

which Dr. Bauer has advanced to account for the motion of these charged ions is unsatisfactory in several respects, and he further considers that the experimental evidence which has been brought forward by Mr. Faris to support Dr. Bauer's theory is inconclusive.

Then followed several reports of committees, which were either outlined or taken as read. These included the report of the seismological committee, in which reference is made to the interesting results on the semi-diurnal change in level (caused by the tide) obtained by Plummer at Bidston Observatory. The meeting of the section then came to an end.

CHEMISTRY AT THE BRITISH ASSOCIATION.

IN arranging the programme for the Sheffield meeting the organising sectional committee had made it the main object to discuss broader questions of interest to other sections rather than to encourage the reading of papers appealing mainly to specialists; further, in view of the special character of the industries of Sheffield, much of the programme was devoted to metallurgical subjects. The results of the meeting fully justified this departure, and the three joint discussions not only proved of the greatest interest, but were most stimulating in character; indeed, it is probable that in two cases, at least, they will serve as points of departure for much new research. The metallurgical papers were equally stimulating and in harmony with the tone set by the president's address—the meeting as a whole should do much to inspire the filling of some of the gaps in our knowledge to which Mr. Stead made reference.

The joint discussion with Section A attracted a very large audience. The subject chosen—combustion—should have had the cooperation of the engineers, who were discussing the report of their committee on gaseous explosions on the same morning, but could not see their way to attend the joint meeting. Prof. Bone presented a report giving a very complete summary of the principal researches upon the chemical aspects of gaseous combustion during the past thirty years. He dealt in turn with ignition temperatures, the explosion wave, the pressures produced in gaseous explosions, the influence of moisture upon combustion, the combustion of hydrocarbons, and the influence of hot surfaces upon combustion. This last question is of considerable technical importance, hot surfaces accelerating dissociation, and probably also combustion, and hence playing a potent part in the development and concentration of the heat in gas-fired furnaces. The line of attack followed has been to determine the rates of combination of different gases with oxygen when the reacting mixtures are brought into contact with various solid surfaces at selected constant temperatures.

Sir J. J. Thomson directed attention to the fact that combustion was concerned, not only with atoms and molecules, but also with electrons, *i.e.* bodies of much smaller dimensions and moving with very high velocities. These may precede the explosion wave and prepare the way for it by ionising the gas. The motion of the ions can be stopped at once by means of a transverse magnetic field, and it would be of great interest to repeat Prof. Dixon's experiments on the photography of the explosive wave under such conditions.

It had been shown by the work of Townsend and others that in carefully dried gases the velocity of the negative electrons might be 100 times as great as the velocity of the positive electrons. The amount of moisture required to reduce this velocity to its ordinary lower value was exceedingly small, and comparable with that required to initiate chemical change. It was not unlikely that the two phenomena were very closely related.

In reference to the influence of hot surfaces in promoting combustion, it was not improbable that the emission of charged particles from the surface was a factor of primary importance. Hot lime gave out an enormous stream of negative electrons; hot metals emitted an excess of positive electrons. These electrons might produce very important effects by uniting (perhaps selec-

tively) with moisture, with the oxygen or with the inflammable constituent of the gaseous mixture. The action of surfaces might ultimately be found to depend on the fact that they formed a support for layers of electrified gas in which chemical changes proceeded with high velocity.

Sir Oliver Lodge referred to the fact that the velocity of sound was not a constant quantity. If a bullet were to travel with a velocity greater than that of sound the air would be shattered as if by an explosion. This result was in practice prevented by the compression, and consequent heating, of the air in front of the bullet, whereby the velocity of sound was momentarily raised to perhaps three times its ordinary value. Whilst hot surfaces promoted combustion, cool surfaces had an opposite effect; this was responsible for the production of vast quantities of soot and smoke, especially in firing steam boilers. The discovery of a surface which would promote combustion even at lower temperatures would be of very great value.

