

THE ANALYST

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS AND OTHER ANALYTICAL CHEMISTS.

AN ordinary Meeting of the Society was held on Wednesday, April 5, in the Chemical Society's Rooms, Burlington House. The President, Mr. P. A. Ellis Richards, F.I.C., was in the Chair.

A Certificate was read for the first time in favour of Mr. Frederick Major, B.Sc. (Lond.), A.I.C.

Certificates were read for the second time in favour of Messrs. William John Agnew, B.A. (R.U.I.); Reginald Ernest Essery, B.Sc. (Bristol), A.I.C.; Arthur Thomas Etheridge, M.B.E., B.Sc. (Lond.), F.I.C.; George Girvan Herbert, A.I.C.; and George Lewis Hutchison, B.Sc. (Lond.), F.I.C.

The following were elected Members of the Society:—As Honorary Member: Sir Robert Robertson, K.B.E., F.R.S. As Ordinary Members: Messrs. Reginald Thomas Colgate, D.Sc. (Lond.), F.I.C.; Frederick Norman Appleyard, A.I.C.; Harold James Foster; Hammersley David George Holt, B.A. (Cantab.); Shozaemon Keimatsu; and James Miller, F.I.C.

The following papers were read:—"The Constants of Indian Beeswax," by O. D. Roberts, F.I.C., and H. T. Islip, A.I.C.; "Note on the Liver Oil of the 'Tope' (*Galeus galeus*)," by A. Chaston Chapman, F.R.S., F.I.C.; "Note on the Examination of Foods for the presence of Sulphites," by A. Chaston Chapman, F.R.S., F.I.C.; "Demonstration of Artificial Daylight for Laboratory Purposes (Sheringham System)" by Sydney H. Groom, B.A.; "A Tropical Milk Supply," by Alexander Bruce, B.Sc.; and "Certain Tropical Oilseeds," by E. R. Bolton, F.I.C., and D. G. Hewer, B.Sc.

Obituary.

FRANCIS WILLIAM PASSMORE.

By the death of Dr. F. W. Passmore, F.I.C., in November last, at the age of 54, the chemical profession lost one of its most valued practitioners.

For nearly thirty years Dr. Passmore had been engaged in consulting practice in London, but, precluded as he was by the confidential nature of his work from publishing scientific papers, his name was perhaps less well known to the general body of chemists than his talents would otherwise have ensured. Among those with whom he came into contact, no one stood higher than he in professional esteem and affectionate regard.

His tastes lay principally in the direction of organic chemistry, and his training—which culminated in a period of study under Emil Fischer at Würzburg—had afforded ample scope for their development. As a consultant, he followed his bent in applying a wide and deep knowledge of that branch of the science to chemical industry, and he met with success as technical director in various organic chemical manufactures. He was too sound a chemist, however, and had too broad an outlook, for his activities to be restricted even to the wide domain of organic chemistry, and he was engaged from time to time in several other branches of chemical and technical work.

He was chiefly distinguished as a leading member of that small group of scientific men who are habitually engaged as witnesses in patent litigation and as advisers to inventors and others on patent questions generally. He was richly endowed with the qualities required for this work—a profound knowledge and love of his subject, insight, swiftness of comprehension, clearness of exposition, accuracy in experimental work, a calm and level judgment, and, above all, that critical faculty which debars the thinker from accepting and insisting upon his own view, however attractive, unless it has first passed the test of his own closest scrutiny. He possessed in a high degree the capacity for taking simple, clear-cut views, and for explaining and clarifying the most recondite of organic reactions and processes—always with a sense of what really mattered for the purpose in hand. He had no trace of that tendency, not unknown among chemists and other men of scientific education, of deviating from the path of relevancy into the bog of scientific disquisition, which is so disconcerting to the legal mind seeking for guidance on the points at issue.

A bare record of his professional achievements, read with knowledge of all that they involved, would amply establish what has been said above. Some indication of his work is given in a sympathetic obituary notice, by Mr. E. T. Brewis, in the *Journal of the Society of Chemical Industry* of 30th November last (page 441 R). But in endeavouring to write, with knowledge born of nearly 25 years' close friendship, an intimate appreciation of the man and his work, one recalls with gratitude the thought, so finely expressed by Emerson, of how much the good name and quality of a man of high character transcend a mere catalogue

of his achievements. "Something resided in the man which begot an expectation that outran all his performance." No one who was associated with Passmore could fail to feel the weight of his influence, and it was an influence for good. To his intimates, he was distinguished by strength and simplicity of character—the simplicity of one whose every action was so unerringly and inevitably determined by the laws of right and reason, that his motives were at all times clear and estimable and his actions transparently honourable.

In the Courts—whether in the Chancery Division, the Court of Appeal, or the House of Lords—Passmore's reputation stood second to none for probity, and his evidence was always received with the greatest respect.

His genial, kindly personality and his loyal friendship are deeply missed by a wide circle of friends.

HORATIO BALLANTYNE.

EDWIN WILLIAM TAYLOR JONES.

E. W. T. JONES, F.I.C., who died on February 19th at the age of nearly seventy-six, was an original member of the Society of Public Analysts, of which he had been twice Vice-President, and it was only in deference to his own wish, expressed on several occasions, that he was never nominated by the Council for the Presidency. He twice served on the Council of the Institute of Chemistry.

At the time of his death he had been for nearly forty-nine years Public Analyst for the Borough of Wolverhampton, and for the County of Stafford, and he was also Public Analyst for Kidderminster, Walsall, Newcastle-under-Lyme, and Stoke-on-Trent. He was also Official Analyst for the County of Stafford and some of the foregoing boroughs under the Fertilisers and Feeding Stuffs Act.

He was the son of the late Edward Jones, of Russell's Hall, Dudley, and was educated at a private school, from which he went for a time into chemical works at Wolverhampton, afterwards going to London for a systematic course of training at the Royal College of Chemistry, in the time of the late Dr. A. W. Hofmann. At the conclusion of his course there he passed the usual final examinations of the College, and, at the same time, took the silver medal for organic chemistry and the bronze medal for inorganic chemistry awarded by the Science and Art Department of South Kensington.

In 1871, at twenty-five years of age, he began practice as an analytical chemist in Wolverhampton in the laboratory which he occupied up to the time of his death. On the passing of the Sale of Food and Drugs Act he was appointed under its provisions to the official positions which have been already referred to.

Jones was an earnest member of the band of early pioneers in food analysis, and had the credit of being the first public analyst to certify officially under the Sale of Food and Drugs Act the then prevalent adulteration of lard with cottonseed oil.

He contributed many papers to the Proceedings of our Society, as well as taking, for many years, an active part in the discussions which arose at its meetings.

