the basis of therapeutics have been the consequence. Lord Lister, whom I am proud to be able to greet as an old friend, is already and always will be reckoned amongst the greatest benefactors of the human race. May he long be spared to remain at the head of the movement which he called into existence.

ARTIFICIAL IMMUNISATION.

It remains for me to say a word concerning the other great problem, the solution of which the whole world is awaiting with anxious impatience. I refer to the problem of immunity and its practical corollary, artificial immunisation. It has already happened once that an Englishman has succeeded in applying this to the definite destruction of at least one of the most deadly infectious diseases. Jenner's noble discovery has stood its trial as successfully, except in popular fancy, as he hoped. Vaccine is in all hands; vaccination is, with the aid of Governments, spreading continually. Pasteur also laboured with determination; others have followed him, and the new doctrine of antitoxins is continually acquiring more adherents. But it has not yet emerged from the conflict of opinions, and still less is the secret of immunity itself revealed. We must become well accustomed to the thought that only the next century can bring light and certainty on this point. Prof. Virchow, having referred with pride to the influence of cellular pathology in modern treatment, entailing, as it does, the principle of destroying the focus of disease by early operation, concluded his lecture in these words:—May the Medical School of Charing-cross Hospital continue upon the newly-opened path with zeal and good fortune. But may its students at the same time never forget that neither the physician nor the naturalist dares to dispense with a cool head and a calm spirit, with practical observation and critical judgment.

CHEMISTRY AT THE BRITISH ASSOCIATION.

ALTHOUGH no epoch-making discoveries can be recorded amongst the contributions to the Chemical Section this year, the work of the Section was full of interest and attraction. A very wide range of subjects was included in the programme, and the presence of many past-presidents of the Section added very considerably to the success of the meeting. The announcement of the discovery of two new elements, *Monium* and *Xenon*, must constitute a record for the first two days of the meeting, although new elements, especially amongst the rarer earths and gases, hardly excite the interest that similar discoveries did some years back. Monium is described in Sir William Crookes' address. It is an added element culled "from the waste heaps of the mineral elements," characterised by a group of distinctive lines in the ultra-violet end of the spectrum, and having an atomic weight of about 118, between those accepted for yttrium and lanthanum respectively. "Xenon" was described by Prof. Ramsay and Dr. Travers in their paper on "The extraction from air of the companions of Argon and on Neon." It accompanies krypton and metargon in the last fractions of liquefied argon, and is easily separated from the latter on account of its higher boiling point. It remains behind after the other two gases have evaporated, and is the heaviest of the three gases. Xenon, "the stranger," shows an analogous spectrum to argon, but differing entirely in the position of the lines. With the ordinary discharge the gas shows three lines in the red, and about five very brilliant lines in the blue; while with the jar and spark-gap these lines disappear, and are replaced by four brilliant lines in the green, intermediate in position between the two groups of argon lines. The remainder of the paper dealt with the successful issue of the search for "an undiscovered gas"—the subject of Prof. Ramsay's presidential address to the Section at Toronto. This gas should have an atomic weight higher than that of helium by about 16 units, and lower than that of argon by about 20. The determination of the atomic weight of neon gave the figure 19·2; it would therefore follow fluorine, and precede sodium in the periodic table. Like argon and helium it is monatomic; it is present in the air in the proportion of about 1 part in 40,000. Prof. Emerson Reynolds added a note on the position of helium, argon, krypton and neon in his diagrammatic representation of the relations of the elements, and pointed out that their atomic weights as yet determined were well in accord with his representation of the periodic law. Amongst other papers on inorganic chemistry, Prof. F. Clowes gave an account of his work on the action of magnesium on cupric sulphate solutions, under the title of "Equivalent replacement of metals." The reaction was studied with both hot and cold solutions, and under various conditions of concentration. In all cases cuprous oxide is formed, and hydrogen is evolved side by side with the deposition of the copper. This evolution of hydrogen is attributed in part, but not wholly, to the presence of free sulphuric acid formed by hydrolysis of the cupric sulphate and accompanied by the separation of a basic salt. Prof. Hodgkinson and Mr. Coote, in a paper on "Alkaline chlorates and sulphates of the heavy metals," pointed out that many solid sulphates, whether containing water of crystallisation or anhydrous, give off chlorine in addition to oxygen when gently heated with potassium or sodium chlorate. A residue of the alkaline sulphate and chloride and the oxide and chloride of the metal is left behind. The evolution of chlorine and oxygen occurs at temperatures very little above 100° C. Mr. R. G. Durrant described a series of "Green cobaltic compounds" he had obtained by oxidising potassium cobaltous oxalate with hydrogen peroxide; similar results follow the oxidation of cobaltous salts in presence of glycollates, citrates, malates, lactates or succinates of the alkali metals.

