

W. Ramsay, Richthofen, and Tyndall. We miss, however, a number of well-known names, as, for instance, the following, who have occupied the president's chair of the Royal Society:—Sir Joseph Banks, Sir Humphry Davy, Sir Joseph Hooker, Sir George Stokes, Sir William Huggins, Lord Rayleigh, and also the present president, Sir Archibald Geikie. Perhaps the company will be able to extend its collection of portraits by the addition of these and a few other British men of science of world-wide renown.

THE Selborne Society has revived the old title of its magazine, which will henceforth be called *The Selborne Magazine (and Nature Notes)*, and will be published by Messrs. George Philip and Son, Ltd., 32 Fleet Street, E.C. All communications with regard to the society should be addressed to the honorary general secretary, Selborne Society, 20 Hanover Square, London, as heretofore.

THE January number of *Knowledge and Scientific News*, which is the first number of the enlarged series, contains a five-page illustrated article on the Cavendish Laboratory and Sir J. J. Thomson from the pen of Dr. A. Wood, who has himself worked in the laboratory for the last half-dozen years. He gives an outline of the history of the laboratory, and points out the prominent position it has taken in the march of science during the last twenty years. Views of the original laboratory and of the extension recently opened by Lord Rayleigh are given, but readers will value most the excellent reproduction of the portrait of Sir J. J. Thomson, in which he has his hand on the commutator of an induction coil and his keen eye on the vacuum tubes in front of him.

OUR ASTRONOMICAL COLUMN.

FURTHER PHOTOGRAPHS OF MOREHOUSE'S COMET.—Prof. Barnard describes, and reproduces, more photographs of comet 1908c in the December (1908) number of the *Astrophysical Journal* (vol. xxviii., No. 5, p. 384). The four reproduced were selected because they illustrate so well the remarkable changes which took place in the comet; they were taken on October 14, 15, 16, and 30, 1908.

These changes have been described before, but Prof. Barnard directs attention to one or two peculiarities of especial interest. A comparison of the plates taken on October 15 and 16 appears to indicate that there was no acceleration of the motion of the ejected matter in the direction of the length of the tail. From the photographs taken on the former date it appears to Prof. Barnard that the ejected masses moved southwards at a greater rate than did the comet, thus producing the observed changes in position angle of the various sections of the tail.

Prof. Barnard believes that the masses forming the tail were actually ejected by the action of the comet itself to a large extent, and states that both in this and in Daniel's comet he observed pulsations of light at irregular intervals, such as might be expected to accompany the violent actions which would eject such masses. He also directs attention to the great difference between the visual and the photographic brightness of this comet; in a moonlit sky the tail could not be observed visually, yet a good photograph, showing an extension of eight or nine degrees, was obtained when the moon was $10\frac{1}{2}$ days old.

According to the measures of the photographs taken on October 15 and 16 respectively, the uniform value of the recession of the detached masses was about 3'.5 per hour.

SEARCH-EPIHEMERIS FOR HALLEY'S COMET.—A search-epheemeris for Halley's comet, submitted by an unnamed competitor for the *Astronomische Gesellschaft* prize, appears in No. 4295 of the *Astronomische Nachrichten* (p. 369, December 31, 1908). It gives the computed positions of the comet at intervals of ten days for the present year, and for every fourth day, commencing at January 2, in 1910. Observers should remark that this ephemeris

differs, for the present epoch, from that previously given by Messrs. Cowell and Crommelin, whilst the difference between it and that computed by Dr. Smart (*Monthly Notices*, March, 1908, p. 394), for January 2, 1910, amounts to more than 3h. in R.A. and to nearly 4° in declination.

THE DISTRIBUTION OF ERUPTIVE PROMINENCES ON THE SOLAR DISC.—Some interesting statements concerning the nature and distribution of eruptive prominences on the sun's disc, and of their relations to spots, are made by Mr. Phillip Fox in No. 4, vol. xxviii., of the *Astrophysical Journal*.

