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OF THE

CHEMICAL SOCIETY.

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No. 320.

Thursday, February 7th, 1907, at 8.30 p.m., Professor R. MELDOLA, F.R.S., President, in the Chair.

Mr. H. S. Redgrove was formally admitted a Fellow of the Society.

The PRESIDENT gave expression to the deep sense of loss experienced by Fellows of the Society through the death, on February 2nd, of Professor Dmitri Ivanovitsch Mendeléeff, F.R.S., and of Professor Nicolai Menshutkin, which occurred on February 5th. These chemists were Honorary and Foreign Members of the Society, having been elected in 1883 and 1898 respectively.

Certificates were read for the first time in favour of Messrs. :

John Campbell Allan, 91, Norse Road, Scotstoun, Glasgow.

Francis James Bailey, Findon Hill, Sacriston, Durham.

Charles Stanley Gibson, B.A., 45, Shakespeare Street, Manchester.

Joshua Craven Gregory, B.Sc., F.I.C., 126, Woodlands Road, Glasgow.

John Robinson, Agricultural College, Aspatria, Cumberland.

Of the following papers, those marked * were read :

- *20. "The rapid electro-analytical deposition and separation of metals. Part I. The metals of the silver and copper groups and zinc." By Henry Julius Salomon Sand.**

The experiments on a new electro-analytical method of rapid determination and separation of metals referred to in a preliminary note (*Proc.*, 1906, 22, 43) have been continued. The metals hitherto studied are silver, mercury, copper, bismuth, lead, cadmium, and zinc. With the exception of the separation silver-mercury, each metal has been successfully separated from all the others by the method of graded potential. In order to separate silver from mercury the metals were deposited together, converted into their cyanides, and these separated in the usual way by means of their different behaviour to acids. The silver was then estimated electrolytically in the pure silver cyanide obtained. Experiments have been carried out in which the seven metals studied have been quantitatively separated from one solution. The silver was separated from the mercury as described above, and the lead and part of the bismuth were removed on the anode. All the other separations were brought about by graded potential. The metals were deposited in the following sequence. 1. Mercury and silver. 2. Lead and part of bismuth on anode ;—copper and rest of bismuth on cathode. 3. Cadmium. 4. Zinc. 5. After dissolving the combined deposit of copper and bismuth, the latter was estimated. 6. Rest of bismuth separated from lead after dissolving the deposit. 7. Lead. 8. Cadmium tested for traces of lead. One evaporation was necessary. The time required for the depositions in these experiments varied between five and fifteen minutes.

DISCUSSION.

MR. EDWARD GARDNER asked if the author had had any experience in depositing copper from solutions containing a large quantity of ferric sulphate, and whether he had been able, in such solutions, to obtain an adherent deposit by any method of graded potential.

MR. SAND stated that the presence of metals of variable valency, such as iron, which pass from one stage of oxidation to another with extreme readiness caused much difficulty. Work on such cases was being carried out at present.

*21. "The alkaloids of ergot."

By George Barger and Francis Howard Carr.

The authors assign to Tanret's crystalline ergotinine the formula $C_{35}H_{39}O_5N_5$, and have abandoned the formula $C_{25}H_{32}O_4N_4$ provisionally suggested in a preliminary note communicated to the British Association (*Chem. News*, 1906, **94**, 89). Tanret's original formula, $C_{35}H_{40}O_6N_4$, was based on faulty nitrogen determinations. In the above-mentioned note, the authors suggested the name ergotoxine for a second amorphous ergot alkaloid, of which they had crystallised several salts. Subsequently this alkaloid was described by Kraft (*Arch. Pharm.*, 1906, **244**, 336) as hydroergotinine, because by boiling its solution in methyl alcohol it was converted into ergotinine. Kraft did not analyse hydroergotinine.

In an attempt to acetylate ergotoxine with acetic anhydride the authors obtained ergotinine. As the latter alkaloid contains no acetyl group the change must be due to dehydration. The reverse change occurs when an ergotinine solution in dilute phosphoric acid is boiled. The crystalline phosphate of an amorphous alkaloid is then formed, closely resembling ergotoxine phosphate.

For ergotoxine the formula $C_{35}H_{41}O_6N_5$ is deduced from the analyses of the free base and of the following crystalline salts:

$C_{35}H_{41}O_6N_5 \cdot HCl$, m. p. 205° ; $C_{35}H_{41}O_6N_5 \cdot H_3PO_4 \cdot H_2O$, m. p. $186-187^\circ$; $C_{35}H_{41}O_6N_5 \cdot C_2H_2O_4$, m. p. 179° , and $(C_{35}H_{41}O_6N_5)_2 \cdot C_2H_2O_4$, m. p. 179° .

The two formulæ, $C_{35}H_{39}O_5N_5$ and $C_{35}H_{41}O_6N_5$, thus independently arrived at for the crystalline and the amorphous alkaloid respectively establish the theory, first put forward by Kraft, that the former is the anhydride of the latter.

In contradistinction to ergotinine, ergotoxine is strongly active physiologically, producing all the typical effects of ergot. It is contained in most commercial specimens of ergotinine and also in Tanret's so-called "amorphous ergotinine."

DISCUSSION.

Dr. BYWATERS asked whether other alkaloids were known which passed from an inactive to an active form by being simply hydrated, and whether the fact of the active alkaloid being amorphous and forming a colloidal solution did not indicate that it was rather polymerisation instead of hydration that had occurred.

Dr. BARGER stated that some alkaloids were known which behaved similarly to those mentioned in the paper. The salts of both alkaloids formed colloidal solutions under certain conditions.

- *22. "Influence of substitution on the formation of diazoamines and aminoazo-compounds. Part VI. The partially methylated 4:6-diamino-*m*-xylenes." By Gilbert Thomas Morgan and Frances Mary Gore Micklethwait.**

In examining the effect of substitution on the formation of *o*-amino-azo-compounds of the benzene series, the authors have methylated progressively 4:6-diamino-*m*-xylene and have studied the action of diazonium salts on the products. *Methyl-4:6-diamino-m-xylene* yields azo-derivatives like the unmethylated diamine itself, but *as-dimethyl-4:6-diamino-m-xylene* and *trimethyl-4:6-diamino-m-xylene* furnish stable diazoamines which are accompanied only by traces of azo-compounds.

DISCUSSION.

The PRESIDENT congratulated Dr. Morgan on the extreme ingenuity of the method by which he had effected the progressive methylation of these substituted *meta*-diamines. He asked with reference to the possible formation of aminoazo-compounds with the azo- and dimethyl-amino-groups in the *ortho*-position whether the action of the usual transforming agents on the corresponding diazoamines had been tried, and if so with what result.

