

which is thus made readily available. Mr. Rhee's volumes will doubtless become for the future historian a storehouse of information great and small, and for the official a book of reference of permanent value.

In the voluminous reports of congressional proceedings which are here reprinted, many things will be found which are of special interest to English readers. There are numerous allusions to our own institutions, such as the Royal Society and the British Museum. Among other matters of the kind we note, in the proceedings of the thirty-third congress (1853-55), a letter of Prof. Agassiz, in which he mentions that Smithson's magnificent bequest of 105,000*l.* sterling was originally intended for our own Royal Society, but that certain scientific papers which that gentleman offered for publication in the *Philosophical Transactions* were declined, "upon which he changed his will and made his bequest to the United States." One can scarcely, however, grudge the loss to our own country in view of the liberal spirit and the enlightened policy which have always ruled the affairs of "the Smithsonian," and have done so much to advance the cause of science.

That policy has not been maintained without many a struggle. It took, to begin with, eight years to decide what form the establishment for "increase and diffusion of knowledge" was to take. Schemes for "a library, a botanical garden, an observatory, a chemical laboratory, a popular publishing house, a lecture lyceum, an art museum," all fought together and killed each other, and when this consummation was reached and the Smithsonian Institution was erected upon the battlefield, the ghosts of two at least of the old schemes—the library and the college—continued to haunt the proceedings of congress and cause endless trouble. It was in the course of one of these after-battles—a battle with those who desired to divert the funds of the Institution from scientific work to the foundation of a great library—that a letter from Prof. Benjamin Peirce was read which makes honourable mention of the scientific work both of the foundation and the founder, an extract from which may serve as an appropriate conclusion to this notice:—

"The valuable contributions to knowledge which have already been made by the Smithsonian Institution are a living proof that vast libraries are not necessary to the development of new thoughts. If you will compare these memoirs with the scientific productions of the same period in Europe you may find them, perchance, inferior in erudition, but not in profoundness and originality of thought. Do you believe that Smithson, who was himself engaged in chemical investigations, could have intended a library by his words 'an institution for the increase and diffusion of knowledge among men'? If you will examine his nine memoirs to the Royal Society, of which he was an active member, and his eighteen other contributions to science, you will not find one of them which required a library for its production. Each was the natural growth of a deeply thinking mind. Smithson was emphatically a maker, not a collector of books; and, in the scientific circle to which he belonged, the ordinary use of language would have totally precluded the interpretation which some men of quite a different cast of mind have presumed to impose upon his words" (p. 557).

H. R.

#### ARCTIC MAGNETIC OBSERVATIONS.

A SYSTEMATIC series of observations on terrestrial magnetism, atmospheric electricity and aurora was commenced by Prof. Birkeland and his assistants in 1899-1900, and a report upon some of the results was published last year.<sup>1</sup> The first observations were made at

<sup>1</sup> "Expédition Norvégienne de 1899-1900 pour l'étude des aurores boréales. Résultats des recherches magnétiques." Par Kr. Birkeland. Pp. 80; with 12 plates. (Christiania, 1901.)

Bossekop (Finmarken), in the north of Norway. For magnetic observation, self-recording photographic apparatus was employed of the Eschenhagen pattern, the drums carrying the paper being capable of rotation at two speeds, the faster supplying a very open time scale. Fast runs were made simultaneously on certain prearranged days at Bossekop and Potsdam. A comparison of the records showed the simultaneous, or practically simultaneous, occurrence on several occasions of small regular magnetic waves at the two stations. Similar previous comparisons by Eschenhagen and others have led to similar results, but the comparatively great distance—some 2000 kilometres—between the two stations in the present case makes the results of special interest.

Only a portion of the report mentioned in the foot-note is devoted to the work at Bossekop. A considerable part is occupied with the description of experiments with electric discharges in vacuum tubes, in which Prof. Birkeland has succeeded in producing phenomena having a close resemblance to some of the more prominent features of aurora. Reference is also made to work by Prof. J. J. Thomson and other recent investigators in vacuum-tube discharges. There is also a discussion of the bearing of the observations and experiments on Prof. Birkeland's theory of the cause of aurora and magnetic storms. This he believes to be electric currents in the upper atmosphere, the ultimate source of which he ascribes to cathode rays or other electrical emanations from the sun. The observations and experiments are illustrated in the text and in various plates at the end of the book.