From observations made with the Rumford spectroheliograph, Mr. Fox deduces that the especially brilliant points in the flocculi adjacent to spots, designated "eruptions" by Hale and Ellerman, are the bases of eruptive prominences. Evidence of this has accrued from the fact that when these eruptions have been observed near the limb, they have been found to coincide with eruptive prominences projecting above the limb.

The position of these eruptive prominences in relation to spots leads to the conclusion that the spot is preceded by, and has its genesis in, an eruption; this appears to be so generally the rule that Mr. Fox thinks it is safe to predict the advent of a spot whenever an isolated eruption is observed.

An examination of all the H α spectroheliograms shows that solar vortices are counter-clockwise in the northern and clockwise in the southern hemisphere.

Mr. Fox suggests that the location of eruptive prominences between the members of well-developed spot groups, and their absence in front of the leading spot, may be due, at least in part, to the interference of the whirls circulating around the various spots.

DOUBLE-STAR ORBITS.—The orbits of η Cassiopeiæ and γ Coronæ Borealis are re-discussed, in the light of the more recent observations, by Prof. Doberck in No. 4296 of the *Astronomische Nachrichten* (pp. 383-6, January 2), and revised elements are given for each.

According to these elements, the period of the former star is 507.60 years and the eccentricity of the orbit is 0.5220, whilst for γ Coronæ the corresponding figures are 81.49 years and 0.3908.

ERRORS IN MEASURES OF STAR IMAGES AND SPECTRA.—Some results of great importance to those concerned in the photographic determinations of stellar positions, and of the wave-lengths of stellar spectra, are published by Prof. Perrine in Bulletin No. 143 of the Lick Observatory.

The experience of everyone engaged in such work is that the discordances found in the measures are greater than can be accounted for by errors of measurement alone, and, whilst developing the method of determining stellar parallaxes by photography, Prof. Perrine has investigated the source of the outstanding discordances. His results indicate that the irregularity, in size and distribution, of the grains in the photographic film is the chief source of the trouble. Instead of each star image being a regular collection of equally sized grains, it is a complicated and irregular gathering of particles intersected by lanes and vacant spaces, and composed of bodies of different sizes. This irregularity leads to errors of setting, because the centre of such an agglomeration is so indefinite, and may depend more upon the structure of the particular part of the film acted upon than upon true position of the area illuminated.