Among his papers published in the ANALYST were the following:—"Butter Fat, Its Analysis and Composition"—two papers—(Vol. II., pp. 19 and 37); "Influence of Age on the Specific Gravity of Butter Fat and the Percentage of Soluble and Insoluble Acids" (Vol. IV., p. 39); "The Influence of Age on the Composition of Butter Fat" (Vol. IV., p. 93); "Starch in Ground Ginger" (Vol. XI., p. 75); "The Examination of Wort" and "The Estimation of Starch" (Vol. XII., p. 163); "The Specific Gravity of Fat at 100° F. when Clear and when Clouded with Crystals" (Vol. XIII., p. 201); "The Adulteration of Lard with Cottonseed Oil" (Vol. XIII., p. 170); "Notes on Lactose" (Vol. XIV., p. 81); "The Turbidity of Oils and Fats in Glacial Acetic Acid" (Vol. XIX., p. 151); "Treacle or Golden Syrup" (Vol. XXV., p. 87); and "The Detection and Determination of Maize in Wheaten Flour" (Vol. XXV., p. 317).

Abstracts of papers in other Journals on "Coconut Oil in Margarine," "The Detection of Arsenic in Beer" and "The Colorimetric Estimation of Formaldehyde in Milk" have also appeared in the ANALYST.

He left a widow, one daughter and two sons—one of whom, Mr. E. V. Jones, has been for many years associated with him in his professional work.

BERNARD DYER.

Demonstration of the Use of a Universal Indicator.

BY FRANCIS H. CARR, C.B.E., F.I.C.

(At the Meeting, February 1, 1922.)

THE use of a mixed indicator for the determination of hydrogen ion concentration was demonstrated. It was explained that the idea of an indicator showing changes of colour corresponding to the spectrum was originally suggested by Dr. J. Moir (*J. Chem. Met. and Min. Soc. S. Africa*, February, 1917, p. 129), who used a mixed solution of methyl red, naphtholphthalein and phenolphthalein for determining the neutrality of waters.

This mixture has been improved by the addition of bromothymol-blue or thymol-phthalein and cresol-phthalein or cresol red. Mr. Cocking and Mr. Chappel have thus obtained a mixture which exhibits a series of colour changes over a range of P_H from 3 to 11, combining the advantages of the several indicators. A solution containing this mixture affords a convenient and rapid means of approximately determining the P_H value of a solution. By adding the indicator to a series of prepared buffer solutions, Mr. Carr showed that the colours produced were as follows:— P_H 3, pale red; P_H 4, red; P_H 5, orange red; P_H 6, orange; P_H 6.5, yellow; P_H 7, greenish yellow; P_H 8, green; P_H 8.5, bluish green; P_H 9, greenish blue; P_H 9.5, blue; P_H 10, violet; P_H 11, reddish violet.

DISCUSSION.

Mr. HINKS enquired why the colours in Mr. Carr's exhibit went in the spectrum order, as he could see no connection between the spectrum and hydrogen ion concentration.

Mr. R. L. COLLETT commented upon the small changes of colour which the solution underwent at the extremes of acidity and alkalinity. For instance, between P_H 9 and 11 the change of colour was slight as compared with the change between 6 and 7, which was good. He was of opinion that the solution required to be improved in this respect.

Mr. S. E. MELLING said that these indicators were very helpful in de-watering activated sludge; he had written out to the States (where he knew they were obtainable) for a series of indicators, being unaware that they were to be had in England, and he was very pleased to gather from Mr. Carr's demonstration that they were now made in this country.

Mr. CARR, in replying to Mr. Hinks' question, said that the colour change was in the spectrum order chiefly because the indicators employed had been chosen for that purpose.

Replying to Mr. Collett, he admitted that it was desirable to improve the solution at the extreme points of acidity and alkalinity. Mr. Cocking and Mr. Chappel, who worked on this subject, hoped that as new indicators are discovered they may be able eventually to perfect it. In the meantime, he considered that the solution served a very useful purpose on account of its very wide range, being chiefly of use for determining the approximate acidity, and enabling one to choose the most suitable indicator for a more accurate determination when that was required.

The Examination of B.P. Ointments.

BY NORMAN EVERS, B.Sc., F.I.C., AND G. D. ELSDON, B.Sc., F.I.C.

(Read at the Meeting, March 1, 1922.)

SOME time ago it fell to the lot of the writers to find methods for the examination of those ointments given in the British Pharmacopoeia of 1914 which are commonly used. A careful search through the literature gave very little assistance, and, where methods were described, they were mostly found, on trial, to be unsatisfactory. A number of methods or modifications of existing methods have been devised and outlines of these are suggested below under the various headings. Some ointments which have already been dealt with are:—White precipitate (ammoniated mercury) ointment (Elsdon, Y.B.P., 1911, 447); phenol and salicylic acid ointments (Elsdon, Y.B.P., 1920, 476); atropine and cocaine ointments (Foster, Y.B.P., 1921, 363).

CANTHARIDIN OINTMENT.—From 20 to 30 grms. are dissolved in a mixture of equal parts of ether and chloroform, transferred to a separator, and washed three times with about 15 c.c. of a 5 per cent. solution of sodium carbonate. The mixed alkaline washings are filtered, transferred to a separator, acidified with sulphuric acid and extracted three times with chloroform (about 10 c.c. each time). The mixed chloroform washings are evaporated to dryness.

The residue is washed with two or three small quantities of a mixture of equal parts of petroleum spirit and dehydrated alcohol saturated with cantharidin, and the washings filtered through a plug of cotton wool placed in a funnel and previously treated with chloroform and the petroleum spirit alcohol mixture.

The cantharidin in the dish is then dissolved in chloroform (2 or 3 small quantities), which is passed through the cotton wool and collected in a weighed dish. The chloroform extract is evaporated, and the residue dried in the desiccator and weighed as cantharidin. The B.P. ointment should contain 0.033 per cent. of cantharidin.

CALOMEL OINTMENT.—For the determination of calomel 5 grms. are dissolved in ether, filtered through paper, and the paper washed with ether until free from fat and dried. The residue, with the paper, is dropped into a stoppered bottle, and 50 c.c. of potassium iodide solution (10 per cent.) and 50 c.c. of 0.1 *N* iodine solution added. After complete solution has taken place, the excess of iodine is titrated back with 0.1 *N* thiosulphate solution (1 c.c. 0.1 *N* I = 0.0236 gm. HgCl).

(B.P. strength = 20 per cent. of mercurous chloride.)

CREOSOTE OINTMENT.—The proportion of creosote may be estimated by weighing out one gm. into a flat-bottomed metal dish which is heated on the water bath until there is no odour of creosote and there is no further loss in weight. The total loss in weight may be taken as creosote. The B.P. formula requires 10 per cent. of creosote.

EUCALYPTUS OINTMENT.—This may be examined in the same way as creosote ointment. The B.P. formula requires 10 per cent. of eucalyptus oil.

GALL OINTMENT.—The percentage of powdered galls may be estimated by extracting from 2 to 5 grms. in a fat-free thimble in a Soxhlet apparatus with light petroleum spirit, the thimble having previously been dried and weighed. The weight of residue so obtained can be taken for most purposes as the weight of the original galls, as galls are not appreciably soluble in petroleum spirit. The residue should be examined microscopically and the matter soluble in alcohol (about 70 per cent.) may be estimated, if desired.

