suggests that in periodic changes in the refraction may be found in part the explanation of the discrepancy between the values of the aberration constant derived from the solar parallax and that given by Talcott's method. Further work can alone elucidate the point.

Engineering for July 18 gives an account of investigations made by the United States Bureau of Mines on the ignition of mine-gas by glow-lamps. That all types of glow-lamps are not equally liable to cause ignition of explosive gas was known from previous experiments, conducted chiefly in Belgium, France, and Germany. The American investigators come to the following chief conclusions:—The naked carbon filaments of standard types of lamps, burning at rated voltages, will invariably ignite explosive gaseous mixtures. If the gas can reach those filaments without breaking them, or without producing partial combustion within the bulbs, the gas is sure to be ignited. Several, but not all, sizes of standard lamps (carbon and metallic filaments) and of miniature lamps (small lamps for miners) will ignite the gas when smashed while burning at rated voltages; those lamps which do not cause ignition usually, may do so if the broken pieces of the filament produce a short circuit when the lamps are smashed. Reviewing the results, all the lamps tested must be considered unsafe, though some specimens of a class might not cause ignition. Alternating or direct current, and coupling in series or parallel, made little difference.

MESSRS. J. and A. CHURCHILL have nearly ready for publication the seventh edition of "The Microtomist's Vade-Mecum," by A. B. Lee; the sixth edition of the late Prof. J. Campbell Brown's "Practical Chemistry," edited by Dr. Bengough; and the third edition of "A Text-book of Physics," edited by A. Wilmer Duff.

THE publication of a new series of books, entitled "The Cambridge Technical Series," and edited by Mr. P. Abbott, is being undertaken by the Cambridge University Press. The series will be comprehensive and will include the whole sphere of technical work in the widest sense. Among the subjects arranged for are:—Automobile engineering, electro-technical measurements, chemistry and technology of oils and fats, mining geology, and domestic science.

A COPY of their new list of wireless apparatus and accessories has been sent to us by Messrs. F. Darton and Co., 142 St. John Street, Clerkenwell, London, E.C. This firm has a long-distance installation at work at its factory, and makes a practice of explaining the most efficient methods of using the apparatus supplied to customers. The list is well illustrated, and full particulars of many forms of transmitting and receiving apparatus are supplied.

OUR ASTRONOMICAL COLUMN.

PERIODIC SPECTRUM OF α CANUM VENATICORUM.—Prof. A. Belopolsky publishes in *Astronomische Nachrichten*, No. 4664, the epochs of maximum intensity of the dark line $\lambda=412{\cdot}993\ \mu\mu$ in the spectrum of α Canum Venaticorum. Fifty hours is stated to be the length of time of the visibility of this line, and the periodicity very near 5·50 days. Other lines become faint at these epochs.

1913	July	24·96	G.M.T.	Aug.	15·96	G.M.T.
	,,	30·46	,,	,,	21·46	,,
	Aug.	4·96	,,	,,	26·96	,,
	,,	10·46	,,	Sept.	1·46	,,
				,,	6·96	,,

STARS HAVING PECULIAR SPECTRA.—The observations carried out by Miss Cannon for the Revised Draper Catalogue have added already ten stars to those known to have bright lines in their spectra, and twenty-four new composite spectra. Details of these are given in Harvard Circular 178. The bright-line stars have spectra belonging to classes ranging between B3 and Oe. The latter shows the bands λλ4633 and 4688 bright, whilst Hβ is seen bright in the rest, one also showing Hγ as a bright line. Of the twenty-four stars showing composite spectra only four are included in Burnham's General Catalogue of Double Stars.

In the same circular it is remarked that a photograph of the spectrum of Nova Geminorum No. 2 secured on April 5, 1913, shows only slight changes since November 9, 1912, when the brightest band was at λ4363. Between λλ4686–5007 the spectrum resembles that of the prevailing type of gaseous nebulæ, but differences occur in other portions of the spectrum.

THE ORIGIN OF THE PLANETS.—In a memoir communicated to the American Academy of Arts and Sciences (vol. xiv., No. 1) Prof. P. Lowell arrives at some interesting conclusions regarding the genesis of the solar system. Inquiring into the causes of a striking commensurability exhibited between the mean motions of adjacent planets some of the deductions he makes are:—(1) The planets grew out of scattered material; (2) each brought the next one into being by the perturbation it induced; (3) Jupiter was the starting point, and is the only one of the planets that could have had a nucleus at the start.