In reply to Dr. Cain's suggestion that steric hindrance might be the cause of the non-formation of azo-derivatives from tetramethyl-4:6-diamino-*m*-xylene, Dr. MORGAN preferred to take the view that the absence of a labile hydrogen atom attached to nitrogen was the inhibiting factor. The non-formation of *ortho*azo-derivatives from tertiary amines was a general rule which held both in the benzene and naphthalene series, whereas the phenomena attributed to steric hindrance in one of these series were frequently not manifested in the other.

In reply to the President he stated that repeated attempts to transform the diazoamines of the *as*-dimethyl- and trimethyl-4:6-diamino-*m*-xylenes had not led to the isolation of definite aminoazo-compounds.

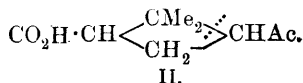
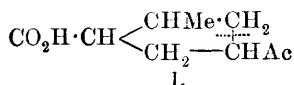
- *23. "The constitution of umbellulone. Part II. The reduction of umbellulonic acid." By Frank Tutin.**

When umbellulonic acid, $C_9H_{14}O_3$, obtained by the oxidation of umbellulone (*Trans.*, 1906, 89, 1104), is reduced by means of sodium and alcohol, a *hydroxy-acid* having the formula $C_9H_{18}O_3$ is produced. It is evident from this fact that the ring contained in umbellulonic

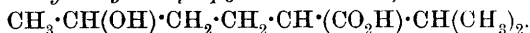
acid has been opened by the addition of two atoms of hydrogen, and the resulting hydroxy-acid must therefore be a chain compound.

This hydroxy-acid gives a *lactone* (b. p. 246—248°), and when oxidised with permanganate in presence of an excess of alkali yields acetic and *isopropylsuccinic* acids.

In the previous communication (*loc. cit.*) it was shown that umbellulonic acid must contain either a methylpentamethylene or a dimethyltetramethylene ring. Only two keto-acids containing either of these rings are capable of giving on reduction a hydroxy-acid, which, by subsequent oxidation, would yield acetic and *isopropylsuccinic* acids, namely, those possessing the following formulæ :



A hydroxy-acid which would yield on oxidation acetic and *isopropylsuccinic* acids, could only be formed from one of the above keto-acids by the opening of the ring on reduction at the place indicated by the dotted line. The product of the reduction of umbellulonic acid will therefore be *δ-hydroxy-α-isopropyl-n-hexoic acid*,



Formula II represents pinonic acid, and it has previously been shown that umbellulonic acid is neither identical nor stereoisomeric with this compound. Umbellulonic acid must, therefore, be correctly represented by formula I.

It follows from this that the correctness of the formula previously assigned to umbellulone cannot be doubted.

*24. "The reduction of hydroxylaminodihydroumbelluloneoxime." By Frank Tutin.

Hydroxylaminodihydroumbelluloneoxime was prepared by Power and Lees in their investigation of the essential oil of *Umbellularia Californica* (*Trans.*, 1904, **85**, 636). When reduced with sodium and alcohol it gives a *base* (b. p. 136—138°/50 mm.), which is a liquid soluble in water. From the results obtained by the analysis of the *dibenzoate*, *dihydrochloride*, and *dibenzoyl* derivative of this base it is impossible to say with certainty whether it has the formula $\text{C}_{10}\text{H}_{26}\text{N}_2$ or $\text{C}_{10}\text{H}_{22}\text{N}_2$, although it is most probable that the latter is correct. The base may therefore be designated *aminotetrahydroumbellulylamine*.

Aminotetrahydroumbellulylamine dibenzoate crystallises in needles melting at 212—213°; the *dihydrochloride* also forms needles, but it is infusible at 305°. *Dibenzoylaminotetrahydroumbellulylamine* crystallises in prisms or in leaflets, which melt at 194°.

Although evidence was obtained of the presence of bases which are probably stereoisomeric with aminotetrahydroumbellulylamine, no derivative of them could be isolated in a state of purity.

25. "Studies on optically active carbimides. Part V. The aryl esters and the amides of *l*-menthylcarbamic acid." By Robert Howson Pickard and William Oswald Littlebury.

A continuation of the investigation of derivatives of menthylamine (see *Proc.*, 1905, 21, 286). Eleven aryl esters and eighteen amides of *l*-menthylcarbamic acid were described and the rotations of these when dissolved in chloroform and pyridine compared. Attention was drawn to the approximately constant molecular rotation given by certain derivatives of menthylamine and menthol.

26. "Some constituents of natural indigo. Part I." By Arthur George Perkin and William Popplewell Bloxam.

Indigo-brown, an impurity of natural indigo, is best isolated by means of boiling pyridine. The crude product contains, in addition to small quantities of indirubin and a colourless wax, certain brown amorphous substances, of which the compound (*a*), $C_{16}H_{12}O_3N_2$, is present in by far the largest amount. This substance is insoluble in all the usual solvents except pyridine, but dissolves in alkali hydroxide solutions, and is readily reduced in this condition. When digested with strong aqueous potassium hydroxide it is converted into anthranilic acid and an amorphous, brown substance of uncertain composition. Two closely-allied compounds (*b*) and (*c*) present in but small amount have been isolated, the former of which is soluble in acetic acid and insoluble in alcohol, whereas the latter dissolves in alcohol. These substances, to which the respective compositions $C_{24}H_{22}O_5N_3$ and $C_{16}H_{14}O_4N_2$ are ascribed, closely resemble in general properties the compound $C_{16}H_{12}O_3N_2$, and from them also anthranilic acid was obtained. It is considered possible that these brown compounds are derivatives or condensation products of indoxyl, which are formed from indican during the process of manufacture. The leaves of the *Indigofera arrecta* and *I. Sumatrana* are practically devoid of tannin matter.

27. "The occurrence of isatin in some samples of Java indigo." By Arthur George Perkin.

During the examination of samples of Java indigo rich in indirubin, for yellow colouring matter (*Proc.*, 1904, 20, 172) by extraction with

sodium carbonate solution and isolation of the products from the neutralised liquid with ether, there was obtained in addition to kampherol a small amount of substance crystallising from benzene in orange needles melting at 200° . This gave the thiophen reaction and was found to consist of isatin. The quantity present was exceedingly small, and in many other samples it appeared to be absent, but the point is interesting as it indicates that the formation of indirubin during the manufacture of natural indigo follows the well known synthesis of Baeyer (*Ber.*, 1881, 14, 1745). Indirubin appears to be most readily formed when the fermented plant extract is oxidised under slightly alkaline conditions, and in these circumstances the oxidation of a portion of the indoxyl to isatin would appear to be facilitated.

28. "The absorption spectra of benzoic acid, the benzoates, and benzamide." By Walter Noel Hartley and Edgar Percy Hedley.

The absorption spectra of benzoic acid and phthalic acid were photographed by Hartley and Huntington, and characteristic bands were found in both; those of the former being situated between λ 280 and λ 270 with a continuous absorption beyond λ 255.