This work is to be regarded only as introductory to a larger scheme in which Prof. Birkeland is about to embark, and in which he desires the cooperation of magnetic and meteorological observatories. The further scheme is described in two circulars which have recently been widely distributed.

The Norwegian Government is to maintain four stations in operation from August 1, 1902, to June 30, 1903. They are situated at Bossekop and in Iceland, Spitzbergen and Nova Zembla. At each of the stations there will be continuous photographic registration of the horizontal and vertical components of magnetic force and of the declination. The instruments are of the latest Eschenhagen pattern, similar to those supplied to the German and British Antarctic expeditions, with arrangements for running at ordinary or at rapid rates. Rapid runs are to be made on certain specified days and times, mainly during the 'term' hours on the 1st and 15th of each month, according to the scheme agreed on between the British and German Antarctic expeditions.

In addition there are to be rapid runs from 9 to 11 p.m., G.M.T., on December 2 to 8, 1902, January 2 to 8 and February 3 to 9, 1903. Prof. Birkeland is anxious that as many magnetic observatories as possible should participate in this scheme of rapid registration. He also asks for the cooperation of meteorologists in observing cirrus clouds, and especially in recording the direction of cirrus bands when such exist. This information is more particularly desired during the days of special magnetic observations referred to above. Prof. Birkeland thinks it probable that high cirrus may be influenced by the electric currents which he believes to exist in the upper atmosphere, and to which, as already stated, he ascribes a principal, if not an exclusive, part in the production of aurora and magnetic disturbances.

One of the principal objects of having four stations in Arctic regions is to obtain data from which calculations can be made as to the direction, altitude and intensity of atmospheric electric currents, if such exist. Prof. Birkeland hopes to obtain quantitative results sufficiently definite to put his theory to the test. The completeness of the test will, however, be much enhanced by the

cooperation of existing magnetic observatories in Europe and other parts of the world.

As one of the principal desiderata is magnetic curves with very open time scale, it may not be out of place to explain that it is not necessary for this purpose to have a specially constructed magnetograph of the Eschenhagen or any similar pattern with small magnets. The ordinary Kew pattern magnetograph, with the usual damping arrangements, requires only a simple addition to the clock to work admirably as a rapid-motion instrument. Additions of this kind have been made to the Mauritius magnetograph by Mr. Claxton, the Director of the Royal Alfred Observatory, and a similar arrangement has been made at Kew itself at a trifling cost. The objection has, indeed, been raised to the use of ordinary magnetographs for this purpose, that the natural period of vibration of the magnets may coincide with that of the short magnetic waves which it is especially desired to investigate. When Eschenhagen described his early observations he apparently believed that the earth magnetic waves were restricted to one or two definite short periods, notably one of about thirty seconds; and he approved a short period of vibration for the magnet system so as to avoid possible synchronism. The records at Potsdam and Bossekop, however, discussed by Prof. Birkeland, and those taken elsewhere, show waves of all periods from eight or ten seconds up to several minutes, the longer-period waves being identical with those long familiar to all concerned with the records of the older types of magnetographs run at the ordinary slow rate. It would thus appear that synchronism is likely to happen very rarely, whatever type of magnetograph is employed. In some respects, of course, a very short period in the magnet system has its advantages, but it is not without its drawbacks. It means small magnets, entailing the use of small mirrors, and so necessitating a more intense light or more sensitive paper than is requisite when heavier magnet systems and larger mirrors are used. The greater robustness of the large-magnet systems is also a recommendation to those responsible for obtaining the records, especially at stations which do not possess a skilled mechanic and are not situated near large towns, a situation which the spread of electric tramways is fast rendering impossible.

C. CHREE.

#### CORONATION HONOURS TO MEN OF SCIENCE.

AS we went to press last week, news of the King's serious illness was published, and national rejoicing at the anticipated Coronation ceremonies was suddenly changed to sorrow and deep anxiety. Since then, the nation has been slowly recovering from the shock, and the favourable bulletins which the King's physicians have issued this week encourage the hope that the crisis has been successfully passed and that His Majesty's convalescence is assured.