Prof. Lowell enunciates the following law:—"Each planet has formed the next in the series at one of the adjacent commensurable-period points, corresponding to $\frac{1}{2}$, $\frac{2}{3}$, $\frac{1}{3}$, and in one instance $\frac{3}{5}$ of its mean motion, each then displacing the other slightly sunward, thus making of the solar system an articulated whole, an inorganic organism, which not only evolved but evolved in a definite order, the steps of which celestial mechanics enables us to retrace."

On the basis of this law he makes some predictions regarding "the nearest trans-Neptunian planet"; thus it should have a major axis of 47·5 astronomical units, and a mass comparable with Neptune, though probably less.

THE HULL MEETING OF THE MUSEUMS ASSOCIATION.

THE annual conference of the Museums Association was held at Hull last week, under the presidency of Mr. E. Howarth. There was a large attendance, including representatives from abroad, as well as from numerous places in the British Isles.

As his presidential address, Mr. Howarth gave a helpful and suggestive discourse on the scope, function, and development of museums, using the word in its most comprehensive sense. He pointed out that though the universe could not be represented in a museum, yet even the provincial institution was doing work of a national character. It would be foolish to attempt to reproduce the British Museum in every town, but the principles dominating it were applicable to the smallest village museum. Museums should

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hold a recognised position in the scheme of national education from its base to its summit, and each museum, whether its teaching be general or specific, should do more than merely provide object-lessons. It should focus attention upon the progress of human knowledge and achievement. This cannot be done by punishing the visitor with endless series of specimens of interest only to the specialist. It must be accomplished by selecting a strictly limited number of objects, and so displaying them as to endow them with an intensely human interest. The gathering together of objects of local significance should be the primary duty of the curator, and their effective display his greatest achievement.

In a paper entitled "Methods of Collecting," Mr. T. Sheppard gave a brief account of the growth of the Hull museums. As evidence of continued development it may be mentioned that at the association dinner it was announced that Colonel G. H. Clarke had determined to purchase and present to Hull the Mortimer collection of prehistoric antiquities, geological specimens, and other relics, at present housed in the museum at Driffield. The announcement was received with the greatest enthusiasm, for the collection is renowned as one of the best series of Yorkshire prehistoric antiquities in existence, and its value is enhanced by the careful and scrupulous records kept by Mr. Mortimer.

The most novel paper of the conference was probably that given by Mr. J. A. Charlton Deas, of Sunderland, "How to Show our Museums and Art Galleries to the Blind." In essence this was a report of experiments made by Mr. Deas at the Sunderland Museum and Art Gallery, where demonstrations have lately been given to parties of blind people, both adults and children. Blind visitors in the museum were taken in hand by guides. They handled certain specimens, and each feature was explained at the moment of touch. Attached to each specimen was a carefully drawn-out descriptive label, which was read by the guide, and great care was taken in leading the hands or fingers of the blind to the important features. Mr. Deas emphasised the need for conscientious guiding of the blind person's hands, and said that where possible there should be a guide for each blind visitor. The blind children of the council school were also taken in this way through the museum and art gallery. Some remarkable models were made, after the examination of the specimens, by children between eight and fifteen years of age, none of whom had any special knowledge of modelling. In fact, in some cases they were a first attempt. The models, though rough, showed in many cases remarkable spirit.

Prof. Roberts Beaumont, of Leeds University, read a paper upon the organisation of a textile museum, in which he said that the subject, though a large one, had not received that full attention which those connected with the textile arts considered it should have. He insisted upon the importance of illustrative models being technically correct, and effective for the demonstration of the purpose and function for which the machines were originally invented. Nor is it enough to furnish the student with specimens illustrating the history of textile ornament. Such analyses should accompany the specimens as would make them increasingly suggestive to those who viewed them and increasingly inspiring. A textile museum should set forth the history of manufacture and the process and sequence of invention, typifying the nature, scope, and function of each department of the industry, exemplifying each phase of woven art, stimulating research, and proving a veritable storehouse of classified knowledge.

