapidary, qualifications which should be named along with those for which the medal is awarded, because no unscientific lapidary could have obtained equally illustrative sections, and no common artist could have depicted them with equal exactitude. The more important results thus obtained refer to the structure, affinities, and reproductive organs of *Calamites* and its allies, to *Lepidodendron*, *Sigillaria*, *Lepidostrobus*, *Asterophyllites*, and to other genera of the Carboniferous epoch.

In addition to these contributions to the history of previously known genera of that epoch, Prof. Williamson has been able to show, on the one hand, that groups of now living plants which were not previously supposed to have a great geological antiquity, actually flourished during the Carboniferous period, and, on the other, that plants of that period which had been previously referred with confidence to groups now living, have in reality other and widely different affinities.

The Medal was received by Prof. Williamson.

The Statutes relating to the election of Council and Officers having been read, and Mr. A. J. Ellis and Col. Strange having been, with the consent of the Society, nominated Scrutators, the votes of the Fellows present were collected, and the following were declared duly elected as Council and Officers for the ensuing year:—

President.—Joseph Dalton Hooker, C.B., M.D., D.C.L., LL.D.

Treasurer.—William Spottiswoode, M.A., LL.D.

Secretaries.— { Prof. George Gabriel Stokes, M.A., D.C.L., LL.D.
 { Prof. Thomas Henry Huxley, LL.D., Ph.D.

Foreign Secretary.—Prof. Alexander William Williamson, Ph.D.

Other Members of the Council.—Prof. J. Couch Adams, LL.D.; the Duke of Devonshire, K.G., D.C.L.; Capt. Frederick J. O. Evans, R.N.,

C.B.; John Evans, Pres. G.S., F.S.A.; Albert C. L. G. Günther, M.A., M.D.; Daniel Hanbury, Treas. L.S.; Sir John Hawkshaw, Knt., M.I.C.E.; Joseph Norman Lockyer, F.R.A.S.; Robert Mallet, C.E., M.R.I.A.; Nevil Story Maskelyne, M.A.; C. Watkins Merrifield, Hon. Sec. I.N.A.; Prof. Edmund A. Parkes, M.D.; Right Hon. Lyon Playfair, C.B., LL.D.; Andrew Crombie Ramsay, LL.D.; Major-Gen. Sir. H. C. Rawlinson, K.C.B.; Prof. J. S. Burdon Sanderson, M.D.

The thanks of the Society were given to the Scrutators.

The following Table shows the progress and present state of the Society with respect to the number of Fellows:—

	Patron and Royal.	Foreign.	Com- pounders.	£4 yearly.	Total.
December 1, 1873.	4	48	266	258	576
Elected			+ 6	+ 10	+ 16
Deceased		— 6	— 7	— 7	— 20
Since compounded .			+ 2	— 2	
Withdrawn			— 1		— 1
	4	42	266	259	571

Trust Funds.

	£	s.	d.	£	s.	d.
Donation Fund	164	11	2	225	0	0
Rumford Fund	68	19	2	35	9	6
Wintringham Fund	35	12	6	4	18	4
Copley Medal Fund	9	19	7	4	0	0
Davy Medal Fund	32	13	1	2	19	0
Balances from 1873	693	13	5	545	11	5
	£5726	3	3	236	18	8
				37	13	2
				£5726	3	3

Donation Fund	225	0	0
Wintringham Fund	35	9	6
Copley Medal Fund	4	18	4
J. N. Lockyer, Bakerian Lecture	4	0	0
Dr. Ferrier, Croonian Lecture	2	19	0
Balance at Bank	545	11	5
Balances on hand, Catalogue and Petty Cash	236	18	8
	37	13	2
	£5726	3	3