Prof. H. B. Dixon stated that the explosion of hydrogen and chlorine by light was of special interest, as it did not occur in the well-dried gas. Both Mellor and Chapman and Burgess had failed to find any evidence of ignition by light of a mixture of two substances—three kinds of molecules seemed to be necessary. But when once the explosion wave was started it proceeded independently of moisture, and, indeed, was actually most rapid in the dry gas; the explosion was then propagated by molecular collisions between pairs of molecules. It was not unlikely that invisible compression waves might travel a little in front of the visible flame, the particles being thereby raised to a higher temperature, but remaining uncombined until they collided with one another.

Prof. Armstrong denied the possibility of any interaction taking place between two substances if neither was an electrolyte. Highly purified materials must be used for work of this kind. Perhaps the most suggestive experiment was that of Sir James Dewar, who had purified helium so perfectly by the use of charcoal cooled in liquid air that it would not permit an electric discharge to pass through it, although the presence of the gas was clearly shown by the radiometer.

A paper on the molecular weight of radium emanation, by Sir Wm. Ramsay and Dr. R. W. Gray, was delivered by Dr. Gray, who first described in detail the construction of the micro-balance used, and showed how the exact volume of emanation weighed was determined. The mean value of 221 was obtained for the molecular weight of the emanation, and the fact emphasised that the radium emanation was in every sense a true chemical element. Chemically it is absolutely inert, and the atomic weight shows that it falls into the argon series in the periodic table, filling the second vacant space below xenon. The name "niton" (shining) and the chemical symbol Nt was proposed for the emanation. Sir J. J. Thomson suggested that the name should be left to the Congress of Radiology at Brussels (see NATURE, October 13).

The more purely physical papers read at the joint meeting are dealt with in the account of the proceedings of the physical section.

The report on solubility submitted by Dr. J. V. Eyre is the outcome of a systematic study of the literature; the material is classified chronologically and according to subject, and contains a brief statement of the main conclusions arrived at by the various authors.

The conjoint discussion on the biochemistry of respiration was of the greatest value in enabling workers on the subject, representing the three sciences concerned, to correlate their views. Mr. F. F. Blackman, who opened the proceedings, gave a very complete summary of the present position of the subject, dividing it into three sections:—(1) the nature of the chemical reaction (or complex of reactions) that constitutes respiration; (2) the extent to which this reaction in the cell conforms to the laws of general chemistry; (3) the influence on the progress of the reaction of the peculiar medium (protoplasm) in which it takes place. A summary statement of respiration takes the form of the equation for the complete oxidation of glucose, but actually the process is most complicated. The existing theories as to the stages in

which glucose undergoes oxidation and the part played by oxidases were all fully described.

Mr. Blackman advocated the hypothesis that normal respiration consists of two processes, a small "protoplasmic respiration" which cannot be suppressed without death, and a larger "floating respiration" which depends on the available sugar supply, and can be reduced or abolished by starvation.

A brief summary of the oxidative breakdown in animal tissues was given by Mr. H. M. Vernon, who described some of his own work on the subject.

Dr. E. F. Armstrong summarised the existing knowledge with regard to the oxydases, and debated whether they are to be regarded as organic enzymes or as inorganic catalysts in a colloidal substrate. The facts that oxydase solutions retain their activity after somewhat drastic purification, that they invariably contain, even after the most thorough purification, traces of manganese, iron, or calcium salts, and that their action may be imitated by colloidal suspensions of the salts of these metals, are all in favour of the later view. On the other hand, there is distinct evidence of the specific nature of oxydases and of the existence of different oxydases. He further described the remarkable blackening of the leaf of *Aucuba japonica* produced when this is exposed to toluene or chloroform vapour, the change being attributed to an oxidative effect produced by an oxydase. A systematic investigation of what substances were able to cause this blackening showed it to be produced by most organic vapours, e.g. ethyl acetate, ether, benzene, &c., by carbon dioxide, and by such salts in aqueous solution as cadmium iodide, mercuric chloride, and sodium and potassium fluorides. All these substances possess but little affinity for water, and it is supposed that they are therefore able to pass through the differential septa, enter the cell, and set up osmotic disturbances whereby the cell contents become diluted and hydrolysis sets in to restore equilibrium. This brings the various cell enzymes into play, and a general degradation takes place. Measurements of the amount of sugar or starch or glucoside in the leaf before and after stimulation confirm this view—a great increase in the amount of reducing sugar is produced.

