

Sir Oliver Lodge discussed the assumed necessary constancy of the observed velocity of light in free space as contrasted with the universally admitted constancy of its true velocity. He contended that there is no experimental evidence for the dogma that wave-fronts are concentric with a travelling observer initially situated at the source. The Michelson-Morley experiment is consistent with such concentricity, but does not necessitate it. He argued that the Einstein equations exercise no physical discrimination, and are consistent either with this mode of expression or with the FitzGerald-Lorentz conception of the contraction of matter, which was a safer mode of expressing physical results than the attempt to impose complications upon time and space. The paper gave rise to some lively discussion from the supporters of the more modern views.

Mr. F. J. M. Stratton exhibited some spectrograms of Nova Aquilæ III. recently obtained at the Lick Observatory by Mr. Moore, which show important changes taking place in the distribution of radiation from the growing disc of Nova Aquilæ. It appears that the disc given by the H $\beta$  radiation is growing at only half the rate of that given by the nebular lines N<sub>1</sub>, N<sub>2</sub>, while the complex bands in the spectrum corresponding with all three lines give the same multiple of the wave-lengths for the displacement of separate maxima. Moreover, the separate maxima originate in different portions of the disc, and are inclined to the normal position of spectral lines. A complex combination of expansion, rotation, and vortex motion is needed to explain the effects in terms of the Doppler principle. While the maxima remain

fixed in position, the most displaced ones are growing brighter as compared with the central ones.

A further paper on astrophysics was communicated by the Rev. A. L. Cortie, who drew some remarkable comparisons between observations on solar faculæ and photographs of calcium flocculi. The occurrence of magnetic storms on the earth was attributed to the emission of electrons from low, disturbed areas of the sun, giving rise to the formation of clouds into which the earth then passed.

The programme also included an interesting paper by Prof. S. Chapman, who gave an account of some recent extensions of his work on the subject of magnetic storms. Prof. Horton described the results which he had obtained on ionisation phenomena in neon; and Prof. Whiddington showed how he had been able to detect distances of molecular magnitude by observing the variations of frequency in a thermionic-valve circuit produced by the minute changes of capacity resulting from the displacement of one plate of a condenser included in the circuit.

The reports of the Committees on Tidal Observations and on Seismology were of more than usual interest, and in the latter report Mr. J. J. Shaw referred to his recent observations on microseisms. Both communications are being published in the reports of the Association. Much interest was added to the proceedings of the Section by the opportune appearance of the new star in Cygnus. The discovery was announced by the Astronomer Royal at the first session of the Section, and reports of later observations on the new star were received during the meeting.

### Chemistry at the British Association.

THE meetings of Section B at Cardiff were fairly well attended, although the programme did not contain any remarkable novelties, and the war papers, which were so conspicuous a feature of the meeting at Bournemouth, were absent. Mr. Heycock's presidential address dealt with the development of metallography, a branch of physical chemistry which owes so much to the work of Heycock and Neville, whose investigations not only opened up important new lines of research, but also set a standard of accuracy which has had a most beneficial effect on later work in metallography, especially in this country. The lesson of the intimate connection between pure science and the advance of industry was well enforced by the address. The president was able to show lantern-slides made from the original photographs of Sorby taken just half a century ago, and members were enabled to appreciate the remarkable skill of the Sheffield amateur who was a pioneer in so many branches of science.

The Section held only one joint meeting for the purpose of hearing the papers in Section A on the subject of isotopic elements. There was a very large attendance at this meeting, and the latest discoveries concerning the isotopes of the commoner elements were described with admirable clearness by Dr. Aston. It is to be regretted that no chemist took part in the discussion. The doctrine of isotopes was founded on chemical evidence, and although recent developments have come chiefly from the physical side, the subject is one of intense chemical interest, and the conclusions which have been reached, inevitable as they appear to be, call for a drastic revision of conventional ideas regarding the elements. No chemist specially associated with the work of determining atomic weights was present, or it would have been interesting to learn whether accurate atomic-weight determinations have

ever been made for a single element, other than those of the radio-active group, from materials of widely different origin and geological age; whether, for example, such differences as have been observed between specimens of lead from minerals containing thorium and uranium respectively could be found between chlorides of widely differing origin so as to indicate that the isotopes of chlorine were present in a different ratio from that which has led to the accepted atomic weight of that element. The later paper of Sir E. Rutherford on the structure of the atom was also of great chemical importance, and considerations of this kind have, in the hands of Langmuir and others, been brought into direct relation with chemical facts. It is to be hoped that by the time of the next meeting of the Association chemists will be prepared to join with physicists in the discussion of these questions.

The three subjects selected for discussion on the technical side were fuel, lubrication, and non-ferrous metallurgy. Capt. Desborough's paper on industrial alcohol gave an excellent review of the prospects of production of this fuel from vegetable sources in temperate regions, and showed that, whilst the present cost of root crops grown on cultivated land is too high to allow of their profitable utilisation as sources of alcohol, the possibility of growing suitable crops on reclaimed land is by no means excluded, and figures were given to show that artichokes, sugar-beet, and a South American tuberous plant are all deserving of consideration. The use of maize in certain climates and of waste cellulose is also being studied. The experiments now in progress at the Royal Naval Cordite Factory may be expected to throw some light on the question, and the Section took occasion to pass a resolution urging on the Government Departments concerned the desirability of continuing such experi-