In a paper by Baly and Collie (*Trans.*, 1905, 87, 1332) it is stated that "The spectrum of benzoic acid has been observed by Hartley and Huntington (*Phil. Trans.*, 1879, 170, I, 257) and only shows general absorption rather strongly. This is only to be expected from the presence of the ketonic oxygen in the β -position."

As many benzoyl derivatives show absorption bands in their spectra, including benzaldehyde, it was considered necessary to settle this question decisively.

The absorption curves of benzoic acid, potassium and silver benzoates, and benzamide have been drawn from the photographs of the spectra of these substances, which were specially prepared and were of great purity and finely crystallised. The absorption bands of the different substances are all obviously related to the bands in benzoic acid, and the absorption is due to the benzene ring.

29. "The absorption spectra of phthalic, isophthalic, and terephthalic acids, phthalic anhydride, and phthalimide." By Walter Noel Hartley and Edgar Percy Hedley.

Phthalic acid was examined by Hartley and Huntington (*Phil. Trans.*, 1879, 170, I, 257), but the isomeric acids have not been investigated. The sparing solubility of terephthalic acid rendered it necessary for its examination to convert it into the dimethyl ester and

to examine salts of the acid. It was found that phthalic anhydride, dissolved in cold alcohol, gave no absorption band, but that after warming for five minutes the spectrum showed a marked extension, and finally a strong absorption band was developed.

Phthalimide underwent no such change; it is therefore apparent that the group $\begin{smallmatrix} \text{CO} \\ \diagup \\ \text{C} \\ \diagdown \\ \text{CO} \end{smallmatrix} \text{NH}$ is more stable than $\begin{smallmatrix} \text{CO} \\ \diagup \\ \text{C} \\ \diagdown \\ \text{O} \end{smallmatrix}$.

o-Phthalic acid gives an absorption curve of the character that might be expected from a comparison with that of benzoic acid and from the difference in constitution between the two.

*iso*Phthalic acid has a shallow band of absorption situated in the same position as that of phthalic acid, but it is much less persistent.

Terephthalic acid being insoluble, its dimethyl ester and salts were examined, and it was found that the acid has no band, but merely an extension at or near where a band might be expected.

30. " $\alpha\alpha\gamma$ -Trimethyl- and $\alpha\alpha\gamma\gamma$ -tetramethyl-tricarballic acids and $\alpha\delta$ -dimethylbutane- $\alpha\beta\delta$ -tricarboxylic acid." By Herbert Henstock and Charles Henry Graham Sprankling.

In a former communication by Bone and Sprankling, a method was given for the preparation of alkyl tricarballic acids in alcoholic solution; in the case of the acids here discussed, the method has been modified and toluene was used instead of alcohol. The two reactions, (1) the condensation of the sodium compound of β -methylcyanosuccinic diethyl ester with α -bromo*isobutyric* ethyl ester, and (2) the condensation of the sodium compound of $\beta\beta$ -dimethylcyanosuccinic diethyl ester with α -bromopropionic ester, should both yield products from which, on hydrolysis, $\alpha\alpha\gamma$ -trimethyltricarballic acid should be obtained. It was found, however, that in reaction (1) $\alpha\delta$ -dimethylbutane- $\alpha\beta\delta$ -tricarboxylic acid is produced; probably hydrogen bromide is first eliminated from α -bromo*isobutyric* ester, and the resulting methylacrylic ester condenses with the sodium compound of β -methylcyanosuccinic ester as follows: $\text{CO}_2\text{Et}\cdot\text{CHMe}\cdot\text{CNa}(\text{CN})\cdot\text{CO}_2\text{Et} + \text{CH}_2\cdot\text{CMe}\cdot\text{CO}_2\text{Et} = \text{CO}_2\text{Et}\cdot\text{CHMe}\cdot\text{C}(\text{CN})(\text{CO}_2\text{Et})\cdot\text{CH}_2\cdot\text{CMeNa}\cdot\text{CO}_2\text{Et}$. Reaction (2) yields $\alpha\alpha\gamma$ -trimethyltricarballic acid.

The condensation of $\beta\beta$ -dimethylsodiocyanosuccinic diethyl ester with α -bromo*isobutyric* ester furnishes a product which, on hydrolysis, yields $\alpha\alpha\gamma\gamma$ -tetramethyltricarballic acid.

31. "A reaction of certain colouring matters of the oxazine series." By Jocelyn Field Thorpe.

Those colouring matters of the oxazine series which are derivatives of phenonaphthoxazine containing amino- or substituted amino-groups

in the position 6 of the phenonaphthoxazine ring, are readily converted into the corresponding phenonaphthoxazone by warming on the water-bath in the presence of very dilute acids. Thus Nile-blue A (3-diethylamino-6-aminophenonaphthoxazine sulphate) and Nile-blue 2B (3-diethylamino-6-benzylaminophenonaphthoxazine chloride) are converted into 3-diethylaminophenonaphthoxazone, melting at 204° , whereas New Methylene-blue GG (3:6-tetramethyldiaminophenonaphthoxazine chloride) and New Blue B (3-dimethylamino-6-dimethylaminophenylaminophenonaphthoxazine chloride) are converted into 3-dimethylaminophenonaphthoxazone, melting at 244° . Also those compounds which contain no substituting group in the position 6 in the phenonaphthoxazine molecule pass on warming with dilute acids into the corresponding oxazones containing the oxygen in that position. Thus, Meldola's blue (3-dimethylaminophenonaphthoxazine chloride) passes into 3-dimethylphenonaphthoxazone, melting at 244° , identical with the compound derived from New Methylene-blue GG and New Blue B.

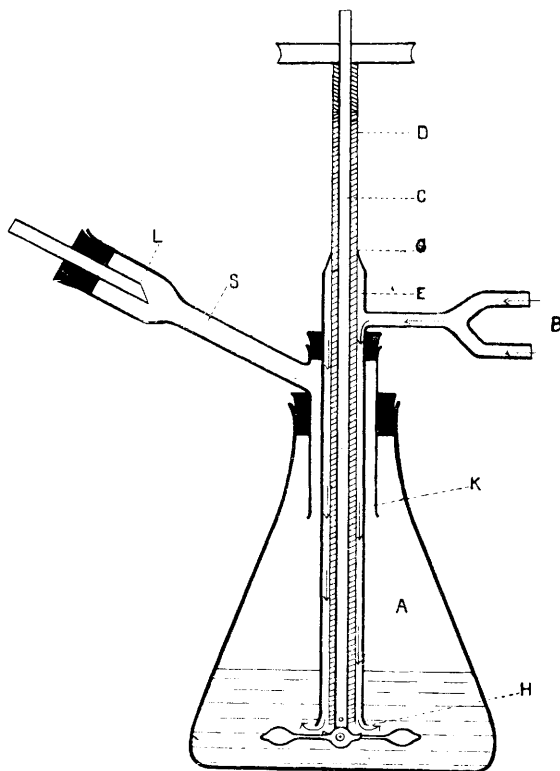
32. "The alkylation of *d*-fructose." By Thomas Purdie and David McLaren Paul.