The stimulative effect of chloroform on respiration formed the subject of a paper by Mr. D. Thoday, whose results appeared to harmonise very closely with those of Dr. Armstrong; this paper will be more appropriately discussed under Section K. Prof. Armstrong, who followed, made a critical examination of the mechanism of the oxidative changes, and laid stress on the extremely complicated nature of the respiratory phenomenon.

The joint meeting with the Educational Section to discuss the neglect of science by industry and commerce attracted a large audience. Mr. Blair, who opened, spoke at considerable length in detailing evidence which he had collected from 150 past students of universities or institutions of university rank—all belonging to a class for whom the earning of a living was imperative. His paper appeared in full in NATURE of September 15. Following a supplemental paper by Sir Wm. Tilden, the subject was debated in turn by Dr. H. T. Bovey, Principal Griffiths, Dr. Beilby, Sir Wm. White, Mr. J. E. Stead, and Prof. Armstrong. The general tone expressed, both in Mr. Blair's address and by subsequent speakers, was one of hope, and it was agreed that England is not so far behind other countries in the application of science to commerce and industry as is often asserted. The main fact emphasised was that it was, above all, necessary to educate the public and bring home to them the advantages of pure science, and, further, it was all-important to establish some easy means to bring about a better understanding and more frequent communication between those who studied science and those concerned in its application.

On Tuesday, September 6, it was necessary to divide the section, the metallurgical and the organic chemistry papers being taken separately. The first paper, by Prof. J. O. Arnold, dealt with a fourth recaescence in steel. Steel in cooling contracts to a certain point, and then suddenly expands. It is agreed that this takes place three times; but Prof. Arnold, as the result of several years' experience, considers there is a fourth recaescence

due to constitutional segregation, namely, the falling out between Ar_3 and Ar_1 of the ferrite and hardenite from their state of solid solution into microscopically visible masses. Numerous photomicrographs and cooling curves were shown to support this view. In the ensuing discussion Dr. C. H. Carpenter contended there was no need to term the process a fourth recaescence, and interpreted it as a prolongation of the Ar_3 and Ar_2 inversions. He criticised adversely the apparatus employed by Prof. Arnold, advocating in its place the differential method of registering recaescence. Prof. Arnold, in replying, stated this method to be quite untrustworthy. Mr. Stead said it is well known that in steels containing under the eutectoid proportion of carbon, when cooling from Ar_3 to Ar_{1-2} , the carbides and ferrite segregate. Prof. Arnold by his very careful research was the first to show that this segregation is coincident with an evolution of heat.

Prof. H. M. Howe, in a brief paper on allotropy or transmutation, took the view that changes such as that from the diamond to lampblack in reality involve transmutation, and the fact that but a single series of derivatives is given by such compounds was explained as meaning that the derivativeless element inevitably transmutes whenever it enters into combination.

