couragement of experiments which are not clearly legitimate of living animals." The amendment was seconded by Professor Rolleston, and carried by a large majority. The following appointments were then made :—Council : The President and President elect ; Vice-president and Vice-presidents elect ; General Secretaries and Assistant-secretary ; General Treasurer ; trustees, presidents of former years, and the following gentlemen :—Mr. Bateman, Dr. Beddoe, Mr. G. Busk, Dr. Debus, Mr. Warren Delarue, Mr. J. Evans, Captain Galton, Mr. F. Galton, Mr. Gassiot, Mr. Godwin-Austen, Lord Houghton, Mr. W. Huggins, Sir John Lubbock, Prof. W. A. Miller, Mr. Newmarch, Sir S. Northcote, Prof. Ramsay, Prof. Rankine, Dr. J. Simon, Lieut.-Col. Strange, Col. Sykes, Sir W. Tite, Prof. Tyndall, Mr. A. R. Wallace, Prof. Wheatstone, Prof. A. W. Williamson. General Secretaries, Prof. Hirst and Dr. Thomas Thomson. Assistant Secretary, Mr. Griffiths. Treasurer, Mr. Spottiswoode. Auditors, Mr. G. Busk, Dr. M. Foster, Mr. Gwyn Jeffreys. Mr. J. Evans and Dr. M. Foster were added to the Committee of Recommendations. B.

REPORT OF THE COUNCIL

"The Council have received the usual reports from the General Treasurer and from the Kew Committee. Their reports for the past year will be laid before the General Committee this day.

The Council have to report upon the action they have taken relative to each of the four resolutions referred to them by the General Committee at Exeter.

The first of these resolutions was—

'That the Council be requested to take into their consideration the existing relations between the Kew Committee and the British Association.'

The Council accordingly appointed a Committee of their own body to examine into these relations. This Committee had before them a special report drawn up by the Kew Committee, and, after due deliberation, they recommended—

'That the existing relations between the Kew Observatory and the British Association be continued unaltered until the completion, in 1872, of the magnetic and solar decennial period ; but that after that date all connexion between them shall cease.'

The Council adopted this recommendation, and now offer it, as their own, to the General Committee.

The second resolution referred to the Council was as follows :—

'That the full influence of the British Association for the Advancement of Science should at once be exerted to obtain the appointment of a Royal Commission to consider—

First, the character and value of existing institutions and facilities for scientific investigation, and the amount of time and money devoted to such purposes.

Secondly, what modifications or augmentations of the means and facilities that are at present available for the maintenance and extension of science are requisite ; and,

Thirdly, in what manner these can be best supplied.'

By a third resolution the Council was 'requested to ascertain whether the action of Government in relation to the higher scientific education has been in accordance with the principles of impartiality which were understood to guide them in this matter ; and to consider whether that action has been well calculated to utilise and develop the resources of the country for this end, and to favour the free development of the higher scientific education. That the Council be requested to take such measures as may appear to them best calculated to carry out the conclusions to which they may be led by these inquiries and deliberations.'

The Committee of the Council appointed to consider these two resolutions reported their opinion to be favourable to the appointment of a Royal Commission to inquire into the relations of the State to scientific instruction and investigation ; and they added that no such inquiry would, in their opinion, be complete which did not extend itself to the action of the State in relation to scientific education, and the effect of that action upon independent educational institutions.

Your President and Council, acting on the advice of this Committee, constituted themselves a Deputation and waited upon the Lord President of the Council. They are glad to be able to report that their efforts to bring this important subject before Her Majesty's Government have been attended with success. On the 18th of May, Her Majesty issued a Commission "to make inquiry with regard to Scientific Instruction and the Advancement of Science, and to inquire what aid thereto is derived from grants voted by Parliament or from endowments belonging to the several universities in Great Britain and Ireland and the colleges thereof, and whether such aid could be rendered in a manner more effectual for the purpose." The Commissioners appointed by Her Majesty are the Duke of Devonshire, the Marquis of Lansdowne, Sir John Lubbock, Bart., Sir James Phillips Kay Shuttleworth, Bart., Bernhard Samuelson, Esq., M.P., Dr. Sharpey, Professor Huxley, Dr. W. A. Miller, and Professor Stokes. J. Norman Lockyer, Esq., F.R.S., has been appointed Secretary to the Commissioners, who, up to last July, were engaged taking evidence with great assiduity, and have now adjourned their meetings until November. There is every reason to hope that valuable results will follow from their deliberations.

The fourth resolution which the General Committee referred to the Council was—

'That the rules under which members are admitted to the General Committee be reconsidered.'