In another branch of the science, physical chemistry, Prof. Sydney Young contributed a most lucid and interesting account of his researches on the "Thermal properties of gases and liquids." The subject is one which has engaged Prof. Young's attention for the past eleven years, and his descriptive summary of his labours was therefore received with special interest. One chief aim of these investigations has been to ascertain whether the generalisations of Van der Waals regarding the relations of pressure, temperature and volume for both gases and liquids, are really true, and if not, whether the observed deviations would throw any light on the modifications which must be made in Van der Waals's fundamental formula in order to bring it into accurate agreement with the experimentally determined isothermals for liquids and gases. The vapour pressures and specific volumes of a number of substances were therefore determined, both as liquid and as saturated vapour, from low temperatures to their critical points. Twenty-six substances have been examined altogether, including paraffins, benzene and its haloid derivatives, esters, alcohols and acetic acid, and the data obtained allow of a simple classification in respect to their physical constants. Amongst other points of interest the results show that the molecules of the alcohols at moderate temperatures are polymerised in the liquid, but not in the gaseous state, whilst there is polymerisation in both states in the case of acetic acid; also, that the molecules of the alcohols and acetic acid appear to be polymerised to a considerable extent at the critical point. Prof. Young also described his methods for the determination of the critical constants and of the specific volumes of both liquid and saturated vapour. Ample proof was obtained in the course of these investigations that the views of Andrews regarding the behaviour of a substance in the neighbourhood of the critical point are correct, and also that the vapour pressure of a pure substance is quite independent of the relative volumes of liquid and vapour. The method of fractional distillation of liquids adopted for the preparation of pure substances was described, and the apparatus was exhibited at work; it has thus been found quite feasible to separate perfectly pure normal and iso-pentane from American petroleum. The Earl of Berkeley described the methods he has adopted for the more exact determination of the densities of crystals, in which special precautions are taken to eliminate errors in the measurement of temperature, volume and mass, occlusion of mother liquor, and absorption of moisture. The determinations recorded were made in carbon tetrachloride, a maximum divergence of 0·04 per cent. being shown as the result of four determinations of the density of potassium carbonate crystals. Under the head of physical chemistry the joint-meeting with Section A on the "Results of the recent Eclipse expeditions," has been referred to in connection with the doings of the Physical Section. The modern photographic plate as a sensitive medium for the recording of chemical action was the subject of several interesting communications, notably that of Dr. W. J. Russell on "The action exerted by certain metals and other organic substances on a photographic plate." Some account of these researches has already been given in NATURE. Dr. Russell showed a series of slides illustrating the action of printer's ink, wood, dry

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copal varnish, turpentine, drying oils, essential oils and metals on a photographic plate, in the dark, and detailed his method of experiment. Actual contact is not necessary to obtain the action; it takes place also at a distance. The time required is dependent upon the temperature; in the earlier experiments it required a week to produce a developable image, but by raising the temperature to 55° C. considerable action was recorded in five minutes. Sheets of gelatine, celluloid, gutta-percha and collodion do not hinder the action, when placed as screens between the active surface and the plate. Hydrogen peroxide is regarded by Dr. Russell as most probably the active agent in all these actions, but further experiments are in progress to decide this more definitely. In a complementary paper by Mr. C. H. Bothamley, on "The action of certain substances on the undeveloped photographic image," evidence was adduced to show that printer's ink can after a time act on a photographic plate and destroy the "latent image." The vapour of hydrogen peroxide and turpentine have the same effect. Whereas, therefore, hydrogen peroxide acting for a short time or in small quantity produces a developable image, by more prolonged action or in a more concentrated form it acts as an oxidiser and destroys the image. Probably both actions take place simultaneously, and the result at any given instance depends on their relative rates. Prof. Percy Frankland contributed an additional photographic action—that of bacteria. By placing gelatine cultures of *Bacillus coli communis* and of *Proteus vulgaris*, either in juxtaposition or at a distance of half an inch from a photographic plate, definite developable images were obtained. The action is stopped by glass or mica, and is therefore not due to radiation, but to the evolution of some volatile matter which reacts with the plate. Bacterial growths which are luminous in the dark (*Photobacterium phosphorescens*) have a still greater action. The investigation is to be extended to other organic structures vegetable and animal, living and dead. Amongst these contributions may be included an account by Dr. J. H. Gladstone and Mr. Hibbert of their further work on "The absorption of the Röntgen rays by chemical compounds," which dealt chiefly with their attempts to perfect quantitative methods of estimating the comparative densities of their radiographs. Mr. Hibbert also described an instrument he had devised for ascertaining the relative grades of the Röntgen rays.