The object of this research was to ascertain if ketoses can be alkylated by the methods already applied to aldoses, and to study the optical activity of the ketose derivatives thus obtained. Fischer's methylfructoside was methylated by means of methyl iodide and silver oxide. The resultant liquid, which had the composition of tetramethyl methylfructoside, gave on hydrolysis a liquid having the composition of tetramethyl fructose, and the properties of a reducing sugar. On realkylation, both by the silver oxide process and by Fischer's method, the substance yielded fully methylated methylfructosides. The rotatory powers of the series of compounds were abnormally low compared with that of the parent sugar. This anomaly, however, was finally explained by the isolation from the syrupy ketose of crystalline tetramethyl- α -fructose (m. p. $98-99^{\circ}$), which showed in alcoholic solution $[\alpha]_D^{20} - 94.2^{\circ} \rightarrow -86.7^{\circ}$. After fusion, the substance exhibits mutarotation in the opposite sense, owing to partial transformation of the α -sugar into the β -form. This compound gave liquid tetramethyl methylfructosides of high rotatory power. Evidence was obtained that the low rotatory power of the syrupy ketose was probably due to the presence of an isomeric dextrorotatory hexose, produced by isomeric change during the preparation of Fischer's methylfructoside. Evidence was also adduced for the existence of two stereoisomeric fructosides in the latter substance.

33. "A simple apparatus, with stirrer, for treating a liquid at its boiling point with two or more gases." By Norman Leslie Gebhard.

Whilst studying the action of certain gases on liquids at their boiling points, the apparatus represented in the figure was devised and found very satisfactory.

The liquid is placed in an Erlenmeyer flask *A*, of capacity appropriate



to the volume of liquid under treatment. The rest of the apparatus includes a centrifugal stirrer in the liquid, driven by a water turbine through a horizontal pulley, the rod *C* carrying the stirrer rotating in an outer tube *D*. At *G*, *D* is sealed into a tube *E*, of slightly wider bore. The tube *E* reaches almost to the stirrer and dips well below the surface of the liquid. The gases enter at the tubes *B*, pass along the annular space between *D* and *E*, as indicated by the arrows, and encounter the liquid at *H* just above the stirrer. The upper part of *E*

is surrounded for part of its length by a wider tube *K* with a side tube *S*, through which the vapour of the boiling liquid passes to be condensed in the reflux condenser *L*. *E* is fitted to *K* and the latter to the flask by means of suitable corks. The apparatus enables a liquid, in vigorous ebullition, to be subjected to the action of gases, with constant stirring, and can be constructed without difficulty by anyone with a moderate knowledge of glass-blowing.

34. "Note on the arsenates of lead and calcium."

By Spencer Pickering.

Crystallised sodium arsenate of commerce consists of the disodium salt, generally united with 7, but sometimes with 12, molecules of water of crystallisation. In either case, this water may all be expelled at 100°, and decomposition into the pyro-arsenate commences at 150°. The preparations dried at 300° in accordance with the Pharmacopœia are, therefore, overheated. With lead acetate, all commercially pure samples give a precipitate of triplumbic arsenate; but with lead nitrate, the precipitate consists of the diplumbic salt, mixed, occasionally, with a certain amount of the tri- or mono-plumbic arsenates. With preparations of crude sodium arsenate, the amount of lead salt required for precipitation varies considerably, and there is an indication that a compound of the di- and tri-plumbic salts may sometimes be formed.

With calcium chloride or nitrate, sodium arsenate forms the tri-calcium arsenate; but, when thus prepared, it is not very insoluble, and is, therefore, unsuitable as an insecticide. But it may be completely precipitated by calcium hydroxide; and thus a mixture of lime and sodium arsenate may be used as a substitute for lead arsenate.

35. "Camphor- β -sulphinic acid and camphorylsulphonium bases."

By Samuel Smiles and Thomas Percy Hilditch.

Camphor- β -sulphinic acid has been prepared by the reduction with zinc dust of the chloride of Reychler's camphorsulphonic acid. It was further shown that the acid when mixed with a phenolic ether and a dehydrating agent behaves in a similar manner to the aromatic sulphinic acids and yields the camphoryl sulphonium bases. The sulphinic acid and those sulphonium bases which have been prepared exhibit a strong lævorotatory power in distinction from the dextrorotatory sulphonic acid from which they were obtained. With the object of ascertaining whether this change in rotatory power is due to any alteration in structure of the camphor complex, the sulphinic acid was oxidised and and it was found that the products were the original sulphonic acid

and *d*-camphoryl- α -disulphone. The authors conclude that the above change is probably caused by the conversion of the sulphur from the sexavalent to the quadrivalent state.

36. "The condensation of salicylamide with aryl aldehydes."

By Charles Alexander Keane and William Walter Scott Nicholls.

Benzaldehyde, when heated with salicylamide in presence of hydrochloric acid or of sodium acetate, condenses to form a cyclic compound, in the production of which one molecular proportion of the amide reacts with one of the aldehyde. The substance gives no coloration with ferric chloride, indicating that the hydroxyl group of the salicylamide has participated in the condensation, and it yields an acetyl derivative which is decomposed by concentrated sulphuric acid with the formation of *N*-acetylsalicylamide. It is accordingly regarded as a cyclic compound of the oxazine group, namely, 2-phenyl-1:3-benzoxazone, $\text{C}_6\text{H}_4 \begin{smallmatrix} \text{CO} \cdot \text{NH} \\ \diagdown \quad \diagup \\ \text{O} \quad \text{C} \end{smallmatrix} \text{HPh}$; an alternative tautomeric formula is of course also possible. It crystallises from alcohol in silky needles which melt at 169° . On prolonged boiling with water it is gradually decomposed into its constituents; this decomposition is very readily effected by alkalis, less readily by dilute mineral acids. Heated with aniline, benzylideneaniline and salicylamide are formed. The *acetyl* derivative crystallises from alcohol in slender prisms which melt at 88° . It is decomposed into its constituents by heating with dilute alkalis or with dilute mineral acids, and when heated with aniline forms acetanilide, benzylideneaniline, and salicylamide.

2-*p*-Methoxyphenyl-1:3-benzoxazone, $\text{C}_6\text{H}_4 \begin{smallmatrix} \text{CO} \cdot \text{NH} \\ \diagdown \quad \diagup \\ \text{O} \quad \text{CH} \cdot \text{C}_6\text{H}_4 \cdot \text{OMe} \end{smallmatrix}$, is prepared by the condensation of salicylamide with anisaldehyde. It melts at 166 — 167° and forms an *acetyl* derivative which melts at 91° , and resembles the corresponding phenyl compound in its chemical behaviour.