IODINE OINTMENT.—Five grms. of the ointment are dissolved in chloroform, 50 c.c. of water added, and the free iodine titrated with 0.1 *N* thiosulphate solution. (1 c.c. of 0.1 *N* Na₂S₂O₃ = 0.01269 gm. iodine.) Potassium iodide may be estimated by washing out the melted ointment with water in a similar manner to the process given under mercury ointment. After boiling, to remove any free iodine, the potassium iodide may be titrated with 0.1 *N* silver nitrate solution (1 c.c. of 0.1 *N* AgNO₃ = 0.0166 gm. KI). The free iodine is usually about 70 per cent. of that actually added. The U.S.P. states that it must be freshly prepared (see Y.B.P., 1913, 355; 1915, 270; 1917, 103; 1918, 334).

IODOFORM OINTMENT.—For the estimation of iodoform 5 grms. of the ointment are heated for two hours under a reflux condenser with 50 c.c. of 0.1 *N* silver nitrate solution, the condenser being occasionally washed down with a little water to prevent the collection of iodoform therein. The liquid is then cooled,

diluted to 110 c.c., boiled, cooled and filtered, and 100 c.c. of the filtrate titrated with thiocyanate solution in the usual way.

(1 c.c. 0.1 N $\text{AgNO}_3 = 0.01312$ gm. CHI_3 .)

The iodoform may also be estimated by loss on the water-bath. This method gives results about 0.2 per cent. higher than the foregoing, but may include moisture.

MERCURY OINTMENT.—Three grms. of the ointment are heated in a 100 c.c. extraction flask on the water bath with 20 c.c. of concentrated nitric acid until the mercury is dissolved and the evolution of fumes ceases. The mixture is then diluted with about an equal quantity of water and warmed until the fat has risen to the surface. The liquid is allowed to cool and is decanted from the cake of fat, which is subsequently broken up and washed twice with water, and the washings added to the original liquid. The united liquids are diluted to about 75 c.c., and completely oxidised by the gradual addition of potassium permanganate solution, excess of the latter being removed by means of a dilute solution of ferrous sulphate. The whole is then diluted to 100 c.c. and filtered, and the mercury estimated in the filtrate by titrating 25 c.c. with 0.1 N thiocyanate solution in the usual way. (1 c.c. 0.1 N thiocyanate solution = 0.0100 gm. Hg.) (Rupp, Y.B.P., 1907, 103.)

COMPOUND MERCURY OINTMENT.—The mercury may be estimated as given under mercury ointment. The camphor is found by heating about 2 grms. on a flat bottomed dish on the water bath for two hours; the loss is due to camphor.

RESIN OINTMENT.—*Ung. Resinae B.P.* consists of resin 26 per cent.; yellow beeswax, 26 per cent.; olive oil, 26 per cent.; and lard, 22 per cent. The acid values of these constituents are:—

	Range	Average
Resin	150—185	167
Beeswax	16.8—22.4	19.6
Olive Oil	1—6	3
Lard	0—1.2	

A calculation from these figures shows that the range of possible acid value for *Ung. Resinae* is 43.4 to 55.2, and that the average figure is 49.3. Allowing average values for the constituents, the approximate percentage of resin may be calculated from the formula $\frac{(a - 5.9) \times 100}{167}$, where a is the acid value found.

SULPHUR OINTMENT.—The ointment (0.5 gm.) is heated over a small flame with 5 c.c. of concentrated nitric acid and 3 c.c. of bromine. When the excess of bromine is removed the liquid is diluted with water and transferred to a separator. The fat is extracted with three quantities of ether, and the mixed ethereal solutions washed twice with 5 c.c. of water, the washings being added to the aqueous liquid. The sulphate is then precipitated by means of barium chloride in the usual way. (B.P. strength = 10 per cent.)

All the above methods have been tried with ointments prepared in the laboratory and found to give satisfactory results.

THE LOSS OF VOLATILE CONSTITUENTS IN THE PREPARATION OF OINTMENTS.

Ointments containing a volatile constituent are liable to lose a certain proportion of this ingredient in the course of their preparation. The B.P. gives no directions as to any precautions to be taken to prevent this loss, and, moreover, gives no standards for the finished ointment. The amount of loss will, therefore, depend on the care exercised in their preparation, and the question arises as to what proportion of loss is allowable in manufacture. Experiments were carried out with this point in view. It will be understood that it is to be expected that the loss will be greater on the manufacturing scale than in the laboratory.

Phenol Ointment.—Two samples were prepared in the laboratory strictly in accordance with the B.P. directions. In the one case (A) precautions were taken against loss, and the other (B) was made without any special precautions.

The following percentages of phenol were obtained (the B.P. strength being 3 per cent.). (A), 2.73 per cent.; (B), 2.11 per cent. It is therefore possible to lose up to 30 per cent. of the phenol added.

Creosote Ointment.—A sample prepared in the laboratory contained 9.33 per cent. of creosote, and, after several days' exposure in an open pot, 9.10 per cent. of creosote instead of the 10 per cent. added.

Eucalyptus Ointment.—A sample carefully prepared in the laboratory did not show any loss of oil. A specimen prepared on the manufacturing scale, however, contained only 9.24 per cent. of essential oil, instead of the 10 per cent. added.

Salicylic Acid Ointment.—Two samples prepared in the laboratory contained only 1.84 per cent. and 1.33 per cent., instead of the 2 per cent. added. Commercial samples contained 1.87 per cent. and 1.12 per cent.

The Refractive Index of Ointments.—The refractive index of certain ointments has been determined at 60° C. From the limits of refractive index of the materials used maximum and minimum values have been calculated for each ointment where all the materials are capable of being examined in this way. The results obtained, together with those given by ointments from various sources, are given in the following tables:—

TABLE I.

Refractive Indices of Materials for B.P. Ointments.

Materials	Ref. Ind. 60°C.	Materials	Ref. Ind. 60°C.
Beeswax	1.446—1.450	Wool fat	1.470—1.474
Lard	1.451—1.458	Spermaceti	1.438—1.439
Paraffin Molle Alb.	1.453—1.460	Chaulmoogra oil	1.464—1.466
Paraffin Molle Flav.	1.467—1.474	Eucalyptus oil	1.444—1.458
Paraffin wax	1.436—1.437	Pix Liquida	1.502—1.527
Paraffin liq.	1.460—1.469	Creosote	1.519—1.521
Olive oil	1.453—1.456	Phenol	1.527
Oleic acid	1.445—1.447		

TABLE II.
Refractive Indices of Ointments at 60° C.