Applied chemistry received attention under various headings. Special local interest naturally centred in Dr. J. Gordon Parker's paper on "Recent advances in the tanning industry," in which the lack of scientific methods amongst the tanners of this country was sternly criticised. Dr. Parker referred to the employment of extracts in tanning as a marked advance which had also brought about improved methods of estimating the tanning value of the materials employed in the industry, but bateing and "puering" of hides by means of dog and hen excrement was stigmatised as a standing disgrace to the leather trade. American and continental tanners appear to be far ahead of their English brethren in respect to the extraction of tanning materials in the tanyard. The cold extraction processes employed here mean loss and waste. Analyses of over 300 samples of so-called waste-spent tan from forty tanyards in Great Britain having shown an average of over 9 per cent. of available tannic acid. With valonia alone this represents a loss of 1*l.* 13*s.* 4*d.* a ton, about 500,000*l.* annually. In Germany and America warm extraction, which means practically complete extraction, has proved successful. The fear of darker colour in leather from the use of warm extracts is much exaggerated; as the temperature of extracting is raised, more colouring matter is dissolved, but it is difficultly soluble, and much of it is re-deposited on cooling. Mr. Vernon Harcourt exhibited and described his new "10-candle pentane lamp," which was most favourably commented on by Prof. Vernon Boys as a standard of light. Mr. Vernon Harcourt pointed out the advantages of a 10 or 16-candle standard for testing illuminating gas, over that now employed, and also the need of a large but compact standard flame. The burner is supplied with a mixture of air and gaseous pentane from a reservoir placed on a bracket at the top of the lamp. As this mixture falls down a siphon tube connecting the reservoir and the lamp, fresh air enters the former, which is provided with cross partitions, causing the air to travel backwards and forwards over the surface of the pentane and to mix with a proportion of pentane, which varies in amount with the external temperature. The arrangement of the lamp is such, however, that the variation in the proportion of pentane does not affect the output of light. There is a casing round the burner with a conical top which steadies the flame, the upper part of which is drawn together in a long brass chimney which cuts off the light of this part of the flame. The lamp is so constructed that a cool air current issues through the middle of the argand burner, which thus gives a steady flame 60–70 mm. high, having an illuminating value of rather more than ten candles. By adjusting the tube which receives the top of the flame at a height of 47 mm., the light shed horizontally is reduced to exactly ten candles. Comparisons made between four different lamps showed concordant results, their values being also in accord with the one-candle pentane standard. Prof. Emerson Reynolds's experiment, illustrating "The effect on the acetylene flame of varying proportions of carbon dioxide in the gas," was of considerable interest. The experiment had arisen from a chance observation by Mr. Goodwin that expired air when mixed with acetylene appeared to increase the luminosity of the acetylene flame, and also to decrease the tendency to deposit carbon in the burners. More careful study had shown that 5–8 per cent. of carbon dioxide in the gas decreased the smokiness of the flame, and especially prevented the clogging of the burners. The increase in illuminating power was certainly not marked, but the mixture containing 5 per cent. of carbon dioxide gave as much light as the acetylene itself, and therefore there is a gain to this extent per volume of acetylene burned. The action of the carbon dioxide was regarded as probably due to its exerting some oxidising effect.

Agricultural chemistry was dealt with in the report of the Committee on the Carbohydrates of Cereal Straws, and by Dr. Luxmoore, who described a scheme of analysis for Dorsetshire soils, which is to be carried out with the view of obtaining a general knowledge of the soils of the county. Dr. Armstrong also contributed a preliminary report of the Committee established last year for the promotion of agriculture. Dr. Gladstone's report on the "Teaching of science in elementary schools" was followed by an interesting discussion, and Dr. Armstrong gave a suggestive account of methods he had adopted for training children in methods of original inquiry under the title of "Juvenile research." Reports were submitted by the several committees of the Section, which will be published *in extenso* in the *Transactions* of the Association. Amongst these, those on the action of light upon dyed colours, on isomeric naphthalene derivatives, on the wave-length tables of the spectra of the elements, on the bibliography of spectroscopy, and on the electrolytic methods of quantitative analysis were a continuation of previous work. Two new Committees were formed, one to investigate the relation between the absorption spectra and constitution of organic substances, and the other on the chemical and bacterial examination of water and sewage, especially in reference to establishing a uniform method for recording results. The sewage problem was also treated of by Dr. Rideal, in a paper on "Standards of purity for sewage effluents."

Organic chemistry received a fair share of attention, several papers of importance and interest being read. Prof. Noetling, of Mülhausen, described a new series of colours he had obtained from amidated aromatic amidines, the first series of amidine colours prepared. Dr. Laurie and Mr. Strange showed the results they have obtained in studying the cooling curves of fatty acids. The curve, which is very characteristic for pure fatty acids, such as palmitic and stearic, shows a marked change if 1 per cent. of another fatty acid is present, and when a larger proportion of the second acid is introduced a second latent-heat point is developed, the curve showing a discontinuity below the solidifying point of the mixture. The curves given by these mixtures indicate a reproduction of the phenomena observed by Prof. Roberts-Austen in the case of certain alloys. Messrs. Fenton and Jackson showed that the oxidation of polyhydric alcohols in presence of ferrous iron proceeds on analogous lines to that of tartaric acid, "glycerose," the mixture of glyceraldehyde and dihydroxy-acetone being formed from glycerol; whilst Dr. Morrell and Mr. Crofts recorded a corresponding result on the oxidation of glucose, the alcohol group next to the aldehyde group being oxidised. The contributions in this branch of chemistry are usually too technical to interest many of the followers of the Association, but this year all organic chemists felt a special debt of gratitude to the President of the Section, Prof. Japp, not only for the value of his address to them, but also for the manner in which he had placed the methods and limitations of modern organic chemistry before a far wider field of scientific workers.

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