A Committee of the Council devoted considerable care to a revision of the existing rules. The modified rules approved by the Council are now submitted for adoption to the present General Committee, whose constitution is, of course, not affected thereby. The most important of the proposed changes are that henceforth new claims to membership of the General Committee shall be forwarded to the Assistant General Secretary at least one month before the next ensuing Annual Meeting of the Association ; that these claims shall be submitted to the Council, whose decision upon them is to be final ; and that henceforth it is not the authorship of a paper in the Transactions of a scientific society which is alone to constitute a claim to membership of the General Committee, but the publication of any works or papers which have furthered the advancement of any of the subjects taken into consideration at the Sectional meetings of the Society.

Your Council has, also, had under its consideration the desirability of removing certain administrative inconveniences which arise from the circumstance that the next place of meeting is never decided upon by the General Committee until near the close of the actual meeting. They are of opinion that the arrangements of the General Officers would be greatly facilitated, and at the same time the convenience of those who invite the Association consulted, if the General Committee were to decide upon each place of meeting a year earlier than they do at present. In order to make the transition from the existing practice to the proposed one, your Council recommend that two of the invitations which will be received at the present meetings be accepted, one for 1871, and another for 1872.

It has often been urged that the Association labours under disadvantages in consequence of its not possessing central offices in London, where its Council and numerous committees could hold their meetings, where the books and memoirs which have been accumulating for years could be rendered accessible to Members, and where information concerning the Association's proceedings could be promptly obtained during the interval between annual meetings. The Council have had the subject under consideration, and in the event of the establishment at Kew being discontinued, they are prepared to recommend that suitable rooms, in a central situation, should be procured. The additional annual expenditure which this would involve would probably not exceed 150*l*.

The Council have added the names of Professor H. A. Newton and Professor C. S. Lyman, who were present at the Exeter meeting, to the list of corresponding members."

We append the new rules referred to in the Council's Report.

"*New Rules for Admission to the General Committee*

The General Committee will in future consist of the following classes of members :—

CLASS A.—PERMANENT MEMBERS

1. Members of the Council, presidents of the Association, and presidents of sections for the present and preceding years, with authors of reports in the Transactions of the Association.

2. Members who, by the publication of works or papers, have furthered the advancement of those subjects which are taken into consideration at the sectional meetings of the Association. With a view of submitting new claims under this rule to the decision

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of the Council, they must be sent to the assistant general secretary at least one month before the meeting of the Association. The decision of the Council on the claims of any member of the Association to be placed on the list of the General Committee to be final.

CLASS B.—TEMPORARY MEMBERS

3. The president for the time being, or, in his absence, one delegate representing him, of any scientific society publishing transactions. Claims under this rule to be sent to the assistant general secretary before the opening of the meeting.

4. Office-bearers for the time being, or delegates, altogether not exceeding three, from scientific institutions established in the place of meeting. Claims under this rule to be approved by the local secretaries before the opening of the meeting.

5. Foreigners and other individuals whose assistance is desired, and who are specially nominated in writing, for the meeting of the year, by the president and general secretaries.

6. Vice-presidents and secretaries of sections."

SECTIONAL PROCEEDINGS

SECTION A.—*Mathematical and Physical Science.*—President, Prof. J. Clerk Maxwell, F.R.S.

The president delivered the following address :—

AT several of the recent meetings of the British Association the varied and important business of the Mathematical and Physical Section has been introduced by an Address, the subject of which has been left to the selection of the president for the time being. The perplexing duty of choosing a subject has not, however, fallen to me. Professor Sylvester, the president of Section A at the Exeter meeting, gave us a noble vindication of pure mathematics by laying bare, as it were, the very working of the mathematical mind, and setting before us, not the array of symbols and brackets which form the armoury of the mathematician, or the dry results which are only the monuments of his conquests, but the mathematician himself, with all his human faculties directed by his professional sagacity to the pursuit, apprehension, and exhibition of that ideal harmony which he feels to be the root of all knowledge, the fountain of all pleasure, and the condition of all action. The mathematician has, above all things, an eye for symmetry; and Professor Sylvester has not only recognised the symmetry formed by the combination of his own subject with those of the former presidents, but has pointed out the duties of his successor in the following characteristic note :—

"Mr. Spottiswoode favoured the Section, in his opening address, with a combined history of the progress of mathematics and physics; Dr. Tyndall's address was virtually on the limits of physical philosophy; the one here in print," says Professor Sylvester, "is an attempted faint adumbration of the nature of mathematical science in the abstract. What is wanting (like a fourth sphere resting on three others in contact) to build up the ideal pyramid is a discourse on the relation of the two branches (mathematics and physics) to, and their action and reaction upon, one another—a magnificent theme, with which it is to be hoped that some future president of Section A will crown the edifice, and make the tetralogy (symbolisable by A + A′, A, A′, AA′) complete."