Benzylidenebis-*o*-methoxybenzamide, $\text{C}_6\text{H}_5 \cdot \text{CH} : (\text{NH} \cdot \text{CO} \cdot \text{C}_6\text{H}_4 \cdot \text{OMe})_2$, prepared by the condensation of *o*-methoxybenzamide with benzaldehyde, is much more stable towards alkali than the above cyclic compounds, and is not acetylated by heating with acetic anhydride. It crystallises from alcohol in fine needles meltin at 156° .

37. "The condensation of diethylmalonamide with aldehydes."

By Harry Burrows and Charles Alexander Keane.

Diethylmalonamide, when heated with benzaldehyde in presence of hydrochloric acid, condenses similarly to salicylamide (compare Keane

and Nicholls, preceding abstract) to form a cyclic compound of the pyrimidine group : 4 : 6-*diketo*-2-*phenyl*-5 : 5-*diethylhexahydropyrimidine*, $\text{CHPh} \begin{smallmatrix} \text{NH} \cdot \text{CO} \\ \text{NH} \cdot \text{CO} \end{smallmatrix} \text{CEt}_2$. It crystallises in prisms which melt at 262° ; it is stable towards dilute mineral acids, but is decomposed by boiling with sodium hydroxide solution. Heated with acetic anhydride it forms a *diacetyl* derivative which melts at 147° and which is decomposed with elimination of the acetyl groups by treatment with concentrated sulphuric acid.

The corresponding *cinnamyl* compound melts at 241° and also forms a *diacetyl* derivative which melts at 125° .

Chloral-diethylmalonamide, $\text{CEt}_2(\text{CO} \cdot \text{NH}_2)_2, \text{CCl}_3 \cdot \text{CHO}$, is prepared by condensing molecular proportions of diethylmalonamide and chloral hydrate with hydrochloric acid. It melts at 178° and is stable towards boiling water or hot dilute hydrochloric acid.

ANNIVERSARY DINNER.

It has been arranged that the Fellows of the Society and their friends shall dine together at the Whitehall Rooms, Hotel Métropole, at 6.30 for 7 o'clock, on **Friday, March 22nd, 1907** (the day fixed for the Annual General Meeting).

The price of the tickets will be One Guinea each, including wine.

All applications for tickets must be received not later than Friday, March 15th next.

Tickets will be forwarded to Fellows on receipt of a remittance for the number required, made payable to "Mr. S. E. Carr" and addressed to the Assistant Secretary, Chemical Society, Burlington House, W.

At the next Ordinary Meeting on **Thursday, February 21st, 1907**, there will be a ballot for the election of Fellows and the following papers will be communicated :

“The constitution of oxyazo-compounds.” By W. B. Tuck.

“The influence of solvents on the rotation of optically active compounds. Part IX. A new general method for studying intramolecular change.” By T. S. Patterson and A. McMillan.

“The reduction products of *o*- and *p*-dimethoxybenzoin.” By J. C. Irvine and A. M. Moodie.

“Replacement of halogens by hydroxyl. I. The hydrolytic decomposition of hydrogen and sodium monochloroacetates by water and by alkali, and the influence of neutral salts on the reaction velocities.” By G. Senter.

“The reaction of ammonium salts with the constituents of the soil.” By A. D. Hall and C. T. Gimingham.

“Constituents of natural indigo. Part II. Indigo-yellow.” By A. G. Perkin.

CERTIFICATES OF CANDIDATES FOR ELECTION AT THE NEXT BALLOT.

N.B.—The names of those who sign from “General Knowledge” are printed in *italics*.

The following Candidates have been proposed for election. A ballot will be held on Thursday, February 21st, 1907.

Allen, Alfred Frederick,

35, Purrett Road, Plumstead, Woolwich, S.E.

Student. Three years' training in Chem. Lab. of University College, London, for the B.Sc. Exam. (Lond.). Honours in Chemistry. B.Sc. Hons. 1906.

W. Ramsay.

N. T. M. Wilsmore.

J. Norman Collie.

Edward C. Cyril Baly.

Samuel Smiles.

Bagley, George,

Wellington, New Zealand.

Chemist. Works manager for Young's Chemical Works, Wellington, New Zealand, and formerly for the Metropolitan Chemical Co., Wellington, N. Zealand. Joint author with Professor Easterfield of paper on “The Constitution of Abietic Acid,” *Trans.*, 1904.

Thomas H. Easterfield.

P. W. Robertson.

B. C. Aston.

J. S. MacLaurin.

Percy B. Phipson.

Baker, Frank, B.Sc.,

St. John's School, Eton.

Research Student at University College. Three years Student in the Chemical Laboratory, University College, London.

William Ramsay.

Samuel Smiles.

J. Norman Collie.

Edward C. Cyril Baly.

N. T. M. Wilsmore.

Bassett, Henry, jun.,

London (26, Belitha Villas, Barnsbury, N.).

Demonstrator and Assistant Lecturer, University of Liverpool. B.Sc. (Lond.); Ph.D. (Munich); D. ès Sc. (Nancy); F.I.C. 1851 Exhibition Scholar, 1903—1905. Have published papers alone or in conjunction with others in *Trans. Chem. Soc.*; *Berichte*; *Bull. Soc. Chim.*; *Journal de chimie physique*, &c.

J. Campbell Brown.

F. G. Donnan.

William Ramsay.

A. W. Titherley.

J. Norman Collie.

Benton, Frank Stanley,

“Hurstead,” Reigate.

Assistant to John Heron, Esq., F.I.C., F.C.S. Certificated Student of the City and Guilds Technical College, Finsbury.

R. Meldola.

John Heron.

John Castell-Evans.

John C. Umney.

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Lecturer and Demonstrator, Chemical Dept., Finsbury Technical Coll., B.Sc. (Hons.) London. Associate of the Institute of Chemistry.

R. Meldola.

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John Castell-Evans.

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4, Simonside Terrace, Heaton, Newcastle-on-Tyne.

Chemist. B.Sc. (Lond.); A.I.C.; Pharmaceutical Chemist. Jacob Bell Scholar, 1902—03. Jun. demonstrator Practical Chemistry in Pharm. Soc. School, 1903—04, and demonstrator in Pharmaceutics, 1904—05. Chemist with Messrs. Hopkin and Williams, 1905—06. Now with Messrs. C. A. Parsons & Co., Heaton Works.

Arthur W. Crossley.

W. Palmer Wynne.

Herbert Jackson.

Harold Deane.

C. T. Bennett.

Christie, John,

Eton College, Windsor.

Schoolmaster. B.A., Natural Sciences Tripos, Pt. I., 1905. Studied Chemistry for 4 years at Cambridge.

