and the observations were made from the Observatory erected by the Expedition of the Bureau des Longitudes. With an eye-piece magnifying 190 times he observed several occultations of solar spots by the moon, and in about fifteen cases he noticed the phenomenon that is equivalent to that seen in observations of the Transit of Venus and known as the black drop. It was produced, he says, not only at the contact of large spots, but at the point of contact of small ones, and even of the simple filaments forming the penumbræ of spots. M. Bigourdan also made a special look for the phenomena known as Baily's beads, sometimes seen when the sun has been reduced to a very fine crescent by the advance of the lunar disc, but from all accounts he seems to have been unable to see any trace of them. A search round the sun for an intra-Mercurial planet, with a telescope giving a field of 25′, was also made, but with no satisfactory result, since he says that his instrument was not suited for that purpose: the negative result thus obtained affords no argument against the existence of such a body. The duration of totality lasted exactly 4m. 1s.

FINLAY'S COMET (1886, VII.).—The following is the current ephemeris of this periodic comet, as given in *Astronomische Nachrichten*, No. 3164:—

12*h*. *M.T. Paris.*

| 1893. | R A. (app.) h. m. s. | Decl. (app.) ° ′ |
|---|---|---|
| June 1 | 0 40 53 | +1 15·6 |
| 2 | 45 24 | 1 44·6 |
| 3 | 49 55 | 2 13·9 |
| 4 | 54 29 | 2 43·2 |
| 5 | 0 59 4 | 3 12·5 |
| 6 | 1 3 41 | 3 41·9 |
| 7 | 8 18 | 4 11·3 |
| 8 | 1 12 56 | 4 40·6 |

AURORA OBSERVATIONS.—In the event of Lieut. Peary's expedition to a high station in North Greenland (about Lat. 77° 30′ N. and Long. 70° 15′ W.), where regular observations of the aurora will be undertaken, it is hoped that everyone, wherever he may be, will help to supplement these observations by noting himself the times of absence and presence of this phenomenon. With so many workers in so many lands, it is needless to say that a systematic method of recording what is seen should be followed. With the intention of supplying this demand, Mr. M. A. Veeder has issued a set of blanks similar to those that will be used in the expedition, so that when properly filled up comparisons can be made in detail. In addition to the investigation of the local distribution of the aurora, it is hoped that the electro-magnetic conditions of solar origin may be more inquired into, and it is on this account that these circulars have been sent to both solar and magnetical observatories as well as to individual observers. As for the Arctic records, they will be continuous whenever observation is possible, relays of observers connected with the expedition relieving each other. In making such observations it is emphasised here that minute descriptions of the formation of arches, streamers, prismatic colours, and the like, accompanying such variations in the extent of displays, are of interest, but are far less important than that the times should be noted as accurately as possible. Any one desiring these blanks can be supplied directly by applying to M. A. Veeder, New York.

THE CONSTANT OF ABERRATION.—Prof. Chandler, in the *Astronomical Journal* (No. 296), gives the third of his most important papers relating to the constant of aberration, treating in this article specially of Struve's Prime-Vertical Observations, 1840–55, from the new point of view with respect to the variation of latitude. In this discussion, in addition to a direct solution for all the unknowns, he has made an indeterminate one, employing the constants pertaining to the 427-day term, and expressing the unknowns in terms of $y$ and $z$. As regards the former solution, employing the observations of the seven stars from the years 1840–42, the value of the observations obtained is 20″·533, Struve's value from the same material being 20″·445, and for the whole data from 1840–55 the aberration is 20″·514. This last-mentioned value would be the "definite value from Struve's Prime-Vertical Observations, if we accept the direct solution as the best," but he says the *indeterminate* solution throws doubt upon this point. The definite value, as given by this solution, gives $20''\cdot481 + 0\cdot111y + 0\cdot230z$; and, since as yet the most probable values of these constants are not known, those of the 427-day period applied to the special case of Polaris, which were independent of the aberration, give, on this assumption, 20″·474, a value, as will be noticed, smaller than that by the direct solution. The value 20″·500 for the aberration constant is, according to Prof. Chandler, too great, as inferred from the discussion here given. As a "matter of interest" he gives the values of the aberrations deduced from the observations of the several stars made in 1840–42.

THE ASTRONOMICAL DAY.—"Is it desirable, all interests considered, that on and after January 1, 1901, the astronomical day should everywhere begin at mean midnight?" This is the question that has been put forward by a joint committee of the Canadian Institute and the Astronomical and Physical Society of Toronto, and printed in a circular-letter addressed to astronomers of all nations. Many of our readers may remember that as far back as 1884 the Washington International Conference carried unanimously the following resolution, there being representatives of twenty-five nations, "counting among them several astronomers of world-wide fame," that "the conference expresses the hope that as soon as may be practicable, the astronomical and nautical days will be arranged everywhere to begin at mean midnight." That the astronomical and civil day should start together at the same moment seems without doubt the right method of procedure, for what is gained really by reckoning the astronomical time from noon and the civil from the preceding midnight? It is true that changes will have to be made in the *Nautical Almanac*, and all such-like year-books, both astronomical and nautical; but on the assumption that the change is made simultaneously by all nations, and taking into account that such a change cannot come into vogue for five or six years on account of the fact that these books are printed a few years in advance, there seems really no difficulty ahead. The suggestion that the change, if made, should take place with the change of the century seems to be an excellent epoch for such a transition, for besides giving time for a thorough discussion of so important a question, it will, as Otto Struve says, "stamp itself on the memory of all who hereafter would be busied in the investigations in which exact chronology plays a part."