W. SPOTTISWOODE,

*Treasurer.**Estates and Property of the Royal Society, including Trust Funds.*

Estate at Mablethorpe, Lincolnshire (55 A. 2 R. 2 P.), £136 per annum.
 Estate at Acton, Middlesex (34 A. 2 R. 9½ P.), £170 per annum.
 Fee Farm near Lewes, Sussex, rent £19 4s. per annum.
 One fifth of the clear rent of an estate at Lambeth Hill, from the College of Physicians, £3 per annum.
 Stevenson Bequest. Chancery Dividend. One fourth annual interest on £85,336, Government Annuities and Bank Stock (produced £449 2s. 5d. in 1873-74).
 £14,000 Reduced 3 per Cent. Annuities.
 £30,161 0s. 10d. Consolidated Bank Annuities.
 £403 9s. 8d. New 2½ per Cent. Stock—Bakerian and Copley Medal Fund.
 £660 Madras Guaranteed 5 per Cent. Railway Stock—Davy Medal Fund.
 £10,000 Italian Irrigation Bonds—The Gassiot Trust.

Trust Funds. 1874.

Scientific Relief Fund.

Investments up to July 1872, New 3 per Cent. Annuities	£	s.	d.
" " Metropolitan 3½ Consols	6328	11	2
	100	0	0
	<u>£6428 11 2</u>		

Dr.

Balance	£	s.	d.
Dividends	243	1	5
	191	7	7
	<u>£434 9 0</u>		

By Grants
Balance

	£	s.	d.
	220	0	0
	214	9	0
	<u>£434 9 0</u>		

Cr.

Donation Fund.

£5816 1s. 1d. Consols.

To Balance	£	s.	d.
Dividends	680	15	2
Sir F. Ronalds, Bequest	164	11	2
	450	0	0
	<u>£1295 6 4</u>		

By Grants
Ronalds Bequest : bought £484 10s. 5d. Consols

	£	s.	d.
	225	0	0
	450	0	0
	620	6	4
	<u>£1295 6 4</u>		

Trust Funds.

77

Rumford Fund.

£2322 19s. Consols.

	£	s.	d.
1874. Two years' Dividends	137	12	7
Medal Cases	1	10	0
	<hr/>		

Bakerian and Copley Medal Fund.

£403 9s. 8d. New 2½ per Cent.

	£	s.	d.
To Balance.....	68	3	10
Dividends	9	19	7
By Gold Medal.....			4 18 4
Bakerian Lecture			4 0 0
Balance			69 5 1
	<hr/>		
	£78	3	5
	<hr/>		

*Trust Funds.**Wintringham Fund.*

£1200 Consols.

	£	s.	d.
To Balance, 1873	35	9	6
Dividends, 1874	35	12	6
	<hr/>		
	£		
	<hr/>		
By Payment to Foundling Hospital, 1874			35 9 6
	<hr/>		

[Nov. 30,

<i>Croonian Lecture Fund.</i>	
	<i>£ s. d.</i>
To one fifth of Rent of Estate at Lambeth Hill, payable by the College of Physicians	2 19 0
By Croonian Lecture	2 19 0

Davy Medal Fund.
£660 Madras Guaranteed 5 per Cent. Railway Stock.

	<i>£ s. d.</i>
To Balance	136 11 1
Dividends	32 13 1
	<u>£169 4 2</u>

<i>The Gassiot Trust.</i>	
£10,000 Italian Irrigation Bonds.	
	<i>£ s. d.</i>
Dividends	498 18 4
Bonds drawn	469 0 0
By Payments to Kew Committee	290 10 0
Bonds bought	178 10 0
Balance	967 18 4

Account of the appropriation of the sum of £1000 annually voted by Parliament to the Royal Society (the Government Grant), to be employed in aiding the advancement of Science (continued from Vol. XXII. p. 20).

1874.