A second paper dealt with the closing and welding of blow-holes in steel ingots, in which the author supported the practice of allowing blow-holes to form rather abundantly, so as to prevent the formation of a pipe, and then, relying on the ease with which such steel welds, trying to get flawless metal by welding these blow-holes up in the process of rolling the ingot out into its final form. This procedure is of great economic importance in that it enables the steel maker to avoid the serious discarding which would be necessary in case his ingots were free from blow-holes, and hence deeply piped. Many metallurgists have condemned the practice on the ground that the closing of blow-holes is impossible, because the gas which they contained must remain ever present during the rolling, even though somewhat compressed. Prof. Howe described in detail experiments showing that the blow-hole gases had been reabsorbed by the metal to a very great degree, and suggested prolonging the exposure to a temperature above the welding point, so as to complete the reabsorption of the gas while the metal was still weldable. The welding of the blow-holes should be promoted rather by the practice of "reheating" than by that of "direct rolling." Following some remarks by Prof. Arnold and Mr. Hadfield, Mr. Stead described an investigation carried out with Mr. F. M. Parkin on the same subject, which proved conclusively that when two metallic surfaces, quite free from oxide or any foreign matter, are brought together and hammered at temperatures from 1100° – 1150° C., they weld up completely. The question as to what becomes of the imprisoned gas requires careful research; when the cavities are large the gases are enormously compressed, and must interfere with efficient welding. As a result, blisters occasionally appear on finished sheets if afterwards reheated. The gases extracted from a large blister in a soft steel slab gave on analysis:— CO_2 , 23 per cent.; CO, 50.5 per cent.; hydrogen, 17 per cent.; marsh gas, 3.5 per cent.

The next paper, on the provident use of coal, by Prof. H. E. Armstrong, gave rise to a very considerable discussion. During the early stages of combustion a variety of volatile inflammable substances are given off which burn with a smoky flame. By first coking the coal at a low temperature these may be removed and recovered, and a fuel obtained which burns as readily as coal and gives a hotter fire. The gas given off by the coking process is very rich, and it was advocated that this be substituted for the product now produced by carbonising coal at very high temperatures, so as to obtain the maximum possible yield. It is essential that the quality of gas be improved; since the sulphur clauses of the Gas Acts were repealed there has been a steady deterioration. There is no reason why the coal now used in the raw state by the community should not be first coked at a low temperature. The gas would be available as an illuminant and for heating; the residual coke could be burnt without

producing smoke, and a variety of bye-products would have considerable commercial value.

Prof. A. Smithells stated that the point to be proved was whether fuel of the type advocated could be produced under conditions which would enable it to compete economically with the coal and products as put on the market under existing conditions. He considered the whole question to be in the experimental stage.

Dr. Beilby pointed out that in order to supply the public with soft coke instead of the 40 million tons of coal now required for domestic purposes the gas industry would have to be completely revolutionised, and some other very large uses found for the gas and other bye-products. It would not be possible to get chemical uses for such a large quantity, and it would have to be largely burnt as fuel. Mr. Archbutt emphasised the evil caused by sulphur in the gas; the public is not aware of this being the cause of the corrosion of brass, tarnishing of silver, and the destruction of books and furniture. Mr. A. W. Oke defended the gas companies, and other speakers supported Prof. Armstrong, who, in replying, stated that the use of a very large radiant and the supply of a greater quantity of gas was progress in the wrong direction. He agreed with Dr. Beilby that it would be necessary to regard the products of coking from the point of view of their fuel value, but that was a largely enhanced fuel value.

Prof. McWilliam described the properties of a series of steels with varying carbon contents, but containing, in addition, about 1 per cent. manganese, and a similar series containing 2 per cent. chromium, from results recently obtained by him in conjunction with Mr. E. J. Barnes. In pure iron-carbon steels the strength rises steadily with the amount of carbon up to 1.25 per cent. carbon, a further increase resulting in a reduced strength. The carbon is present as iron carbide, and other elements mainly influence the nature, composition, or distribution of the carbide in the steel. The effects of heat treatments such as long annealing and quenching, followed by tempering at different temperatures, are comparatively small when the carbon is low, but greater as the carbon is increased. Comparative tables were shown of steels with carbon contents and heat treatments as nearly alike as could be selected, and varying only in the special element added, to illustrate the very considerable and abiding influence of the fundamental chemical composition.