PHYSICAL OBSERVATIONS OF THE NATIONAL ANTARCTIC EXPEDITION.¹

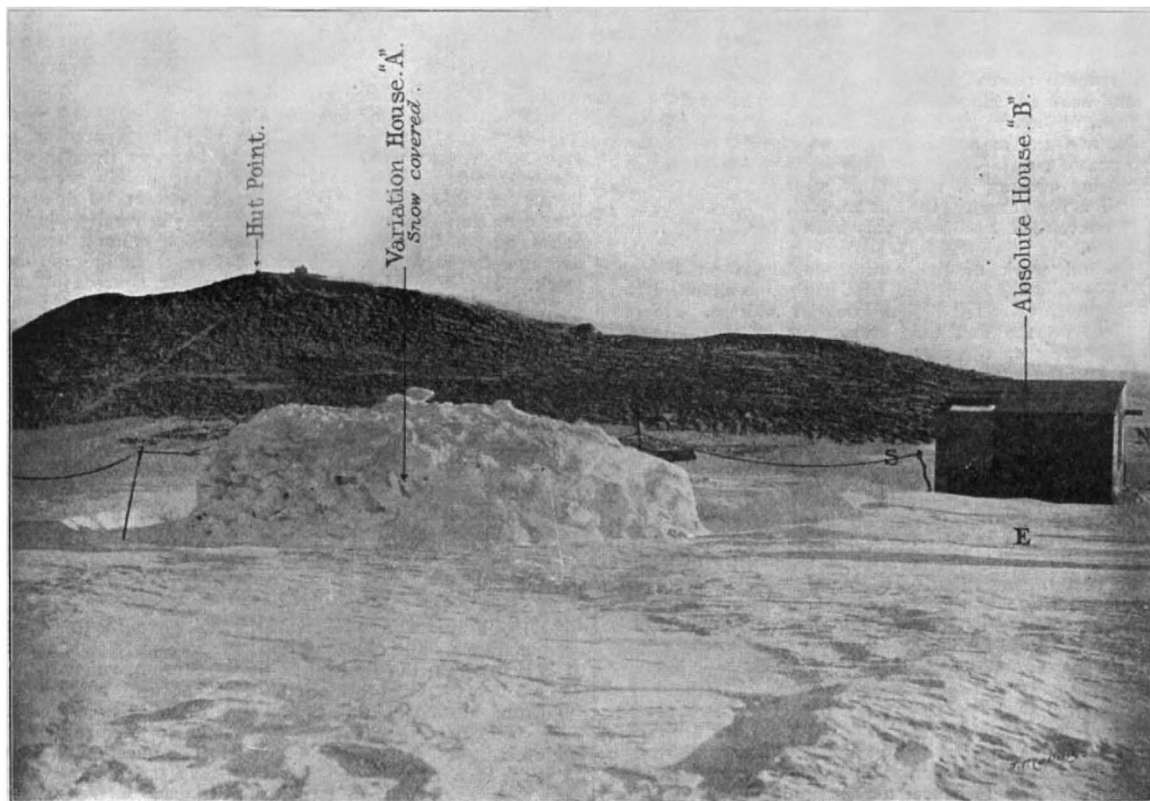
THE series of volumes now being issued by the Royal Society detailing the scientific observations made in the course of the *Discovery* expedition should impress upon the public the extent and variety of the problems that are under consideration, as well as inform them of the degree of success that has attended the efforts of those who have had to make the observations in trying circumstances. Many, unfortunately, fail to grasp the real object of such

¹ "Physical Observations, with Discussions by Various Authors." Prepared under the superintendence of the Royal Society. Pp. v+192. (London: Published by the Royal Society, 1908.)

expeditions, since an approach towards the Pole has acquired so much significance in popular estimation. An examination of the present volume, however, is calculated to offer a wider view with truer perspective. In it are presented the results of only a portion of the physical observations, those having reference to tides, pendulum experiments, earthquakes, and auroral and magnetic phenomena. Following the plan adopted in the meteorological observations, the Royal Society has placed the preparation of the reports on these subjects in the hands of authorities most competent to deal with them.

The tidal observations, extending from May 12, 1902, to September 20, 1903, have been discussed by Sir G. H. Darwin, who remarks that though the tidal constants derived by harmonic analysis may not be sufficiently accurate to give the means of constructing a tide-table for Ross Island, they are sufficiently trustworthy to afford an insight into the nature of Antarctic tides. The sum of the semi-ranges of the three principal diurnal tides amounts

who regrets that a trained physical observer did not accompany the expedition, but gratefully acknowledges the readiness with which Messrs. Bernacchi and Skelton undertook the necessary work of mounting the instruments, and the care with which they carried out the observations. These observers exhibited remarkable skill and ingenuity in overcoming difficulties connected with the apparatus, and what value the observations possess is due to the patience and devotion of these officers. The mean observed value of gravity is slightly in excess of the theoretical, and similar results have been obtained by other observers in the Australian continent. There is, too, a considerable discrepancy between the results obtained at the winter quarters in February and in September, the explanation of which it is not easy to see, as the temperature and pressure were nearly the same. Mr. Bernacchi is inclined to attribute this difference to the large northward movement of ice in the Antarctic summer prior to February. Dr. Chree quotes this opinion without endorsing it.