H. J. H. Fenton.

H. O. Jones.

W. J. Sell.

F. W. Dootson.

F. E. E. Lamplough.

Clough, George William,

29, Oseney Crescent, N.W.

Lecturer, Birkbeck College, E.C. B.Sc. (Birm.). Author of paper entitled "Condensation of Benzophenone Chloride with α - and β -Naphthols" (*Trans.*, 1906, **89**, 771).

Percy F. Frankland.

Alex. McKenzie.

C. F. Baker.

Henry Wren.

G. Druce Lander.

Cook, Taylor,

20, Shiddridge Street, Parson's Green, S.W.

Student at Royal College of Science, 1903—06; B.Sc., A.R.C.S.

At present engaged in teaching at the Royal College of Science.

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M. O. Forster.

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H. E. Fierz.

Dall, Colin Ernest,

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Student. Three years at University College, London. B.Sc., London, 1906. Hons. Chemistry.

William Ramsay.

Edward C. Cyril Baly.

J. Norman Collie.

Samuel Smiles.

N. T. M. Wilsmore.

Davidson, Francis,

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Brewer and Maltster. Well up in General and Analytical Chemistry, able to do all analyses required in brewing and malting.

A. J. Murphy.

B. E. R. Newlands.

Basil P. Wigan.

Arthur R. Ling.

Basil Wm. Valentin.

Geo. Patterson.

Thomas FitzGibbon.

Denham, William Smith,

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Lecturer in Chemistry, Glasgow and West of Scotland Technical College. Fellow of the Institute of Chemistry; B.Sc. (Lond.).

G. G. Henderson.

T. S. Patterson.

Thomas Gray.

Charles E. Fawsitt.

Alexander Davidson, jr.

Dikshit, Mohan Nath Kedarnath,

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Medical Practitioner. Graduate of the Bombay University (Medical Faculty). Lord Reay Lecturer, Grant Medical College, Bombay.

Tutor in Physiology (Experimental and Chemical), G. M. College, Bombay. Veine Analyser to the Techno-chemical Laboratory, Bombay.

John Muter.

Geo. A. Turner.

A. H. M. Muter.

James W. Epps.

J. H. B. Wigginton.

Eastaugh, Frederick Alldis,

Forty Hill, Enfield, then Sydney University, New South Wales.

Metallurgist, engaged as Teacher. First Class Associateship of the Royal School of Mines in Metallurgy. First Class Inter. B.Sc., London. Formerly assistant to Mr. G. T. Holloway, Chemist to Edison Ore Milling Syndicate. Demonstrator at R. S. M., and appointed same in Assaying and Chemistry at Sydney University.

W. Gowland.

William A. Tilden.

S. Herbert Cox.

James C. Philip.

G. T. Morgan.

Farmer, John Edwin,

"Blelsoe," New Road, Mitcham Junction.

Analyst to the Sewage Farms Committees. Corporation of Croydon. Sixteen years' experience of Sewage Purification, over eight years of which in the above. Member of the Society of Chemical Industry, also Member of the Royal Sanitary Institute.

J. Carter Bell.

A. W. Cowburn.

W. J. Dibdin.

James Ashton.

Frank Scuddler.

Fowles, George,

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Science Master. Assistant Chemistry Master, Latymer Upper School, Hammersmith, W., since 1902. Intermediate Science (London Univ.), Honours in Chemistry; reading in Honours Chemistry for final B.Sc.

Frank E. Weston.

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C. T. Bennett.

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Foxell, Edward William Lanchester,

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Chemistry Student, University College, London. Two years at University College, London. B.Sc. (London). Demonstrator in Chemistry, Univ. Coll., London.

William Ramsay.

Edward C. Cyril Baly.

J. Norman Collie.

N. T. M. Wilsmore.

Samuel Smiles.

Fryer, Percival John,

27, Minster Road, Cricklewood, N.W.

Analytical Chemist. For $4\frac{1}{2}$ years Assistant to Mr. A. W. Stokes, F.I.C., F.C.S., Public Analyst. For last $2\frac{1}{2}$ years, Analytical Chemist to the Chiswick Soap and Polish Co., W.

Alf. W. Stokes.

Frank E. Weston.

Cecil Revis.

J. L. White.

*Henry R. Ellis.***Gibson, William Howieson,**

48, Lady Margaret Road, Kentish Town, N.W.

Research Student in Chemistry. Three years a Student at University College, London. Third Class Honours in Physics, Intermediate Science, London. First Class Honours in Chemistry, B.Sc., London, 1906. Demonstrator at University College, London.

William Ramsay.

Samuel Smiles.

J. Norman Collie.

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Godden, William,

Station Road (East), Canterbury.

Two years assisting in teaching at Simon Langton Schools, Canterbury. Three years as Student at the Royal College of Science. A.R.C.Sc.; B.Sc. (Lond.); First Honrs. At present doing Research work at the Royal College of Science.

William A. Tilden.

G. T. Morgan.

M. O. Forster.

Chapman Jones.

James C. Philip.

H. E. Fierz.

Green, William Heber,

The University of Melbourne.

Lecturer and Demonstrator in Chemistry. B.Sc. and Dixon Scholar in March, 1898; Kernot Scholar in 1899. D.Sc. in April, 1905; Demonstrator in Chemical Laboratory since April, 1898. Papers: "The Oxidation of Cane-sugar by Aqueous Solutions of Potassium Permanganate," *Proc. Roy. Soc.*, Victoria (1899), Vol. XI., "Notes on the Iceland Star Method for the Standardization of Hydrochloric Acid," *Chem. News* (1903), 87, pp. 5-8.

Orme Masson.

Fred. W. Steel.

Charles Tilburn.

D. Avery.

Bertram D. Steele.

Grieb, Christopher Maurice Walter,

33, Torrington Park, North Finchley, London, N.

Research Student in Chemistry. Three years a Student in the

Chemical Laboratories at University College, London. Second Class Honours in Chemistry, B.Sc. (London), 1906. Final A.I.C. in Mineral Chemistry, Jan. 1907 (at first entry).

William Ramsay.

N. T. M. Wilsmore.

J. Norman Collie.

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Samuel Smiles.

Edward C. Cyril Baly.

Higham, Richard,

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Principal, Plymouth Grove Municipal Sch., Manchester. First Class Certifs. Adv. Theor. and Pract. Chemistry; Lecturer for ten years in Ely. and Adv. Theor. and Pract. Inorg. Chem. Attended Honours Courses in above subjects. Special Tutor in Chemistry and Mathematics for Matric., Inter., and Final Exams. in Science. First Class Trained Certificated Master, &c.

Alfred Nixon.

John Allan.

R. L. Taylor.

Jas. Grant.

F. S. Sinnatt.

Hooton, William Marrs,

Repton, Burton-on-Trent.