In the absence of the author, a communication by Dr. Rosenhain, on the crystalline structure of iron at high temperatures, was taken as read. The conclusions drawn from the research are that iron at temperatures up to 1100° C. behaves as a crystalline aggregate; it exists in three different modifications possessing widely different mechanical properties, the temperature range at which these modifications exist being consistent with their identification with the α , β , and γ forms of iron. β Iron, though existing at a higher temperature, is markedly stronger and harder than α iron. Iron as found in approximately pure metal at high temperatures possesses the structure and some of the properties of γ iron as found in certain alloy steels. The failure to harden pure iron by quenching is due to the difficulty of inhibiting the $\beta \rightarrow \alpha$ transformation by rapid cooling except in the presence of carbon. If β iron could be preserved in existence at the ordinary temperature it would possess a very high degree of hardness and strength probably quite comparable with that of hardened steel.

Dr. S. M. Copeman brought forward the subject of ferro-silicon, with special reference to possible dangers arising from its transport and storage. A number of accidents have occurred from the handling or transport of ferro-silicon, particularly cases of sudden illness and death caused by the gases evolved from certain cargoes. The subject has had full inquiry at the hands of the Board of Trade, who entrusted the investigation to Dr. Copeman, with the collaboration of Mr. S. R. Bennett and Dr. Wilson Hake. Most of the high-grade ferro-silicon, containing 50 per cent. of silicon, is produced electrically in France. About 4000 tons are imported annually into England. This alloy is exceedingly brittle, and readily decomposes in a moist atmosphere, when

poisonous fumes of phosphoretted hydrogen are evolved. The official recommendations adopted by the Board of Trade comprise the need for ascertaining that the ferro-silicon has been broken into small pieces some time before being taken on board ship; the proper marking of each barrel; the prohibition of conveyance on passenger vessels; and the adoption of certain other precautions during transport. Subsequently Dr. Wilson Hake described the apparatus he had employed for analysing the poisonous gases produced, and Mr. S. R. Bennett showed photomicrographs of certain ferro-silicon alloys. The suggestion was made that the alloy might be protected from moisture by immersion in varnish, but it was stated that it crumbles so readily as to be always presenting new surfaces.

Two rival theories have been suggested to explain the corrosion of iron and steel. The electrolytic theory assumes that pure oxygen (or air) and pure liquid water *alone* are necessary to effect the rusting of pure iron. According to the acid theory, the presence of at least traces of an acid either free or combined with a base is essential to corrosion. Dr. J. N. Friend described a simple form of apparatus by means of which the correctness of the acid theory is established.

A paper embodying researches carried out in the chemical department of Sheffield University, by Messrs. C. Chappell and F. Hodson, dealt with the influence of heat treatment on the corrosion, solubility, and solution pressures of steel. The tests made were simple corrosion, *i.e.* loss of weight after immersion in sea water; galvanic corrosion, *i.e.* loss in sea water in contact with Swedish bar iron; solubility in 1 and 2 per cent. sulphuric acid after seventy-two hours; solution pressure in sea water, 1 per cent. sulphuric acid and N/10 ferrous sulphate. The results show that the solubility tests are untrustworthy as a guide to the relative rates at which the steels corrode. The general effect of heat treatment on the various properties examined is found to be the same in the case of all the tests except simple corrosion, where heat treatment exerts practically the opposite effect. Although heat treatment exerts considerable influence on corrosion, it cannot be expected to make up for the defects due to segregation or inferior material. A research committee, with a grant of 15l., was appointed for the further study of this question, with Mr. W. E. S. Turner as secretary.

The sub-section, under the chairmanship of Prof. Orme-Masson, was occupied mainly with papers from the chemical laboratories of Sheffield University, which testify to the valuable amount of original inquiry which is being carried out there under Prof. Wynne's guidance. Prof. W. P. Wynne and Dr. J. Kenner presented a paper dealing with the nitrochloro- and dichloro-toluene sulphonic acids, whilst Dr. J. Kenner and Mr. E. Witham described the formation of tolane derivatives from benzotrichlorides. A paper on an instance illustrating the relative instability of the trimethylene ring as compared with the tetramethylene ring was read by Dr. J. F. Thorpe (Sorby research fellow). Open-chain nitriles formed from three carbon rings readily pass into imino derivatives of cyclopentene under similar conditions; four carbon rings remain entirely unaffected. A second paper, by Mr. A. D. Mitchell and Dr. J. F. Thorpe, dealt with the elimination of a carbethoxyl group during the closing of the five-membered ring. The closing of an open chain of five carbon atoms to form a five-membered ring imparts to the molecule a condition of tension which limits the capacity of the constituent carbon atoms to combine with groups of more than a certain volume.