Ointment	Calculated	Ointments prepared in Laboratory	Other Samples
Ung. Acid Carbolic.	1.450—1.456	1.4533, 1.4525	1.4518, 1.4520
Ung. Chaulmoograe	1.447—1.451	1.4496	—
Ung. Creosoti	1.453—1.457	1.4529	1.4608
Ung. Cetacei	1.454—1.461	1.4603	1.4579, 1.4548
Ung. Eucalypti	1.445—1.451	1.4480	1.4508, 1.4480, 1.4475, 1.4490, 1.4509, 1.4580
Ung. Lanae Co.	1.458—1.464	1.4595	—
Ung. Paraffin Alb.	1.448—1.454	1.4538	1.4521, 1.4509
Ung. Paraffin Flav.	1.458—1.463	1.4628	—
Ung. Picis Liq.	1.485—1.504	1.4957	1.5066, 1.5064
	Calculated for base		
Ung. Acid Salicylic.	1.448—1.454	1.4528	1.4518, 1.4522
Ung. Atropin.	1.450—1.457	1.4540	1.4525, 1.4538
Ung. Cocain.	1.450—1.456	1.4534	1.4527
Ung. Resinae	1.450—1.454	1.4692	1.4688, 1.4692
Ung. Capsici	1.451—1.457	—	1.4560, 1.4665
Ung. Cantharidin.	1.451—1.458	—	1.4517
Ung. Gallae c Opio	1.451—1.458	—	1.4532, 1.4516, 1.4527
Ung. Hydrarg. Ammon.	1.451—1.458	—	1.4518, 1.4522
Ung. Hydrarg. Subchlor.	1.451—1.458	—	1.4532, 1.4516, 1.4527
Ung. Iodoform.	1.451—1.458	1.4547	1.4478, 1.4590, 1.4545, 1.4564

It will be seen from the above results that the refractive index does not, except in a few cases, give much information as to the strength of the active constituent present. In the case of creosote, tar, or resin ointments, the refractive index of the active constituent is sufficiently far removed from that of the base to cause an appreciable change in the latter on its addition. If the refractive index of the ointment is outside the range given in the above tables, there is a strong suspicion that the composition of the ointment is not what it should be.

DISCUSSION.

Mr. C. J. STOCK said that he was interested in the subject of mercury ointment. He had had experience of having to estimate the metallic mercury, as distinct from total mercury, and had found that there was generally a small amount of what appeared to be mercurous oleate present, which was very difficult to remove from the metallic mercury. He would be glad to hear if Mr. Evers had had experience in the estimation of metallic mercury in mercury ointments. The method required the finding of metallic mercury in the presence of this compound.

Mr. E. T. BREWIS enquired what objection there was to dissolving the fat away and allowing the metallic mercury to sink. Almost invariably one got a small amount of material which might be taken to be mercurous oxide, but which was probably oleate of mercury formed in the making of the ointment. When

"extinguishing" metallic mercury on a manufacturing scale a week or more was taken to do half a ton, and one troubled very little about mercury combined with free acid. The first formation of oleate of mercury helped to "kill" mercury. In making ointments in the laboratory the quantities of ointments required were only a few thousand grains, whereas, on a large scale, to produce ointment suitable for its purpose and free from lumps, machinery was necessary, and there were difficulties to be overcome which one did not experience in dispensing. Another consideration was that, in order to vary the consistency of the ointments to suit winter and summer temperatures, a latitude was given in the official directions. With some ointments a composition which gave the necessary consistency in summer would be as hard as wax in winter. With regard to the question of the particular kind of "pure" lard to be used to obtain this varying melting point, he pointed out that ointment should be as nearly like butter in consistency as possible, and without granular particles. In the case of Eastern countries distinct instructions were given to vary the base of the ointment. For instance, in ointments for a Hindoo population the bases must be those not barred by the customs of the country.

Mr. H. FINNEMORE hoped that when the figures were published it would be shown what percentage of ingredients the authors had found in those preparations made under special conditions. In the case of iodine ointment it could be quite understood that the percentage of uncombined iodine would vary very much, but this uncombined iodine was a measure neither of the iodine present, nor of the medicinal value of the preparation. He instanced a preparation in which, on a large scale, the full quantity was mixed in, but only 95 per cent. of that indicated by the B.P. was found, and his explanation had been that, considering the time it had been made and the manipulation it had undergone, the amount was quite satisfactory. He thought, therefore, that these results should be very carefully examined, for, without serious consideration, it could not be taken for granted that the formulæ of the B.P. and the analyst's results would correspond.

Mr. E. R. BOLTON said that the differences referred to by Mr. Brewis and Mr. Evers might easily be explained by the fact that, although mercury oleate might not be soluble in petroleum spirit, he would expect it to be dissolved to a marked extent by the actual solvent in use, namely, petroleum spirit saturated with fat.

Dr. DYER thought that a fat might easily absorb 50 per cent. of iodine.

Mr. EVERS, in replying, said that he preferred the method given for mercury ointment to the method of Mr. Brewis, because the whole of the mercury was not present as metallic mercury. The method given in the paper estimated the total mercury, and he had never made a separate estimation of metallic mercury. With regard to the loss of volatile constituents, the point was that, if such losses occurred on the laboratory scale, greater losses were to be expected, and actually did occur on the manufacturing scale. As regards the question of the base, this was important from the point of view that on the base depended the absorption of the active principle by the skin.

Note on the Liver Oil of the Tope. (*Galeus galeus*).

BY A. CHASTON CHAPMAN, PRES. I.C., F.R.S.

IN the course of the study of the chemistry of the liver oils of certain fish, I have had occasion to examine the oil from the liver of the tope. As I have not been able to find any reference to this oil in chemical literature, I thought that it might be of interest to place some of my results on record.

For the following description of this fish I am indebted to Mr. C. Tate Regan, F.R.S.:—

THE TOPE—*Galeus galeus*—is a widely distributed species: it occurs on all the coasts of the British Isles, but is much more abundant in England and Ireland than in Scotland. It belongs to the family Carchariidae—sharks without fin spines, with the first dorsal fin well in advance of the pelvis and with the last two or three gill slits above the base of the pectoral fin—and is distinguished from other forms with sharp-edged teeth by the possession of spiracles: in colour it is bluish-grey above and white beneath.

The tope usually attains a length of five or six feet, but specimens of seven feet long have been recorded. It swims low and feeds mainly at or near the bottom on fishes and other marine animals. In the summer, the adults approach the coast to breed, but in winter they retire into deeper water. The tope is viviparous, producing about 20 to 40 young in one season.

Through the kindness of Mr. T. E. Saunders, Collector of Fishery Statistics to the Board of Agriculture and Fisheries, I received some fresh livers, taken under his direction, from the freshly caught fish. There cannot, therefore, be any reasonable doubt as to the authenticity of the oil.

When finely minced and steamed, the livers yielded a considerable quantity of pale-coloured oil, having a rather strong, but not unpleasant odour. This gave on examination the following results:—

Specific Gravity (15°/15° C.)	..	..	..	..	0.9249
Iodine value (Wijs)	..	..	..	..	152.2
Saponification value	..	..	..	..	185.1
Unsaponifiable matters	..	..	..	..	1.14 per cent.
Refractive Index at 15° C.	..	..	..	..	1.4803
at 20° C.	..	..	..	..	1.4778
Specific dispersion (nH β —nH α)	..	..	..	..	0.0101
Brominated glycerides insoluble in ether	..	..	..	..	42.5 per cent.