Chemistry Master, Repton School. M.A. (Oxon., 1st Class Honours, Natural Science). Has carried on research work under Mr. A. G. Vernon Harcourt (on Nitrogen Peroxide) and under Prof. Campbell Brown (on Margoric Acid). M.Sc. (L'pool Univ., 1st Class Honours, Chemistry). Assoc. Institute of Chemistry. Late Head of the Science Dept., Middlesbrough High School and Technical School, 1902—6. Chemistry Master, Repton School.

A. Vernon Harcourt.

J. Campbell Brown.

A. W. Titherley.

W. Collingwood Williams.

Andrea Angel.

Hoyten, William James,

37, Ravelstoke Road, Wimbledon Park, London, S.W.

Surgeon. M.R.C.S., Eng.; F.R.C.P., Lond.; F.R.G.S., F.Z.S. Medallist and 1st Class Certif. Honours Owen's Coll., Practical Chemistry. Serumtherapy of Carcinoma (orig. research), *British Med. Journal*. Action of the Thyroid Gland (orig. research), *British Med. Journal*.

E. A. Fasnacht.

Chas. Turner.

Joseph Gaskell.

Charles Dreyfus.

William McCleary.

Ernest Bentz.

Hughes, Francis Townshend Cunynghame,

Calcutta or Bombay, India.

Major, Indian Army. Qualified in Chemistry and Metallurgy at the Royal College of Science, and in Assaying at the Royal Mint according to regulations laid down for Indian Assay Dept. At present, holds appointment of Dept. Assay Master, Calcutta Mint.

William A. Tilden.

W. H. Merrett.

G. T. Morgan.

*Chapman Jones.**G. S. Newth.***Hussey, Arthur Vivian,**

"Banthwaite," Belmont, Sutton, Surrey.

Research Student, Central Technical College ; Inter. B.Sc. (Lond.), Hons. in Chemistry ; A.C.G.I.

Henry E. Armstrong.

William A. Davis.

Gerald T. Moody.

William Robertson.

T. Martin Lowry.

Edward Horton.

Jackson, Ernest Wilfrid,

65, Douglas Terrace, Middlesbro'.

Analytical Chemist. Premium pupil with J. E. Stead, Esq., F.R.S., &c., 1896—1900, in whose laboratory have occupied the position of chief assistant chemist since 1900. (Honours, City and Guilds' Exam., Iron and Steel.) Teacher of Iron and Steel Manufacture in Technical College.

J. E. Stead.

E. H. Saniter.

H. Frankland.

J. Archyll Jones,

C. H. Ridsdale.

*J. W. Patterson.***Jackson, Victor George,**

21, Frankfurt Road, Herne Hill, S.E.

Analytical Chemist. Engaged in analytical chemistry.

H. B. Baker.

Frank E. King.

A. H. Coote.

*A. Angel.**James Leicester.***Jennings, Sidney James,**

367, Queen's Road, New Cross.

Teacher. Spent three years (Sept., 1901 to Sept., 1904) in University College, London (Analytical), Laboratory, under Sir William Ramsay. Passed B.Sc. (London) in 1904. (Chemistry was one of the subjects.)

William Ramsay.

N. T. M. Wilsmore.

Edward C. Cyril Baly.

E. Barrett.

Francis W. Storey.

King, Albert Theodore,

Church Hill, Horsell, Woking.

Student. Three years at University College, London ; B.Sc. Lond. ;
First Class Honours in Chemistry.

William Ramsay.

Edward C. Cyril Baly.

J. Norman Collie.

Samuel Smiles.

N. T. M. Wilsmore.

Lunan, George,

50, Garscube Terrace, Murrayfield, Edinburgh.

Pharmaceutical Chemist, 20, Queensferry St., Edinburgh. Formerly
Examiner to Pharmaceutical Society of Great Britain. Papers on
following subjects : "Note on Commercial Hypophosphorous Acid,"
P. J., vol. xvii., fol. 773, 3rd series, 1886-87 ; "Hypophosphorous
Acid," *P. J.*, vol. xviii., fol. 872, 3rd series, 1887-88 ; "Syrupus Ferri
Hypophosphites," *P. J.*, vol. xviii., fol. 872, 3rd series, 1887-88 ;
"Purity of Commercial Samples of Dried Sulphate of Iron," *P. J.*,
vol. xix., fol. 226, 3rd series, 1888-89 ; "Tinctura Quininæ Ammoniata,"
P. J., vol. xix., fol. 436, 3rd series, 1888-90 ; "Granular Effervescent
Preparations," *P. J.* [4], vol. viii., p. 141, 1899 ; "Glycerinum Acidi
Borici," *P. J.* [4], vol. xviii., p. 7, 1904 ; Report on "Effervescent
Granules" for the Pharmacopœia Committee of the General Medical
Council, *P. J.* [4], vol. xxiii., fol. 665 *et. seq.*, 1906.

Leonard Dobbin.

Peter MacEwan.

M. Carteighe.

Alex Crum Brown.

Walter Hills.

Charles A. Hill.

Martin, Joseph,

Coopers' Company's School, Bow.

Teacher of Chemistry, Science Department, Coopers' Company's
School, Bow. Three years Student in Armstrong College, Newcastle.
B.Sc. degree (Durham University) in Chemistry. Assistant in Chemistry
Department, Coopers' Company's School, Bow.

P. Phillips Bedson.

S. Hoare Collins.

F. C. Garrett.

Harold E. Richardson.

Clarence Smith.

Matthews, Charles Pask,

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Science Master. Bachelor of Science Honours, University of London.
Works Chemist, Messrs. Hopkin & Williams, Hatton Garden, E.C.

Late Assistant Science Master, Technical Science and Art Schools,
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A. E. Thomas.

Horace Finnemore.

John C. Umney.

W. H. C. Jemmett.

W. H. Mills.

A. E. Dunstan.

Murgatroyd, Louis,

1, Carlton Drive, Heaton, Bradford.

Analytical Chemist. Practised for two years as Analytical Chemist (Sutcliffe and Murgatroyd). Pupil to Dr. Petraczek (Analytical and Consulting Chemist, Bradford) for two years. Student for two years in the Chemistry Department, Yorkshire College. Studied under Dr. Hieppe in the laboratories of Meister, Lucius, & Brüning, Höchst, a/M.

C. Rawson.

Joshua Knowles.

Ad. Liebmman.

William E. Kay.

Thorpe Whitaker.

W. H. Pennington.

William G. White.

Oberländer, Otto, Ph.D.,

Chamber of Commerce Buildings, Oxford Court, Cannon
Street, E.C.

Consulting Chemist. Student at Heidelberg University and Karlsruhe (Polytechnicum). Assistant to Professor Noelting Mülhausen (Alsatia). Manufacturing Chemist in Bury, near Manchester.

J. C. Cain.

Arthur G. Green.

Ad. Liebmman.