Three important physical chemical communications were made by Mr. W. E. S. Turner. The first paper, written jointly with Mr. C. J. Peddle, dealt with molecular association in water, illustrated by substances containing the hydroxyl group. The fact that molecular association may take place in water is not generally recognised, but the authors find it to be quite extensive among aromatic substances. Benzoic acid, for example, is associated in water to a greater extent than in benzene, and the aromatic acids examined nearly all exhibit marked association. A second paper was entitled "The Problem of Molecular Association. 1. The Affinities of the Halogen

Elements." As the result of the determination of the molecular weights of fifty to sixty halogen containing substances of different types, it was shown that molecular association occurs only when the halogen compound is an electrolyte, that there is no special virtue in the halogen elements—such as the existence of a large number of contra or residual valencies—neither is there any virtue in the halogen ion differentiating it from other ions. Molecular association in neutral solvents is the reverse of the supposed electrolytic dissociation in the dissociating solvents.

The third paper, by W. E. S. Turner and E. W. Merry, dealt with the molecular complexity of nitrosoamines. Measurements of the surface energy of three nitrosoamines show that aliphatic nitrosoamines are associated liquids, whilst aromatic nitriles and nitro-compounds are non-associated.

Dr. F. M. Perkin communicated a short note on the action of metals upon alcohols. When ozone is bubbled through lead suspended in a state of fine division in alcohol lead ethoxide is formed, and this substance is readily obtained on boiling up finely divided lead with absolute alcohol. A few drops of alcoholic mercuric chloride solution are added to facilitate the reaction, or dry air is bubbled through the heated mixture for the same reason.

The method has been extended to the preparation of lead methoxide, cadmium ethoxide, mercurous ethoxide, and silver ethoxide.

The reports of the research committees contained much valuable matter. That on dynamic isomerism dealt with the absorption-spectra of camphor and a number of its derivatives. The report of the study of hydroaromatic substances deals with the constitution of the 3:5-dichloro-o-phthalic acid obtained from dimethyldihydroresorcin and the preparation of 1:1:2-trimethylcyclohexanone.

The transformation of nitroamines committee report on the chlorination of anilides and the transformation of acylchloroaminobenzenes, and also on the bromination of anilides. The committee on isomorphous sulphonic derivatives of benzene state that during the past year the results obtained by the examination of twenty-nine derivatives of the 1:4 series have been discussed from the point of view of the Barlow-Pope theory, correlating crystalline structure with molecular form, and found to be in complete accordance with it.

GEOLOGY AT THE BRITISH ASSOCIATION.

AS was perhaps natural in a year when a geologist, Dr. Bonney, was president of the association, there was an excellent gathering at Section C, which was fortunate in being able to welcome, in addition to the president, Prof. A. P. Coleman, three other geologists from Canada, Dr. R. Bell, Mr. J. B. Tyrrell, and Prof. Spencer. The meetings of the section were well attended, the number of papers presented was sufficient to afford a full programme for the last day (Wednesday), and several well-sustained discussions took place. Any account of the sectional proceedings would be incomplete without a reference to the interesting series of excursions arranged by Mr. B. Hobson and Mr. Cosmo Johns. On Saturday there was a whole day excursion to the Castleton district under the leadership of Dr. Arnold Bemrose, while four half-day excursions were carried out. The sectional dinner was attended by more than sixty members. Successful joint meetings were held with the geographical section and agricultural sub-section; the papers read on the latter occasion are referred to in the report of the sub-section.

The great majority of the papers and reports read before the section were stratigraphical in character. In pre-Cambrian geology there was, in the first place, the president's address on "The Canadian Shield," already printed *in extenso* in NATURE (vol. lxxxiv., p. 333).