The theme thus distinctly laid down for his successor by our late President is indeed a magnificent one, far too magnificent for any efforts of mine to realise. I have endeavoured to follow Mr. Spottiswoode, as with far-reaching vision he distinguishes the systems of science into which phenomena, our knowledge of which is still in the nebulous stage, are growing. I have been carried by the penetrating insight and forcible expression of Dr. Tyndall into that sanctuary of minuteness and of power where molecules obey the laws of their existence, clash together in fierce collision, or grapple in yet more fierce embrace, building up in secret the forms of visible things. I have been guided by Professor Sylvester towards those serene heights

> "Where never creeps a cloud, or moves a wind,
> Nor ever falls the least white star of snow,
> Nor ever lowest roll of thunder moans,
> Nor sound of human sorrow mounts, to mar
> Their sacred everlasting calm."

But who will lead me into that still more hidden and dimmer region where Thought weds Fact; where the mental operation of the mathematician and the physical action of the molecules are seen in their true relation? Does not the way to it pass through the very den of the metaphysician, strewed with the remains of former explorers, and abhorred by every man of science? It would indeed be a foolhardy adventure for me to take up the valuable time of the section by leading you into those speculations which require, as we know, thousands of years even to shape themselves intelligibly.

But we are met as cultivators of mathematics and physics. In our daily work we are led up to questions the same in kind with those of metaphysics; and we approach them, not trusting to the native penetrating power of our own minds, but trained by a long-continued adjustment of our modes of thought to the facts of external nature. As mathematicians, we perform certain mental operations on the symbols of number or of quantity, and, by proceeding step by step from more simple to more complex operations, we are enabled to express the same thing in many different forms. The equivalence of these different forms, though a necessary consequence of self-evident axioms, is not always, to our minds, self-evident; but the mathematician, who, by long practice, has acquired a familiarity with many of these forms, and has become expert in the processes which lead from one to another, can often transform a perplexing expression into another which explains its meaning in more intelligible language.

As students of physics, we observe phenomena under varied circumstances, and endeavour to deduce the laws of their relations. Every natural phenomenon is, to our minds, the result of an infinitely complex system of conditions. What we set ourselves to do is to unravel these conditions, and by viewing the phenomenon in a way which is in itself partial and imperfect, to piece out its features one by one, beginning with that which strikes us first, and thus gradually learning how to look at the whole phenomenon so as to obtain a continually greater degree of clearness and distinctness. In this process, the feature which presents itself most forcibly to the untrained inquirer may not be that which is considered most fundamental by the experienced man of science; for the success of any physical investigation depends on the judicious selection of what is to be observed as of primary importance, combined with a voluntary abstraction of the mind from those features which, however attractive they appear, we are not yet sufficiently advanced in science to investigate with profit.

Intellectual processes of this kind have been going on since the first formation of language, and are going on still. No doubt the feature which strikes us first and most forcibly in any phenomenon, is the pleasure or the pain which accompanies it, and the agreeable or disagreeable results which follow after it. A theory of nature from this point of view is embodied in many of our words and phrases, and is by no means extinct even in our deliberate opinions. It was a great step in science when men became convinced that, in order to understand the nature of things, they must begin by asking, not whether a thing is good or bad, noxious or beneficial, but of what kind is it? and how much is there of it? Quality and quantity were then first recognised as the primary features to be observed in scientific inquiry. As science has been developed, the domain of quantity has everywhere encroached on that of quality, till the process of scientific inquiry seems to have become simply the measurement and registration of quantities, combined with a mathematical discussion of the numbers thus obtained. It is this scientific method of directing our attention to those features of phenomena which may be regarded as quantities which brings physical research under the influence of mathematical reasoning. In the work of the section we shall have abundant examples of the successful application of this method to the most recent conquests of science; but I wish at present to direct your attention to some of the reciprocal effects of the progress of science on those elementary conceptions which are sometimes thought to be beyond the reach of change.

If the skill of the mathematician has enabled the experimentalist to see that the quantities which he has measured are connected by necessary relations, the discoveries of physics have revealed to the mathematician new forms of quantities which he could never have imagined for himself. Of the methods by which the mathematician may make his labours most useful to the student of nature, that which I think is at present most important is the systematic classification of quantities. The quantities which we study in mathematics and physics may be classified in two different ways. The student who wishes to master any particular science must make himself familiar with the various kinds of quantities which belong to that science. When he understands all the relations between these quantities, he regards them as forming a connected system, and he classes the whole system of quantities together as belonging

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