National Antarctic Expedition: View of Magnetic Houses at Winter Quarters. From "Physical Observations."

to 21.6 inches, and of the three semi-diurnal tides to 3.4 inches, consequently the effect of the semi-diurnal tides is scarcely noticeable on a simple inspection of the tidal curves; but a further investigation shows that the semi-diurnal tide exhibits a progressive change both in amplitude and phase as the season advances. The cause of this change it is not easy to determine, since there is no astronomical tide that can give an annual inequality in the semi-diurnal tide of sufficient amount to account for the perturbation. The tidal observations made in the *Scotia* have been reduced by Messrs. Selby and Hunter, of the National Physical Laboratory, and have been incorporated in this volume. The tides in the South Orkneys, the *Scotia* station, are normal for a place in the Southern Ocean. The semi-diurnal tides are considerable, and the solar tide is large in comparison with the lunar tide, the ratio being 0.6, as against 0.465 required by the equilibrium theory.

The pendulum observations, made on several occasions at the winter quarters, have been discussed by Dr. Chree,

The earthquake records discussed by Prof. Milne disclose the existence of a centre of seismic activity situated to the south of New Zealand, no fewer than 136 earthquakes having been recorded in the twenty-one months the apparatus was at work. The most interesting feature in the discussion has been to confirm a suspicion that Prof. Milne entertained, that earthquake shocks could reappear at antipodal stations without being recorded at intermediate positions. New Zealand being nearly at our antipodes, he had noticed that many earthquakes having their origin in or near that colony were registered at English stations, particularly at Bidston, without disturbing the instruments at observatories remote from that diameter. Prof. Milne remarks that he has met with a number of instances "where the movement from an epifocal area has travelled round and through the world to reappear as a recordable quantity at its antipodes."

The pictures of the aurora reproduced from the drawings of Dr. Wilson are very striking, but Mr. Bernacchi remarks that though the phenomenon is frequent the dis-

play is not brilliant. The light is comparable with that of the Milky Way, and the moonlight between the first and third quarters is usually sufficient to overcome that of the aurora. Owing to this feeble light, the spectroscopic observations were not successful. On some occasions the characteristic yellow line near D was seen in a direct-vision spectroscope, but no record was obtained by photography, though plates were exposed from a few minutes to twenty-four hours and longer.

In the last section Commander Chetwynd and Dr. Chree discuss the results of the magnetic observations. One interesting result is the determination of the position of the south magnetic pole by the method of observed declinations and inclinations. The results are as follows:—

By declination ... $72^{\circ} 50'$ S. lat. ... $156^{\circ} 20'$ E. long.
 „ inclination ... $72^{\circ} 52'$ „ ... $156^{\circ} 30'$ „

The close agreement is curious and eminently satisfactory.

THE NORTH OF ENGLAND EDUCATION CONFERENCE.

THE seventh annual meeting of the above conference was held at Manchester during the latter half of last week, January 7-9. The meeting was very well attended, and the arrangements for social intercourse and general comfort were excellent. There was a conversazione on Thursday evening at the Municipal School of Technology, and a reception at the Town Hall on Friday evening. A convenient handbook was issued containing a full programme.

The actual work of the conference began on Friday, when the president, the Right Rev. Bishop Welldon, Dean of Manchester, delivered his presidential address. He put great stress on the fact that everything in education depends ultimately on the teacher, who cannot be too highly trained; but the success of education depends also on the completeness with which the good scholar can ascend the educational ladder right up to the university. The ultimate aim of all educational efforts is "to fit the young, young men and women alike, to be good husbands and wives, good parents of families, good citizens."

In his address on "The Incidence of the Cost of Education," Lord Stanley of Alderley appealed for more Government aid in the shape of money, and he suggested that a Royal Commission should be appointed in order to inquire into the cost of education. He maintained, in any case, that a large share of the cost should be borne locally by the levying of rates, whereas Alderman Oulton (Liverpool) was rather in favour of increased taxation for educational purposes. There was general agreement on one point—that more money is necessary. It is to be hoped that this suggestion made during the conference on the question of increased financial aid will bear fruit in some form or other. We want to get the best men and women into the teaching profession. They must be well trained, and should be able to expect a reasonably adequate return for the expense of their training and education. The building of modern schools and their outfitting of course also cost money, and every teacher knows how much better he can teach in a good and well equipped than in a poorly furnished and badly lighted and ventilated classroom.