These numbers are, as will be seen, very similar to those given by cod-liver oil.

An interesting point is the high ether-insoluble bromide value. In shark liver oils containing large percentages of spinacene, the bromide value is very high indeed, but in the liver oils of fish belonging to the shark family, and which contain only relatively small proportions of unsaponifiable matters, the insoluble bromide value does not usually exceed 25 per cent.

I am informed that the oil is used for the dressing of leather, and that it is sometimes employed for medicinal purposes by the local fishermen.

I do not know what medicinal or dietetic qualities this oil possesses, but in 1917 Dr. Drummond was good enough to make, at my request, an examination of the dog-fish liver oil, on which I was then working, and found that, as a source of the fat-soluble, growth-promoting accessory substance, it was equal to medicinal cod-liver oil. Probably tope liver oil would have a similar dietetic value.

Note on the Examination of Foods for the Presence of Sulphites.

By A. CHASTON CHAPMAN, PRES. I.C., F.R.S.

In the examination of food-products for the presence of sulphurous acid or sulphites by the method usually adopted, I have frequently obtained indications of what appeared to be somewhat heavy traces in the case of products to which I had reason to feel certain that no sulphite had been added.

The method in question consists, as is well known, in acidifying with phosphoric acid a weighed quantity of the material under examination, and distilling in a current of carbon dioxide into bromine water, the amount of sulphuric acid found in the distillate being taken as representing the sulphurous acid or sulphite present.

It is, of course, obvious that traces of sulphuretted hydrogen—such as may occasionally be formed as the result of the decomposition of meat or meat preparations—interfere with the indications of the method, and some chemists are in the habit of passing the vapour from the distilling flask, before it enters the condenser, through solutions of cadmium or copper salts.

Mentzel (*Zeitsch. Untersuch. Nahr. Genussm.*, 1906, **11**, 320) has investigated the process in its application to meat-products, and has arrived at the conclusion that when the amount of sulphur dioxide exceeds 0·004 per cent., in the case of ordinary meat, or 0·005 per cent. in the case of meat-preparations flavoured with onions, the analyst is justified in inferring the presence of sulphite.

In some of the food-products which I have referred to above as having been submitted to me for examination, no meat or meat-preparation could have been used, and it therefore appeared that the matter was one which needed a little further investigation.

It is, of course, well known that a good many foods and condiments contain sulphur in organic combination, and on submitting these to distillation under the conditions referred to above, volatile organic compounds containing sulphur may distil over and be more or less completely oxidised by the bromine.

Traces of sulphuric acid—say from 0·002 per cent. to 0·004 per cent.—may in fact be obtained from a great variety of foods, and heavy traces may be met with in the case of food products flavoured with onions, or—as in the case of certain pickles—containing mustard. Thus, on distilling ordinary mustard-flour under the conditions mentioned above and using bromine as the oxidising agent, I have obtained an amount of barium sulphate corresponding with as much as 0·18

per cent. of sulphur dioxide, and an even larger amount could, no doubt, have been obtained by varying the conditions of the experiment.

When the distillate from products containing, or yielding volatile organic sulphur compounds was received in hydrogen peroxide instead of in bromine water, practically no oxidation of the organic substances took place. Thus, in the distillation of mustard-flour, the barium sulphate corresponded in one experiment with 0.16 per cent. of sulphur dioxide when bromine was used, but only the merest trace of barium sulphate was obtained when the bromine was replaced by hydrogen peroxide, the other conditions of the experiment remaining the same.

A similar result was obtained in the case of onions, but the difference was less marked, owing to the smaller amount of volatile organic sulphur compounds distilling over.

So far as my experiments have gone, therefore, it would appear that hydrogen peroxide affords a convenient method for distinguishing between volatile organic sulphur compounds and sulphur dioxide. If, in the examination of any food product a very small amount of sulphuric acid is obtained when distilling into bromine water, it would be well to repeat the distillation, using hydrogen peroxide—say 25 c.c. of the peroxide of 10 volumes' strength—in place of the bromine. If, in these circumstances, no sulphuric acid, or only the merest trace, is present, it will be safe to assume that the sulphuric acid in the bromine experiment was due, not to sulphite, but to some organic sulphur compound. Hydrogen peroxide cannot safely be recommended to replace bromine entirely, as, when larger quantities of sulphur dioxide are in question, there is not the same degree of certainty that the oxidation to sulphuric acid will be complete.

THE ESTIMATION OF ALDEHYDES AND KETONES BY MEANS OF HYDROXYLAMINE.

ERRATUM.

Page 148, line 32. For "0.5 N potassium hydroxide solution" read "0.5 N hydroxylamine hydrochloride solution."

Notes.

The Editor desires to point out that the pages of the Journal are open for the inclusion of short notes dealing with analytical practice and kindred matters. Such notes are submitted to the Publication Committee in the usual manner.

DAKAMBALLI STARCH.

A sample of this starch was received from Dr. Vevers of British Guiana through the Wellcome Bureau of Scientific Research. It is prepared by the Indians of British Guiana from the fruit of the tree *Aldina insignis*, and is used

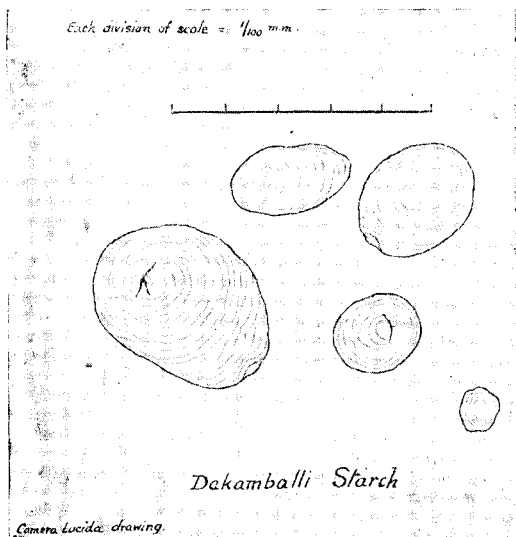
by them as a remedy for dysentery, being administered in the form of a mucilage made by boiling the starch in milk or water.

The starch was of pale brown colour and, on examination under the microscope, was seen to consist entirely of starch granules varying in mean diameter from 11 to 42 micromillimetres. The small granules

were mostly circular, a few being truncated and the larger ones roughly ovate. The hilum was at the broader end, and the concentric rings were well marked. The material was tasteless.

On analysis the following results were obtained:—

	Per Cent.
Moisture	19.57
Fat	0.04
Proteins N \times 6.25	1.25
Crude fibre.. .. .	0.10
Matter soluble in alcohol ..	trace
Matter soluble in cold water ..	..
Ash	0.21
Starch, by difference	78.83
	<hr/>
	100.00
	<hr/>



The amount of starch directly estimated by the method of Davis and Daish (*Journal of Agricultural*

Science, 1914, 6, 152) was 76.1 per cent.