Mr. J. W. Baggaley described a simple and efficient gelatine and glycerine cement by means of which he had been able to mount zoological specimens in spirit.

The association was honoured by the presence of Prof. F. Rathgen, chemist to the Royal Museum at Berlin, whose experiments and writings on the treatment and preservation of antiquities are so well-known to all curators. He gave a paper on the decay and preservation of antiquities, which aimed at giving an outline of the various causes underlying the disintegration of antiquities after excavation, due to the changes which have taken place during varying periods and conditions of interment.

Mr. Cecil W. C. Hallett and Mr. J. H. Leonard, official guides at the British Museum, Bloomsbury, and the British Museum (Natural History), South Kensington, gave accounts of their personal experience in conducting parties of visitors around these great national institutions. Arising out of this experience they were able to give many valuable hints as to the precautions to be taken to ensure successful and enjoyable demonstrations. Some of the difficulties which present themselves—such as noise, interruption from visitors not belonging to the party, &c.—were admittedly difficult to remedy, but, as public appreciation and the powerful advocacy of such friends of museum work as Lord Sudeley seem destined to bring this mode of spreading knowledge of our potentialities into vogue, it is essential that they should be overcome.

Mr. Reginald A. Smith, of the British Museum, gave a paper on curators and the Stone age. He directed attention to the fact that Britain was rapidly showing itself to be a much richer field for discovery in this direction than we have hitherto believed, and that the subject has now attained such public prominence as to call for close attention on the part of the curator. Stone-age archæology may now be described as being in the melting-pot, and it is our duty to see that we assimilate the new and far-reaching ideas which emanate therefrom.

The paper part of the meeting concluded with some interesting remarks by Dr. F. A. Bather, F.R.S., on fittings and preparations noted during a recent visit to the museum of the Institut Océnographique at Monaco, and a message from the Rev. Prof. Henry Browne emphasising the need for assistance from museums in the furtherance of classical studies.

The business meeting had several matters of special interest to consider, foremost amongst which was the question of grants by the Board of Education in aid of the purchase of scientific specimens for provincial museums. These grants have been in abeyance for several years, but the advisory council for the science museum has now taken up the matter, and a subcommittee recently received a deputation from the association in a most understanding and sympathetic spirit. The outcome is that the Museums Association has been asked to submit its views as to the direction in which grants would be helpful and appropriate, and as to the conditions which should accompany them.

The following resolutions were passed:—

"That this association desires to direct the attention of the Board of Education to the great value to provincial museums of the collections sent out by the Victoria and Albert Museum, and trusts that, now that the circulation department has been made a self-contained section of the museum, with no power to circulate any of the specimens in the general museum, the collections available for circulation will be augmented to meet the requirements of the provincial museums, which steadily increase in number, and are undoubtedly attaining a higher level of artistic excellence."

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"The Museums Association, at its annual conference in Hull, 1913, declares itself in cordial sympathy with the proposal to make provision in the grounds of the Crystal Palace for a British Folk-Museum on the open-air plan, and expresses the hope that the Right Hon. the Lord Mayor of London will use every endeavour to carry the proposal into effect."

The conference concluded its business by electing Mr. Charles Madeley, director of the Warrington Museum, to be president for the 1914 meeting, which is to be held at Swansea.

THE ELECTRIC FURNACE SPECTRUM OF IRON.

IN NATURE for April 24 (p. 200) we gave a brief account of the researches carried on by Mr. A. S. King, of the Mount Wilson Solar Observatory, upon the variations of the spectrum of titanium in the electric furnace. Mr. King has now concluded an investigation of the variation with temperature of the electric furnace spectrum of iron, an account of which is published in No. 66 of the Contributions from the Mount Wilson Solar Observatory.

This communication, like others of his on a similar subject, is of great interest, because it shows that the spectrum of a substance is not the same for any temperature. By knowing what spectrum is given at a known temperature it is possible to determine the temperature of stars or portions of the sun, and so utilise these laboratory researches for stellar and solar spectroscopy.

While a great amount of work has already been done in the case of iron, one of the earliest being the differentiation of temperatures by the short- and long-line method of Lockyer, Mr. King has all the advantages of the latest form of furnace and method of determining accurately the varying temperatures for the lower stages of temperature.

One of the great problems in these investigations is to determine whether the changes described are due to temperature or to electrical or chemical conditions which are present in different degrees in the sources of heat.