J. Tcherniac.

R. W. Sindall.

Remfry, Frederic George Percy, B.A. (Camb.), D.Sc. (Geneva),

Sunnymead, Tenby, S. Wales.

Research Student at University of Manchester, now Chemist in Research Laboratory, Messrs. Burroughs, Wellcome & Co. Joint author of following papers: "Formation and Reactions of Imino-compounds," *Jour. Chem. Soc.*, 1904. "Über fünf Quinaldinderivate," *Ber.*, 1905.

Harold B. Dixon.

J. F. Thorpe.

W. H. Perkin, jun.

H. A. D. Jowett.

Frank Lee Pyman.

Robertson, Robert,

9, Sewardstone Road, Waltham Abbey, Essex.

Research Chemist. M.A.; D.Sc. of St. Andrew's University.

Fellow of the Institute of Chemistry. In charge of the Laboratory, Royal Gunpowder Factory. Has prosecuted researches in explosives, of which are published: "On the Will Test for Nitrocellulose," *J.S.C.I.*, 1902, p. 819, and "On Purifying and Stabilising Guncotton," *J.S.C.I.*, 1906, p. 624.

Horatio Ballantyne.

W. Rintoul.

W. T. Thomson.

Sydney S. Napper.

William Barbour.

Salway, Arthur Henry,

15, Palmerston Road, Forest Gate, E.

Research Chemist. Ph.D. (Leipzig), B.Sc. (Lond.).

Published in the Transactions of the Chemical Society a conjoint paper with F. S. Kipping on "The Arrangement in Space of the Groups Combined with the Tervalent Nitrogen Atom."

Frederick B. Power.

M. Barrowcliff.

A. C. O. Hann.

Frank Tutin.

Harold Rogerson.

Schlienger, Charles,

Acadia House, 273, Camden Road, London, N.

Assistant Lecturer. Chemical Department, East Ham Technical College. B.Sc. (London). Late Demonstrator in the Chemical Dept., Birkbeck College, London, E.C.

A. E. Dunstan.

W. H. Barker.

W. T. Clough.

Alex. McKenzie.

H. Wren.

Sewell, William George,

27, Park Road, Wandsworth Common, S.W.

Science Teacher. Bachelor of Science (London). I have studied Chemistry for 15 years, and would like to keep in touch with the latest researches. I have done some research, and am about to devote the whole of my leisure in this direction.

A. Greeves.

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Frank E. Weston.

Léon E. Walling.

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Shepherd, Frederick George,

9, Leinster Road, Rathmines, Co. Dublin.

Chemist. B.Sc. First Class Honours in Chemistry, University of London. Associate of the Royal College of Science, London. Engaged

in research in the laboratory of Messrs. Guinness and Co. Joint author with Prof. Tilden of two papers in the *Transactions*.

William A. Tilden.

G. T. Morgan.

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James C. Philip.

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Smith, Robert Low,

56, Genesta Road, Plumstead, S.E.

Analytical Chemist. Training in Chemistry at King's College, 1902—04. Now occupying position as chemist of Johnson and Phillips' Electrical Engineering and Cable Manufacturing Works.

W. H. Deering.

R. J. Redding.

Oliver Trigger.

H. Russell Pitt.

J. C. Aylan.

Templeton, William Sandilands, M.A., B.Sc.,

Colombo, Ceylon (after 20th October, 1906).

Professor of Physics at the Medical and Technical Colleges, Colombo, Ceylon (recently appointed). Studied Chemistry at Glasgow University under Prof. Ferguson and W. R. Lang, at Glasgow and West of Scotland Technical College under Prof. G. G. Henderson and M. Parker, and at the Royal College of Science, S. Kensington, under Prof. Tilden and Dr. M. O. Forster. Was a teacher of Chemistry for two years in Allan Glen's School, Glasgow. Desires to keep in touch with the latest developments of Chemical Science in view of his having occasionally to undertake the duties of the Prof. of Chemistry at Colombo.

F. E. Matthews.

A. Campion.

John Ferguson.

F. W. Harbord.

M. O. Forster.

Thomas, Richard Noel Garrod,

Balliol College, Oxford.

Bachelor of Arts. Demonstrator in Chemistry, Balliol Coll., Oxon. Part author of a paper on "Spontaneous Crystallisation" (*J.C.S.*, July, 1906).

Harold Hartley.

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D. H. Nagel.

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Toch, Maximilian,

261, West 71 Street, New York City.

Chief Chemist and member of firm of Toch Brothers, Colour and Varnish Mfrs., N.Y. Graduate and Post Graduate, New York University. Graduate Chemical Department, Cooper Institute.

Author of "Chemistry of Mixed Paints," "Permanent Protection of Iron and Steel," "Composition of Paints and Raw Materials," &c.

Chas. Baskerville.

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Science Master. B.Sc., London ; Third Class Honours Chemistry.

Two years Science Master, Dorchester Grammar School. Science Master, St. Joseph's College, Colombo.

E. K. Hanson.

J. W. Dodgson.

John W. Taylor.

J. K. H. Inglis.

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A Science Master at Aldenham, now Assistant Collector in Imperial Customs Service, Madras, India. Formerly Scholar of Emmanuel Coll., Cambridge. Natural Science, Tripos I. and II.

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Teacher of Science. M.A., Cantab (Hons., Nat. Sci. Tripos), Inter. B.Sc. (Lond.). Head of Science Department, Middlesbrough. High School and Middlesbrough Technical Classes, late Head of Science Department, Oldham Hulme Grammar School.

J. E. Stead.

H. Frankland.

J. Archyll Jones.

C. H. Fildesdale.

J. W. Patterson.

E. H. Saniter.

Williams, William Henry,

Government Education Department, Hong Kong.

1903—5, Supervisor Anglo-Chinese Schools ; 1905—present, Headmaster Victoria School (Secondary School for Boys). Organizing Secretary to Govt. for Tech. Instruction. Student : three years Inorg. Chem. ; two years Organic Chem., Municipal Tech. School, Birmingham. Board of Educ. Certifs., 1st Lond. Matric. (Chemistry). Author of "Experiments in Hygiene," a teacher's handbook for instruction in

Tropical Diseases and Sanitary Science, printed and published by the Hong Kong Government. Asst. Lec. (1900—1), Munic. Tech. Day School, B'gham; two years Lecturer in Chemistry and Physics, Institute of Engineers, Hong Kong.

Lionel M. Jones.

T. Slater Price.

T. Francis Rutter.

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Wolff, Mark Arthur,

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Assayer, Analytical Chemist, and Mining Engineer. For two years Chief Assayer and Advising Chemist to the Wei-Hai-Wei Gold Mining Company of Shanghai, China (July, 1904—September, 1906).

W. H. Merrett.

J. W. Shepherd.

E. O. Courtman.

G. T. Morgan.

J. C. Philip.