1. Mr. J. W. L. Glaisher, for Stereotype Plates for a Table of the Power of Numbers	£100
2. Prof. Roscoe, for Instruments for Automatic Registration of Chemical Intensity of total Daylight	50
3. Mr. Schorlemmer, for Researches on the Hydrocarbons	50
4. Mr. Lockyer, for Spectroscopic Researches	200
5. Mr. Schäfer, for Investigation of Connective Tissue.....	50
6. Messrs. Miller and Skertchley, for Researches in Evaporation	50
7. Mr. A. H. Garrod, for an Investigation of the Movements of the Pulse	50
8. Mr. Crookes, for Researches on Attraction and Repulsion accompanying Radiation	100
9. Dr. Brunton, for Apparatus and Material to be used in an Experimental Investigation of the Physiological action of Ammonia.....	50
10. Dr. Klein, for expense of preparing Plates for his work on 'The Anatomy of the Lymphatic System'	50
11. Dr. Armstrong, for an Investigation of the Properties of the Derivatives of Phenol.....	50
12. Mr. Whitehouse, for Researches and Experiments in reference to a new Hygrometer	50
13. Captain Noble, for continuation (jointly with Mr. Abel) of Researches on Explosives	100
	<hr/>
	£950 0 0

<i>Dr.</i>	£	s.	d.		£	s.	d.	<i>Cr.</i>
To balance on hand,				By appropriations as				
Nov. 30, 1873....	1047	18	9	above	950	0	0	
To Grant from Treasury (1874).....	1000	0	0	Printing and Postal				
				charges	8	12	6	
Repayments :—				Balance on hand, Nov.				
Prof. Stewart	4	1	4	30, 1874	1157	19	7	
Parker and Jones ..	21	5	0					
Mr. Friswell	20	0	0					
Interest	23	7	0					
	<hr/>				<hr/>			
	£2116	12	1		£2116	12	1	
	<hr/>				<hr/>			

Account of Grants from the Donation Fund in 1873-74.

Mr. H. Willett, in aid of the Sub-Wealden Exploration Fund.	50	0	0
Dr. Carpenter, for apparatus to demonstrate his Theory of Oceanic Circulation	25	0	0
Dr. Ferrier, for continuation of his Investigations into the Functions of the Brain.	50	0	0
Dr. Dohrn, for the use of the Stazione Zoologica at Naples	100	0	0
	<hr/>		
	£225	0	0

*Report of the Kew Committee for the Year ending
October 31, 1874.*

Magnetic Work.—The Magnetograph instruments were dismounted in January 1874 for the purpose of thorough examination and readjustment, as was announced in last Report. The necessity for this measure is obvious, when it is remembered that the instruments had been in uninterrupted action for the period of fifteen years.

The scale-values were accordingly redetermined, and the instruments handed over to Mr. Adie for examination and repair. They were returned and remounted in May, but have not been set in continuous action as yet, inasmuch as it is intended that the automatic records should be suspended for the entire year, so as to commence a new series of observations with the year 1875. The cost of these operations has been £77 10s.

The monthly observations with the absolute instruments have been continued, as usual, by Mr. G. M. Whipple, who also takes charge of the general magnetic work, in which he has had the assistance, for the first part of the year of Mr. Cullum, and latterly of Mr. Power.

As regards the Magnetic Reductions, the Tabulations of Declination have been completed up to the end of 1873; and copies of the results to 1872 have been intrusted, for discussion, to the two Sergeants of the Royal Artillery, formerly in Sir E. Sabine's office at Woolwich, who have been in constant attendance at Kew since Nov. 1871. The Tabulations of Inclination and Horizontal Force have not been effected.

Magnetic data have been supplied to Dr. Wijkander, of Stockholm, in connexion with the Swedish Expedition to Spitzbergen, M. Diamilla Müller, of Florence, and Capt. Creak, R.N.

A Unifilar and Dip-circle have been repaired for use at the Observatory, and another pair of similar instruments have been lent to the Rev. S. J. Perry, F.R.S., for use at Kerguelen Island, on the Transit of Venus Expedition, as mentioned in last Report.