In a brief summary like this it is not possible to state all the conclusions which the research has led Mr. King to deduce, but the more important may be briefly summarised. In the first place, he has been able to divide into six classes the relative intensities of the iron lines in the visible spectrum for three furnace temperatures and the arc, basing them on the temperature at which a line appears in the furnace, and its rate of growth as the temperature increases. In passing from the furnace to the arc the changes in relative intensity may generally be accounted for by a difference in conditions equivalent to a large temperature difference. The ultra-violet was found a rich region for lines, and it was noted that increase of temperature corresponded to an extension of the line spectrum towards shorter wave-length. The increase in intensity of lines from the outer vapours into the core of an iron arc was found usually to resemble the rate of growth shown by the same lines with rising furnace temperature, and this the author suggests renders it unlikely that chemical reactions in the outer vapours affect the relative intensity of arc lines in any large degree.

So far as the visible region is concerned the enhanced iron lines are above the furnace stage, no lines being observed in the furnace spectrum. The furnace spectra at low and medium temperatures were found, except perhaps in the ultra-violet, to be very similar to those of the several flames.

The author concludes that while there is no definite proof that temperature radiation in a strict sense takes place, the position of temperature as the exciting and regulating agent in furnace phenomena seems to be clear.

ANTARCTIC LICHENS.[1]

LICHENS form a quite exceptional group of plants with many peculiar features, the chief among which is the fact that they are compound organisms, a lichen consisting of a fungus individual and numerous alga individuals—the fungus with its branched and interlacing threads has grown around the alga cells and enclosed them in a nest. The result is that the lichen can grow in places which would be quite unsuitable for the independent existence of either the fungus or the alga of which it is composed. Algæ grow in water or in moist places, while most fungi are extremely sensitive to cold and drought, but lichens can thrive in the bleakest positions and in the most severe climates, as on bare mountain rocks and in the farthest circumpolar regions reached by explorers—provided that the land surface is not covered by perpetual snow. In alpine and arctic regions, lichens do important pioneer work, helping to break up the hardest rock surfaces and prepare soil on which other plants can grow; while on steeply inclined and bare rock, lichens, along with minute algæ, are in general the first colonists.

These pioneer lichens are of the flat crustaceous and foliose types, the former attached closely to the substratum by their entire underside, the latter clinging more loosely, and being therefore detachable without chipping off bits of the rock itself in order to obtain specimens. On less steeply inclined parts, where the vegetation is older, the shrubby or fruticulose lichens are added; these are fixed at the base only, and show much greater variety of form than is found among the encrusting and leafy types.

In his report on the lichens of the Swedish Antarctic expedition, 1901–3, under Dr. O. Nordenskjöld, which has recently been published, Dr. O. V. Darbishire adds to his descriptions of the new species an interesting summary and discussion of the distribution of lichens in the arctic and antarctic regions generally. Unfortunately the good ship *Antarctic* was crushed by ice in January, 1903, and a large portion of the plants collected during her cruise along the coast of Graham Land had to be abandoned when she sank a month later; but though doubtless a considerable amount of material was lost in this disaster, a rich harvest was brought back by the botanical members of the Swedish expedition. This includes no fewer than 145 species of lichens, of which thirty-three are new.

An analysis of the results of antarctic expeditions up to and including Charcot's (1905) shows that at present 106 lichen species are known from the land which lies strictly within the antarctic limits, and that of these thirty-two also occur in subantarctic America, twenty-five in New Zealand, and sixteen in South Georgia, showing a very close affinity between the antarctic lichen flora, on one hand, and the American and New Zealand floras, on the other—the difference to the disadvantage of the latter being accounted for by the greater nearness of the subantarctic American region to the extreme limit of the southern drifting pack-ice. The lichens of subantarctic America and New Zealand are also very nearly allied, for out of 133 lichens in the former flora, 113 are found in New

[1] "The Lichens of the Swedish Antarctic Exp dition." By Otto Vernon Darbishire. Wissensch. Ergebn. der schwedischen Südpolar-Expedition. 1901-1903. Band iv., Lief. 11. Pp. 1—73+3 plates. (London Dulau and Co., Ltd., 1912.) Price 8s. (Subscription price 6s.)

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