Two reports were also presented dealing with pre-Cambrian rocks, one on the composition and origin of the crystalline rocks of Anglesea, and one on Charnwood rocks.

Lower Palaeozoic stratigraphy was represented by a paper by Dr. J. E. Marr and Mr. W. G. Fearnside on the Lower Palaeozoic rocks of the Cautly district, Sedburgh, and a further paper by Miss G. R. Whatney and Miss E. G. Welch described the graptolitic zones from the Salopian beds of the same area; the only other region in which the majority of these zones have hitherto been traced is the Welsh border country. Two reports relative to the Lower Palaeozoic rocks were also presented; the committee appointed for the excavation of critical sections in the Palaeozoic rocks of Wales and the west of England presented an important report drawn up by Mr. E. S. Cobbold on excavations among the Cambrian rocks of Comley, Shropshire, this including a general revision of the results yielded by the excavations of the past three years and a vertical section. An interim report on the rocks of the Glensaul and Lough Nafooey areas, cos. Mayo and Galway, was also read.

A number of papers had reference to Carboniferous strata. Mr. Cosmo Johns' lecture on local geology was chiefly concerned with the Carboniferous rocks, and he further presented a paper on the Yoredale series and its equivalents elsewhere. The report of the committee on the faunal succession of the Lower Carboniferous (Avonian) of the British Isles consisted of an important report drawn up by Dr. A. Vaughan correlating the Belgian succession of the Carboniferous limestone rocks with that of the south-west of England. Mr. E. E. L. Dixon presented a paper on the geology of the Titterstone Clee hills, and three important papers bearing on the Coal-measures of the south Pennine area were read, viz. that by Mr. H. Culpin on marine bands in the Coal-measures of south Yorkshire, that by Mr. W. H. Dyson on the Maltby deep boring, and that of Dr. L. Moysey on some rare fossils from the Derbyshire and Notts coalfield. Members of the section had an opportunity on one of the excursions of inspecting the fine collection of fossils at the Maltby mine, and of obtaining many for themselves, while Dr. Moysey kindly brought his collection to Sheffield, and it was on view during the meeting. A report was also presented by the committee for the investigation of the fossil fauna and flora of the Midland coalfield.

An important discussion took place relative to the concealed coalfield of Notts, Derby, and Yorkshire, which recent discoveries have proved to be far more extensive than was formerly supposed. Prof. P. F. Kendall, in opening the discussion, described the evidence for a great eastward and southward extension of the concealed coalfield, the south-western margin being probably formed by a prolongation of the ancient rocks of the Charnwood area. He further announced that coal had been met with in a boring at Scunthorpe, a point eleven miles to the east of its previously known extent. Triassic geology was represented by a suggestive paper from the Rev. E. C. Spicer on present-day Triassic condition in Australia, and by one by Mr. A. R. Horwood on the origin of the British Trias.

A number of papers and reports had reference to African geology. Dr. J. W. Gregory read a paper on the geology of Cyrenaica, Dr. J. D. Falconer one on the geology of northern Nigeria, and Dr. F. H. Hatch one on the geology of Natal.

A somewhat lengthy report on the correlation and age of South African strata was presented, and a second report on topographical and geological terms used locally in South Africa.

One of the most interesting discussions during the meeting was that following a paper by Mr. G. W. Lamplugh on the shelly moraine of the Sefström Glacier, Spitsbergen, and its teachings. Observations on this glacier, which is subject to somewhat rapid advances and retreats, showed that (1) in a very few years a thickness of some 70 to 80 feet of shelly Boulder-clay could be accumulated, the glacier scooping up the material from the sea bottom and pushing it before itself; (2) that in this clay uninjured shells occurred plentifully; (3) that within a few yards of the spot where the Boulder-clay was accumulating many forms of animal and plant life could flourish—all points of importance in helping to an understanding of British glacial deposits. Other papers referring to glacial geology