No alkaloids or cyanogenetic glucosides could be detected in the sample.

It is well known that mucilaginous substances are sometimes effective remedies in colitis and certain forms of diarrhoea and dysentery, and it is not surprising, therefore, that a mucilage made from clean starch such as this should prove equally useful.

J. A. GOODSON.

WELLCOME CHEMICAL RESEARCH LABORATORIES,
6, KING STREET, SNOW HILL, E.C. 1.

THE USE OF ULTRA VIOLET LIGHT IN ANALYSIS.

It is now fairly well known that the fluorescent effects produced by the action of ultra violet light upon substances have been applied, to a small extent, to work of an analytical nature. In connection with precious stones fluorescence will, in many cases, indicate their place of origin, e.g. will discriminate between Japanese pearls and pearls from other localities. Vegetable and mineral oils can be distinguished, and there is, I believe, some similar application in the cellulose industry. A very large number of substances are fluorescent to some extent, and though some shade of blue seems to be the commonest tint, yet almost every colour can be obtained.

It seems probable that the use of ultra violet light could be extended very considerably, and the results of a few observations made recently are given below with a view to suggesting some of the directions in which research may be profitable.

Cotton is readily distinguished from wool or silk. Various kinds of paper and card differ considerably from one another; this may be due to differences in the sizing, for casein fluoresces more strongly than gelatin or any other proteid material I have tried, and more strongly also than cellulose itself. Even on fabrics, many dyes which are fluorescent can readily be distinguished from other dyes of the same colour which are not. Uranium salts fluoresce brightly in the solid state, and 0.1 per cent. of the nitrate can be detected in solution; a borax bead containing a trace of the oxide is colourless, but distinctly fluorescent. Acetone can be detected in alcohol; 1 per cent. giving a distinct effect. Among the substances which fluoresce most brilliantly are quinine, æsculin, and the dye uranine, and very minute quantities of these substances can be detected by means of ultra violet light. With quinine, one part in a hundred million of water; with uranine, one part in a thousand million; and with æsculin, one part in ten thousand million, show distinct fluorescence under favourable conditions: we have here a sensitiveness comparable with that of the spectroscope.

Suitable means of obtaining ultra violet rays for these experiments are afforded by a powerful source of light in a light-tight box with a small window containing a filter of Chance's ultra violet glass. This latter transmits light between 4000 and 3000 A.U., with a maximum at 3600; the visible spectrum is completely cut out, with the exception of a trace of violet and the extreme red. An ordinary arc lamp will serve as the source of light; but an arc between nichrome or tungsten poles is better. In some respects a mercury vapour lamp is better still, as it gives practically no red rays, which latter are apt to interfere in certain cases. The infra red can be removed by a cell containing copper sulphate or acetate solution, but this diminishes also the intensity of the ultra violet. In some cases it is advantageous to concentrate the rays with a quartz lens.

A. F. KITCHING.

MONKTON COMBE SCHOOL,
NEAR BATH.

Notes from the Reports of Public Analysts.

The Editor would be glad to receive the Annual or other Reports of Public Analysts containing matter of interest to the Society. Notes made from such Reports would be submitted to the Publication Committee.

International Union of Pure and Applied Chemistry.

THIRD INTERNATIONAL CONFERENCE.

The Third International Conference of the Union will be held at Lyons from June 27 to July 2, 1922, in accordance with the arrangements made by the National Federation of the Chemical Associations of France, as directed by the Second International Conference at Brussels (*cf.* ANALYST, 1922, 20). A Local Committee, with M. A. Bernard as Organising Secretary, has been appointed, and a provisional programme of official receptions, meetings, visits to works, and excursions has been drawn up.

The permanent office of the International Union is at 49, Rue des Maturins (8), Paris.

BUREAU OF PHYSICO-CHEMICAL STANDARDS.

A report has been presented by M. J. Timmermans, Secretary of the Bureau, to the Chemical Society of Belgium,* in which an outline is given of the work that has been done since the last Conference of the International Union of Pure and Applied Chemistry (*cf.* ANALYST, 1922, 20).

The Bureau of Standards at Washington has placed at the disposal of the Bureau at Brussels a limited number of samples, the purity and physical constants of which have been determined. It is requested that application for these should only be made when they are required for scientific research or for work where exceptional accuracy is necessary. The weights and prices (in dollars) of these samples are as follows:—Cane sugar (for calorimetry and saccharimetry), 60 grms., 2\$; naphthalene (for calorimetry), 50 grms., 2\$; benzoic acid (for calorimetry), 50 grms., 2\$; sodium oxalate (for oxidimetry), 75 grms., 1.25\$; dextrose (reducing power), 70 grms., 2\$; benzoic acid (for acidimetry), 20 grms., 0.80\$; tin (melting point), 350 grms., 2\$; zinc (m. pt.), 350 grms., 2\$; aluminium (m. pt.), 200 grms., 2\$; copper (m. pt.), 450 grms., 2\$; and lead, 1640 grms., 2\$.

Standards for Low Temperatures.—The freezing points of ten substances have been determined at the Cryogenic Laboratory, University of Leyden, by means of a helium thermometer, and it is suggested that these substances should be adopted as international standards, and be distributed by the Bureau. The proposed substances and their solidification points are as follows:—Carbon tetrachloride, -22.9°C. ; chlorobenzene, -45.2°C. ; chloroform, -63.5°C. ; ethyl acetate, -83.6°C. ; toluene, -95.1°C. ; carbon disulphide, -111.6°C. ; ether (stable form), -116.8°C. ; (unstable form), -123.3°C. ; methylcyclohexane, -126.3°C. ; and isopentane, -159.6°C.

Primary Materials for the Preparation of Standards.—The collaboration of several American works has been enlisted, and several kilos. of the richer fractions of certain organic compounds have been procured, these having been accumulated in the course of the fractional distillation of large quantities of industrial preparation. Similar assistance from European manufacturers would be welcomed.

INTERNATIONAL COMMITTEE ON ATOMIC WEIGHTS:

TWENTY-EIGHTH ANNUAL REPORT.†

DETERMINATIONS PUBLISHED IN 1921.

The International Committee on Atomic Weights recommends the following changes in its table:—Aluminium, 27.0; bismuth, 209.0; thulium, 169.9; and silicon, 28.1.

Boron.—The analysis of boron trichloride and tribromide by Baxter and Scott has given the value 10.83 as the atomic weight of boron. This result agrees better with Aston's isotopic ratio than does Smith and van Haagen's recent result (10.90).

Oxygen.—The mean density of oxygen, prepared in different ways, was found by Moles and Gonzalez to be 1.42889. This result is 0.01 per cent. lower than the value usually assumed, and, if used, will raise in this proportion the molecular weights of gases referred to oxygen.

Fluorine.—Calculating their results upon the density of methyl fluoride, Moles and Batuecas have found the atomic weight of fluorine to be 19.002. If the density of oxygen is taken as 1.4290, fluorine becomes 18.999.