ments with existing plants. Some controversial matters arose in the discussion of the Third Report of the Fuel Economy Committee, which was presented by Prof. Bone. The report includes a memorandum by Prof. Louis urging improvements in the collection and presentation of mining statistics, and these recommendations have been adopted by the Committee. The Committee further disagreed with the policy of the Fuel Research Board in regard to the regulation of the quality of gas, and insisted on the importance of the limitation of inert constituents and sulphur. The hope was expressed that a further opportunity would be afforded to the Committee to submit its views to the Board of Trade before the matter was finally settled. The policy of the Fuel Research Board was defended by a later speaker, and references were made in the discussion to the use of colloidal fuel and to the recovery of ethylene from coke-oven gas. The Section asked for the re-appointment of the Committee, which has done valuable work in directing public attention to the urgent national need for fuel economy. An allied subject was dealt with by Dr. Owens in his paper on the measurement of smoke pollution as carried out by a Committee of the Meteorological Office. The methods of determining acidity in air have been improved, but a good method of estimating the amount of acidity borne by the suspended solid particles is still lacking.

The discussion on lubrication covered similar ground to that of recent meetings of technical societies. Messrs. Wells and Southcombe described the influence of small quantities of free fatty acids in lubricating oils, and Dr. Dunstan directed attention to the present ignorance of the chemical nature of mineral oils. The mode of action of acids on these oils is almost completely unknown. Mr. Tizard regarded lubrication as dependent on the formation of an adsorbing layer on the surface of the metal bearing, and mentioned curious results obtained in determining surface tension between mercury and oils by the drop method. Castor oil and glycerol have about the same viscosity, but the former is a good lubricant and the latter worthless. Mercury drops falling through castor oil remain intact at the bottom of the vessel like lead shot, whilst in glycerol they coalesce immediately.

Mr. Vogel's paper on tungsten described the methods employed in the manufacture of the metal at Widnes, and included an interesting account of the steps taken by the steelmakers of this country, when the outbreak of war deprived them completely of supplies of this most essential metal, to meet the requirements of the industry, with such success that all the tungsten needed is now manufactured at home, whilst a surplus remains for export, the quality being superior to that of the metal used before the war. Prof. Desch gave an account of the preparation and properties of ductile tungsten, and directed attention to the remarkable properties of the metal in the drawn state, a complete theoretical explanation of which is still lacking. Mr. Field's paper claimed great advantages for the electrolytic method of extracting zinc over the usual distillation process, and urged its more widespread adoption. Two short analytical papers were presented by Dr. Stanford, and the last session closed with an exceedingly interesting account by Prof. Jaeger, of Groningen, of his determinations of the surface tension and electrical conductivity of organic liquids and fused salts over the remarkably wide range of  $-100^{\circ}$  C. to  $+1600^{\circ}$  C.

The report of the Committee on Absorption Spectra, which was taken as read and not discussed, consisted mainly of an exposition by Prof. Baly of his theory of absorption. This paper might have furnished the basis of a good discussion, as the physical theory involved is novel, and criticism from both the chemical and the physical sides should be expected. Whilst numerous papers on the use of atomic frequencies and of the idea of quanta have been published in recent years, there has been no thorough discussion of such views, and most chemists have allowed the communications to pass without submitting them to any rigorous scrutiny, so that it is uncertain how far the new ideas are likely to meet with acceptance.

Cardiff afforded many opportunities for the inspection of chemical industries of varied kinds, and the Sectional excursions, which were well attended, included visits to iron- and steel-works, copper-smelting works, tinplate works, gasworks, and a rubber factory.

### The Lakher Head-hunters of Upper Burma.

AT the opening meeting of the session of the Royal Anthropological Institute, held on Tuesday, October 26, Prof. F. G. Parsons, vice-president, in the chair, Mr. Reginald A. Lorrain, of the Lakher Pioneer Mission, read a paper on "Lakherland, the Home of the Head-hunters."

Lakherland lies on the border of Upper Burma, and is some twenty days' march from civilisation. The Lakhers, who are practically unknown to the civilised world, are of the Mongolian type, and chocolate-coloured. While the men wear a small loin-cloth only, save for a large blanket thrown round them in the colder evenings, the women wear more clothing, their garments consisting of a piece of cloth for a skirt reaching down to the ankles, while a breast-jacket nearly covers the upper portion of the body. This jacket is open at the back in order that the heavy loads the women carry should not wear out the garment. The men allow their hair to grow long, but it is fastened in a large knot on the top of the head with long brass pins. A plume of horse-hair is entwined in the head-cloth to show that the wearer has taken a head. The children run about in a nude condition up to the age of ten or twelve years.

The Lakhers are skilled smiths, although their tools and appliances are of the simplest character. The forge consists of three slabs of stone, and the bellows are hollowed trunks of trees in which is fitted a plunger consisting of a circular disc fitted to a handle, feathers being attached to the rim of the disc to make the plunger practically airtight. Pottery is made by the women without a wheel. The clay, which is obtained from the white-ant heaps, is moulded between a stone held inside the pot and a hammer with rope wound over the head.

An interesting feature in a dance described by Mr. Lorrain was that the ceremonial headdress of the chief for this occasion, which is handed down from father to son, was always worn by the chief's daughter.

The dead are buried in graves immediately outside the dwelling-houses. The grave consists of a hole about 4 ft. square, but the body is placed in a small, sloping trench or tunnel underground excavated from one side of this hole. The body is pushed into the tunnel feet first, the cavity then being closed with a stone. An ornamental wooden pole, with projections or ears which distinguish by their number the sex of the deceased, is erected over the grave. Outside