ROYAL OBSERVATORY, GREENWICH.—The Annual Visitation of the Royal Observatory at Greenwich by the Board of Visitors takes place on Saturday, June 3 next. The Observatory will be open for inspection at 3 p.m.

## GEOGRAPHICAL NOTES.

DR. NANSEN writes confirming the statement made in this column as to the baselessness of the assertions regarding the failure of his expedition. He is making rapid progress with his preparations, and expects to sail in the *Fram* on his great venture on June 20.

THE most recent change of name in Africa is the adoption of the official title Niger Coast Protectorate for what was previously known as the Oil Rivers Protectorate, comprising the coastward part of the Niger delta.

NATAL, which has been a British colony for fifty years, has entered upon the final stage of colonial independence by the adoption of responsible government. It is expected that this step will lead to a rapid development of the resources of the country, and a considerable extension of its railways.

THE Antarctic whaler *Balæna* put into Portland Roads for coal on May 25, and reached Dundee on May 30, being the first to return. Mr. W. S. Bruce, who was on board as surgeon and in charge of scientific observations, reports that the homeward trip was favoured by very fine weather. He confirms our fear that opportunities for scientific work had often to be lost on account of the purely commercial character of the trip, and the rigid interpretation of his instructions by the captain. An account of the voyage and its results will probably be given to the meeting of the British Association at Nottingham. On the return journey a series of floats was thrown overboard from the Antarctic ice-margin to the equator, in order to endeavour to get light on the direction and speed of the currents. The lowest air temperature experienced amongst the ice was 21° F.

THE new number of the *Geographical Journal* publishes an old minute of a committee of the Royal Geographical Society held in 1845 to consider the nomenclature of the oceans. At

this meeting Sir John Franklin took part, and as he sailed on his last voyage shortly afterwards it is possible that his absence prevented the matter from being further discussed. The provisional resolution come to by the committee was to give the following names and limits to the oceans:—Arctic Ocean and Antarctic Ocean, to the waters lying within the Arctic and Antarctic Circles respectively. The Atlantic and Pacific Oceans stretched from the Arctic to the Antarctic Circles, and were separated from each other by the meridian of Cape Horn. The Indian Ocean extended from India to the Antarctic Circle, divided from the Atlantic by the meridian of Cape Agulhas and from the Pacific by that of the south point of Tasmania. Mr. Arrowsmith, the eminent cartographer, was present at the meeting, and it is customary in Continental works to refer this systematic definition of the oceans to him. As a matter of fact his maps had a great deal to do with the nomenclature acquiring popularity. The committee proposed a triple sub-division of the Atlantic and Pacific into a northern, southern, and intertropical part. This has not come into general use. It is time that the question of oceanic nomenclature should be seriously considered again, and that the morphology and physiology of these great features be taken into account as well as their superficial outlines in determining a scientific classification.

## THE IRON AND STEEL INSTITUTE.

A MEETING of the Iron and Steel Institute was held on Wednesday and Thursday of last week, May 24 and 25. There was a somewhat short programme, only five papers being on the agenda, and one of these was not read. There were, however, two additional papers afterwards brought in, but they were only read by title, and as they were not discussed, had very little influence on the proceedings. The papers read were as follows:—On the elimination of sulphur from iron and steel, by J. E. Stead, of Middlesbrough; on the Saniter process of desulphurisation, by E. H. Saniter, Wigan; notes on puddling iron, by John Head; on the recording pyrometer, by Prof. W. H. Roberts Austen. On the members assembling on Wednesday morning, the president, Sir Frederick Abel, occupied the chair, and the usual formal business of reading the minutes was first undertaken, after which the report of the council was read by the secretary, from which it appears that the advance of the institute in respect to membership has not been altogether satisfactory of late. The resignation of the secretary, Mr. Jeans, was also mentioned. The opportunity has been taken by the council, of Mr. Jeans's retirement, to introduce some modifications in the secretarial and editorial arrangements. Mr. Bennett H. Brough, an Associate of the Royal School of Mines, who has for some time past been an assistant professor at the Royal College of Science, has been appointed to the office of secretary and editor to the institute.