In the afternoon "The Supply of Teachers" was under discussion. It appears that the supply far exceeds the demand at present, but that circumstances should be made use of to weed out inefficient teachers and replace them by better ones. "The Teaching of Languages" and "The Training of Girls in Domestic Subjects" also came in for debate during the afternoon. In the former, Prof. Sonnenschein appeared as the champion of Latin, though not to the exclusion of German and French. French might even be taken at school before Latin. In the latter, Miss Margaret Ashton argued that it would not be right that girls and boys should be educated entirely on the same lines.

On Saturday, at the general meeting, "The Coordination of the Curricula in Primary and Secondary Schools" formed the subject of a paper by Mr. Paton (Manchester Grammar School). He maintained that the teaching of

science is adequately cared for in the school curricula, but that there is a lack of continuity in the teaching of classics. He mentioned the fact that at the present day most members of the Church, of the Civil Services, of the journalistic and diplomatic professions have been through mainly a classical education; and he held that therefore more attention should be paid to classical education. Most men of science, however, would arrive at the opposite conclusion. Reference may here be made to some remarks made by Lord Fitzmaurice at a recent Royal Society dinner, and quoted by Sir E. Ray Lankester in one of his essays "From an Easy Chair." "It is every day becoming more and more certain that science is the master." Lord Fitzmaurice further said that at no distant date it may be considered not only reasonable, but necessary, to replace the present-day diplomatists by men of science.

We must always remember, however, that the teaching of science at school is still a comparatively recent development. We are not only still learning and experimenting how to teach the subject as well or better than the ancient languages are taught, but we have to contend against a great deal of traditional, and perhaps not unnatural, prejudice.

In the afternoon a powerful plea was put in for the evening instruction of the so-called "masses." There is no doubt that there are really a very large number of men and women workers willing to improve their minds, not only along technical, but also along purely academic lines; but this can only to a limited extent be done by the provision of evening courses. A university degree based on an "evening-class" knowledge cannot, on the average, be so well earned as a degree depending on day work. The idea of giving full university degrees on the strength of evening work should not be encouraged; but everything should be done by universities to encourage the attendance of day workers as students at evening classes in order to cultivate their minds, without any intention of taking a degree. Scholarships obtained at evening courses might then lead on to day courses.

A detailed discussion on the subject of "Methods of Teaching Mathematics" concluded the business of the conference on Saturday afternoon. On this occasion the two chief papers were read by Mr. Garstang (Bedales School, Petersfield) and Mr. Brotherton (School of Technology, Manchester).

THE ÆTHER OF SPACE.¹

THIRTY years ago Clerk Maxwell gave in this place a remarkable address on "Action at a Distance." It is reported in the *Journal of the Institution*, vol. vii., and to it I would direct attention. Most natural philosophers hold, and have held, that action at a distance across empty space is impossible; in other words, that matter cannot act where it is not, but only where it is. The question, "Where is it?" is a further question that may demand attention and require more than a superficial answer. For it can be argued on the hydrodynamic or vortex theory of matter, as well as on the electrical theory, that every atom of matter has a universal, though nearly infinitesimal, prevalence, and extends everywhere, since there is no definite sharp boundary or limiting periphery to the region disturbed by its existence. The lines of force of an isolated electric charge extend throughout illimitable space; and though a charge of opposite sign will curve and concentrate them, yet it is possible to deal with both charges, by the method of superposition, as if they each existed separately without the other. In that case, therefore, however far they reach, such nuclei clearly exert no "action at a distance" in the technical sense.

Some philosophers have reason to suppose that mind can act directly on mind without intervening mechanism, and sometimes that has been spoken of as genuine action at a distance; but, in the first place, no proper conception or physical model can be made of such a process, nor is it clear that space and distance have any particular meaning in the region of psychology. The links between mind and mind may be something quite other than

¹ Abstract of discourse delivered at the Royal Institution on February 21, 1908, by Sir Oliver Lodge, F.R.S.