The operation for perityphlitis, from which the King has been suffering, was decided upon by Lord Lister, Sir Thomas Smith, Sir Francis Laking, Sir Thomas Barlow and Sir Frederick Treves, who are in attendance upon the Sovereign. It is beyond our province to describe the medical history of the illness or the nature of the operation performed by Sir Frederick Treves; but we are glad to know that scientific knowledge renders it possible to give relief to the sufferer without the fear of complications which made the surgeon's work almost hopeless before the introduction of antiseptic methods. Remembering this, we trust that the dark days have been passed and that progress towards recovery will be uninterrupted.

When the illness of the King became known, it was scarcely expected that the honours to be conferred in

connection with the Coronation would be announced. But by His Majesty's express wish the list was published on Thursday last, and we give below the names of men of science included in it. The new Order of Merit which has been created by the King is of particular interest. We have applied to the Lord Chamberlain for a copy of the Warrant of the Order, but so far have not received one; the general principles upon which the Order is founded will, however, be gathered from the following information given to and by the *Times* :—

The new Order is clearly founded on the lines of the well-known Prussian "Ordre pour le Mérite." It will have the same comprehensive range and character, including, besides British subjects who have won conspicuous distinction in the naval and military services, those who are exceptionally eminent as men of letters and in the fields of art and science. The number of its members will be, as is right, very restricted. It is, of course, primarily and essentially a British Order, but provision will be made for taking into its ranks distinguished foreign personages as honorary members. The badge of the Order, to be worn by its members, will consist of a cross of red and blue enamel of eight points, having the words "For Merit" (the motto of the Order) in gold letters within a laurel wreath on a blue enamel centre. The reverse of the badge will show the King's Royal and Imperial cipher in gold (two silver swords with gold hilts, placed saltirewise between the angles of the cross, being added in the case of members chosen for military or naval distinction) also within a laurel wreath, on a blue enamel centre; and the whole will be surmounted by the Imperial Crown enamelled in colour, and suspended by a parti-coloured ribbon of Garter blue and crimson, two inches broad. The Sovereign's insignia, except, of course, for the modifications necessary to distinguish the Royal dignity of the wearer, will be similar to the insignia worn by the ordinary members of the Order. The ceremony of the investiture will be from time to time conducted by the Sovereign as in the case of any other Order, the members designate being introduced by the officer of the Order in attendance. Members of the Order will be entitled to attach a facsimile of its badge and ribbon to their arms. The Seal of the Order will show a facsimile of the badge, impaled with the Royal Arms, on a white ground, with the legend "The Seal of the Order of Merit." June 26, as the day originally fixed for the Coronation ceremony, will be observed as the anniversary of the Order.

The Order only comprises one class of ordinary members, and of the twelve eminent men chosen as the first to be admitted, four are men whose names are familiar throughout the world of science.

Among the new Privy Councillors are Lord Kelvin and Lord Lister.

The new Baronets include Sir Andrew Noble, K.C.B., Sir Francis Laking and Sir Frederick Treves.

The honour of Knighthood has been conferred upon Dr. J. W. Collins, F.R.C.S., Mr. A. Cooper, F.R.C.S., Mr. H. Croom, president of the Royal College of Surgeons (Edinburgh); Dr. T. Fraser, F.R.S., president of the Royal College of Physicians of Edinburgh; Mr. Victor Horsley, F.R.S., Mr. H. G. Howse, president of the Royal College of Surgeons; Principal Oliver Lodge, F.R.S., Prof. W. Macewen, F.R.S., Principal Rücker, F.R.S., and Mr. J. Thornycroft, F.R.S.

In the Order of the Bath (Civil Division) Sir William Church, Bart., president of the Royal College of Physicians, and Prof. W. Ramsay, F.R.S., have been appointed Knight Commanders. Major Ronald Ross, F.R.S., and Prof. A. M. Worthington, F.R.S., have been appointed Companions of the same Order.

In the Military Division of the Order of the Bath, Admiral Sir Erasmus Ommanney, F.R.S., has been appointed Knight Commander.

The Kaiser-I-Hind medal for public service in India has been granted to Mr. Edgar Thurston, superintendent, Government Central Museum, Madras.

Finally, the new Order of Merit includes the names of four distinguished men of science, namely, Lord Rayleigh, Lord Kelvin, Lord Lister and Sir William Huggins.