* *Bull. Soc. Chim. Belg.*, 1922, **31**, 54-62.

† *J. Amer. Chem. Soc.*, 1922, **44**, 427. References to the original publications are given.

Chlorine.—The chlorine from sodalite and apatite was found by Mlle. J. Curie to agree with ordinary chlorine within 0·02 unit of atomic weight.

Nickel.—The atomic weight of meteoric nickel agrees with that of terrestrial nickel (Baxter and Parsons).

Cadmium.—The results obtained by Baxter and Wilson by electrolytic estimation of the cadmium in anhydrous cadmium sulphate have given the value 112·409 as the most probable atomic weight.

Antimony.—Willard and McAlpine obtained, by the analysis of pure synthesised antimony tribromide, results giving an average value of 121·77 for the atomic weight of antimony—a result 1 per cent. higher than that recommended by the Committee.

Lanthanum.—Analyses of pure lanthanum chloride gave an average result of 138·913 as the atomic weight of lanthanum, this being nearly 0·1 unit lower than that in common use.

Isotopes.—A list is given of the isotopes of the existence of which there is experimental evidence, radio-active disintegration products being omitted.

The Pasteur Centenary.

IN order to commemorate the centenary of the birth of Pasteur, the University and the town of Strasbourg, with the concurrence of the Pasteur Institute, and the approval of the family of Pasteur, have proposed to erect a statue facing the Strasbourg University, where, as a professor, Pasteur commenced his career. The inauguration ceremonies will take place on May 1, 1923, under the patronage of M. A. Millerand (President of the Republic), M. le Président A. Loubet, M. R. Poincaré, M. Leredu, and M. Alapetite, and will include the unveiling of the statue, and the opening of an Exhibition of Hygiene and Bacteriology. This Exhibition will be designed to illustrate the advances made in various branches of science as the result of Pasteur's discoveries, and, at the same time, a Congress of Hygiene and Bacteriology will be held for the discussion of questions relating to the prevention of disease.

BRITISH COMMITTEE.

With the object of showing the sympathy of this country with the projects of the French Committee, a British Committee composed of the following members has been formed:—Sir Charles Sherrington, G.B.E., President of the Royal Society (Chairman); Mr. A. Chaston Chapman, F.R.S., President of the Institute of Chemistry of Great Britain and Ireland (Treasurer); Mr. H. E. Field, President of the Institute of Brewing; Professor P. F. Frankland, C.B.E., F.R.S., Emeritus Professor of Chemistry, University of Birmingham; Sir John M'Fadyean, M.R.C.V.S., LL.D., Principal of the Royal Veterinary College; Professor C. J. Martin, C.M.G., F.R.S., Director of the Lister Institute; Sir W. J. Pope, K.B.E., F.R.S., Professor of Chemistry, University of Cambridge; Sir James Walker, F.R.S., President of the Chemical Society; and Sir Almroth Wright, K.B.E., F.R.S., Principal of the Institute of Pathology and Research, St. Mary's Hospital.

It is hoped that those who desire to contribute to the memorial fund will send their contributions to the General Secretary and Treasurer, Monsieur Th. Héring, 6, Rue des Veaux, Strasbourg; or to Mr. A. Chaston Chapman, F.R.S., the Institute of Chemistry, 30, Russell Square, London, W.C.1. The Commissioner-General, Professor Borrel, is very anxious to be furnished with the names of manufacturers and business firms in this country to whom the exhibition might be of especial interest. All who can assist are requested to communicate with Professor Borrel, 3, Rue Koeberlé, Strasbourg. The subscription list will be closed at the end of June.

ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

Food and Drugs Analysis.

An Adulteration of Ground Coffee. L. Gobert. (*Ann. Falsif.*, 1922, 15, 20-25.)—A sample of ground coffee examined recently by the author contained a quantity of the outer seed coat which is removed from coffee beans in the course of the preparation of the latter for the market. This seed coat is readily distinguished (by microscopical examination) from the silvery seed coat of the beans and from the substance of the coffee beans themselves.

W. P. S.

Analyses of some Australian Fruits. T. Steel. (*Proc. Linn. Soc., N.S.W.*, 1921, 46, 487-488.)—Samples of the following fruits were analysed:—(1) *Eupomatia laurina*, a tall laurel-like shrub bearing sub-acid fruits; (2) and (3) *Ficus macrophylla*, a tree largely cultivated for shade, which bears purple globular fruits about one inch in diameter; (4) and (5) *Ficus Cunninghamii*; (6) *Ficus rubiginosa* (unripe fruit); (7) Edible fig, purchased in Sydney (for comparison); (8) and (9) *Podocarpus elata*, which has fleshy fruit stalks, with a hard nut-like fruit on the top. The percentage results were as follows:—

	1	2	3	4	5	6	7	8	9
Dextrose	2.05	5.75	6.77	4.07	3.30	{ 0.30	5.65	2.56	2.00
Lævulose	1.70	4.84	5.69	2.97	2.98		4.07	2.59	1.94
Seeds, fibre, pectose, etc.	17.98	20.24	19.88	8.89	10.50	24.37	3.34	39.20	40.65
Ash	1.42	1.90	1.64	1.11	0.97	2.30	0.44	0.84	0.41
Water	76.85	67.27	66.02	82.96	82.25	73.03	86.50	54.81	55.00
	100.00	100.00	100.00	100.0	100.00	100.00	100.00	100.00	100.0
Nitrogen	—	—	—	0.16	—	0.29	0.25	—	—

Roots of the Dragon Tree. T. Steel. (*Proc. Linn. Soc., N.S.W.*, 1921, 46, 489.)—The long conical white roots of the dragon tree, *Cordyline terminalis*, are roasted and eaten by the natives of Fiji. After roasting, the roots become black, owing to the conversion of the inulin into lævulose, and partial caramelisation of the latter. The raw root contains numerous raphides, but no starch. A sample gave the following results:—Water, 52.98; lævulose, 3.32; inulin, etc., 30.19; soluble ash, 0.27; insoluble ash, 0.59; and fibre, 11.59 per cent. Two roasted samples had the following composition:—Water, 38.0 and 38.64; lævulose, 38.53 and 40.49; caramel, etc., 10.85 and 6.93; soluble ash, 0.58 and 0.58; insoluble ash, 0.42 and 0.68; and fibre, 12.58 and 14.06 per cent. In the Friendly Islands rum is obtained from the cooked root.

Estimation of Lævulose in Oat Straw. S. H. Collins. (*J. Soc. Chem. Ind.*, 1922, 41, 56-57 T.)—Owing to the presence of much colouring matter in aqueous extracts of oat straw the use of strong solutions has been found impracticable for polarimetric readings, and measurements have been made of

solutions containing less than one per cent. of lævulose in 200 mm. water-jacketed tubes at 10° and 67° C. The solutions used should be exactly neutral, or very slightly acid in reaction, as a trace of alkali reacts with lævulose and causes rapid increase in colour on warming. Serious deviation of the zero of the polarimeter was found to occur owing to change of temperature, and this was traced to the cover glasses, which, however, on annealing for three hours at 300° C. proved satisfactory. The results obtained show that when the total sugars present are small in amount, lævulose is probably absent, but, when present, it may be estimated to within 0.05 per cent. Calculated to an average moisture content of 12 per cent. on the straw, the sugars present in British samples were found to be as follows:—Lævulose, 0.0–5.40; sucrose, 0.0–3.25; dextrose, 0.0–3.70; and total sugars, 0.33–8.63 per cent. T. J. W.