Sir Frederick Abel next evacuated the presidential chair, which was then occupied by Mr. E. Windsor Richards, the new president. Mr. Richards is an excellent representative of the practical steel manufacturer, having been engaged in the iron and steel trades all his life. He was for some time manager at the important steel works at Eston in Middlesborough. Some time ago he vacated his position there to take the management of the Lowmoor Iron Works, an establishment almost classical in its antiquity, in an industry which has been so entirely reformed within the last few years. Lowmoor, however, keeps to its old traditions and still produces best Yorkshire iron in the manner practised from a period extending back into the early days of iron manufacture, and this in spite of the improvements and advances made in the manufacture of mild steel. Mr. Richards having been conducted to the chair, at once proceeded to deliver his inaugural address. One of the most important parts was his reference to the remarkable extent to which English steel is made from foreign ore. It is, of course, unnecessary to state at any length the reason for this, as the fact must be well known to nearly all our readers. The iron ores of Britain, upon which our engineering supremacy was so long supposed to rest, is, with some not very important exceptions, unfitted for the production of ingot iron, more generally known as Bessemer, or mild steel. The chief reason for this is the considerable percentage of phosphorus it contains. We have, however, in Lancashire and Cumberland, hæmatite ores which are of a suitable description, but these are not so largely worked as at first might be thought they would be, and the bulk of hæmatite ore required for steel making in England is brought from Bilbao, in North Spain. It has been generally thought of late that these deposits are being rapidly exhausted, and though the use of calcium will perhaps somewhat extend the life of the supply, the end may be sufficiently near to the present time to make it worthy of the serious consideration of steel makers. In the basic process, there is, however, a means by which our native phosphoric ores can be rendered suitable, to a large extent, for steel making purposes, and the successful working of the basic system is therefore a matter of national concern. In England, the process has received serious opposition. Perhaps we have been over-conservative in this matter; or perhaps, on the other hand, we have displayed no more than salutary caution. However this may be, the Germans have gone far ahead of us in the production of basic steel. Germany, like England, has large deposits of phosphoric ore and, unlike England, has not that free sea communication with Spain, which has rendered the importation of hæmatite ores a matter of little difficulty and small expense. It was natural, therefore, that Germany should take hold of the new system with less caution and more vigour than the English steel makers, but the result has been somewhat antagonistic to English interests. Mr. Windsor Richards, in his presidential address, told us that the west coast of England has raised $2\frac{3}{4}$ million tons of ore, free from phosphorus, and could probably increase that quantity to produce $1\frac{1}{2}$ million tons of pig iron, should the demand arise. During the twelve months ending December 1892, the quantity of basic steel made in England was 406,839 tons. In Germany and Luxemburg 2,013,484 tons of steel were made from phosphoric ores.

Mr. Windsor Richards is now, as we have said, an "ironman," which seems a curious thing in the present day, after he has held, perhaps the most important position of his time in the steel trade; however, there is yet a large demand for Lowmoor iron, and the old-fashioned methods of production are still in vogue. Of this he gave some very interesting particulars. The address dealt at some length with the question of over-production, and it seems pretty evident that our facilities for making steel are far ahead of the demand for the material. In spite of this money is still being expended in steel-making plant, although so large a part of that already existing is at present lying idle, and appears likely to do so. The year 1892 was in many respects one of the very worst the iron and steel industry has ever known.

The two papers by Mr. Stead and Mr. Saniter on the elimination of sulphur from iron, were contributions of great value. The subject is one of very considerable importance, and fortunately has been occupying the attention of metallurgists for some time past. It would be impossible for us, in a brief notice of this kind, to give an abstract of these two papers; indeed they are only complementary to papers already read by the authors at former meetings. Calcium chloride is the purifying material in admixture with lime, and the process is adapted, either for purifying fluid iron or pig iron direct from the blast furnace. The process is effected by running the fluid metal into a ladle having a layer of the purifying materials on the bottom, and afterwards running the metal into pigs or plate metal for subsequent use in the puddling process; or the crude sulphury pig may be treated in the basic Siemens furnace or Bessemer converter, with the desulphurising mixture. About $\frac{1}{2}$ cwt. of crude calcium chloride is used per ton of steel, n conjunction with an excess of lime above that which is usually employed; the cost of the calcium chloride is about 35*s*. per ton. About 70 per cent of sulphur can be removed from the charge of metal in an open hearth furnace by this process. It may be added that the process is in practical working at Wigan. What we have already said with regard to dephosphorisation of ore in its bearing on the use of our native ores also applies, to a great extent, to desulphurisation, and although Mr. Saniter does not stand alone in the introduction of a desulphurising process, there is no doubt that he has rendered this country considerable service by his efforts in this direction. The reading of these two papers, together with the introductory business and the presidential address, occupied the whole of the Wednesday sitting, and the discussion on both papers was taken jointly on Thursday morning. The chief point raised was whether the process was one requiring such delicacy in manipulation that ordinary workmen could not be trusted to carry it out so as to produce uniform results. Whether this objection will be fatal time will show, but the general opinion appeared to be that by employing fairly