Method for Preparing Raffinose. E. P. Clark. (*J. Amer. Chem. Soc.*, 1922, 44, 210–213.)—To prepare raffinose from cottonseed meal, the latter is extracted by percolation with water, the solution is treated with a slight excess of basic lead acetate, filtered, and excess of lead is removed by the addition of oxalic acid. The optical rotation of the liquid is then determined, and the liquid is rendered alkaline to litmus with sodium hydroxide, treated with a small quantity of decolorising carbon and filtered. The raffinose is precipitated as insoluble calcium raffinosate by cooling the liquid to 10 C.°, and adding finely powdered calcium oxide; if the optical rotation is calculated to raffinose hydrate with a specific rotation of about 105°, 1 grm. of calcium oxide is required for each grm. of raffinose present. The calcium raffinosate is collected, washed, then suspended in water at 10° C. and decomposed with carbon dioxide; the mixture is filtered, the filtrate evaporated under reduced pressure to 75 per cent. of total solids, then heated at 60° C., and ethyl alcohol is added until precipitation commences. The mixture is re-heated, filtered, seeded, and cooled at 0° C. About two days at this temperature are necessary for the complete crystallisation of the raffinose. Recrystallisation from water or dilute alcohol yields the pure sugar. W. P. S.

Estimation of Sulphurous Acid in Wines. Martini and A. Nourrisson. (*Ann. Falsif.*, 1922, 15, 25–26.)—Two c.c. of phosphoric acid are placed in a distillation flask fitted with a tapped funnel and connected with a condenser; the lower end of the condenser enters an absorption vessel containing 10 c.c. of 0.1 N potassium dichromate solution, and this vessel is connected, in turn, with a vacuum pump. The air is exhausted from the whole apparatus, and 50 c.c. of the wine are then admitted to the flask by means of the tapped funnel, and distilled under reduced pressure for five minutes. The absorption vessel is then disconnected, its contents transferred to a flask, boiled to expel alcohol which has distilled, 2 c.c. of hydrochloric acid are added to the hot solution, the latter cooled and treated with 3 c.c. of 10 per cent. potassium iodide solution, and the liberated iodine is titrated with 0.1 N thiosulphate solution. This titration gives the amount of residual dichromate, and the quantity of the latter which has been reduced by the sulphurous acid is a measure of the amount of this acid in the wine.

W. P. S.

Progressive Disappearance of Free Sulphurous Acid in Preserved Apple Juice. Warcollier and Le Moal. (*Comptes Rend.*, 1922, 174, 634-637.)—

Apple juice, after spontaneous clarification by coagulation of the pectic matters, followed by treatment with sulphurous acid, is sometimes added as sweetening to dry cider, in which it produces no turbidity. When such juice is kept for a long time, more or less of the free sulphurous acid becomes transformed into the combined state, with consequent loss of antiseptic properties. Normal apple juice contains per litre, 20 grms. of dextrose, 80 grms. of lævulose, 20 grms. of sucrose, and 3 to 4 grms. of tannoids, which yield comparatively little combined sulphurous acid; the pectic matters and malic acid of the juice do not unite with sulphurous acid. When added to the juice of rotten apples, however, sulphurous acid rapidly enters into combination. The results of the experiments made indicate that such combination is effected by the agency of compounds, probably of aldehydic or ketonic character, produced by the action of the oxydases of the moulds on the sugars and pectic substances, and, possibly, on the glycerol.

T. H. P.

Identification of Alkaloids under the Microscope from the form of their Picrate Crystals. B. E. Nelson and H. A. Leonard. (*J. Amer. Chem. Soc.*, 1922, 44, 379-373.)—

Alkaloids may frequently be identified by the crystalline form of their picrates, but, in preparing such crystals for microscopic examination, it is essential that the conditions shall be the same in all cases. The most convenient procedure is as follows:—A slight excess of saturated picric acid solution is added to a solution of the alkaloid acidified with hydrochloric acid, in a test tube; the precipitate is centrifuged, washed slightly, dissolved in a minimum quantity of warm 95 per cent. alcohol in a water bath, and allowed to cool slowly in the bath, with further cooling, if necessary. After centrifuging, the mother liquor is poured off, and the crystals transferred to a ringed-cell microscope slide. A second crop of crystals is obtained by warming and cooling the alcoholic solution, after dilution to 50 per cent. Crystals so obtained may be compared with those from known alkaloids. Drawings of the crystalline picrates of the following are given:—Atropine, eucaine, cinchonidine, hydrastine, sparteine, brucine, nicotine, scopolamine, hyoscyamine, pilocarpine, cinchonine, strychnine, morphine, heroin, homatropine, physostigmine, codeine, cocaine, dionin, quinidine, berberine, quinine, aconitine, caffeine, and theobromine.

H. E. C.

Estimation of the Alkaloids in Aconite Extract. A. Astruc, E. Canals and R. Bordier. (*J. Pharm. Chim.*, 1922, 25, 161-164.)—The method given in the French Codex (1908) for the estimation of alkaloids in extract of aconite consists in liberating the alkaloids by means of ammonia, dissolving them in ether, transferring them from the ether to dilute nitric acid, precipitating them by means of silicotungstic acid, calcining the salt formed, and weighing the residue. In some cases this procedure is found to give low results, the error being rectified by more thorough exhaustion of the ammoniacal extract by several quantities of ether. Details of the modified method are given.

T. H. P.

Acid Methylarsinate of Strychnine. J. Bouillot. (*J. Pharm. Chim.*, 1922, 25, 92–97.)—Further samples of commercial strychnine methylarsinate have been analysed, one being found to correspond with the theoretical formula and the other to contain excess of arsenic, owing to the presence of a little free methylarsinic acid. The latter behaves as a monobasic acid towards rosolic acid, and may be estimated as follows:—One grm. of the powdered and dried material is dissolved in 25 to 30 c.c. of water in a 100 c.c. flask, 50 c.c. of 0.1 *N* sodium carbonate solution being added, and the volume made up with water. After being mixed, the liquid is allowed to stand and then filtered, to remove the precipitated strychnine. Fifty c.c. of the filtrate are titrated, in presence of 4 or 5 drops of alcoholic rosolic acid solution, with 0.1 *N* sulphuric acid until the red liquid just turns yellow. The number of grams of methylarsinic acid in the sample taken is given by $0.014(25-n)$, *n* being the number of c.c. of 0.1 *N* sulphuric acid used.

Strychnine (1 mol.) combines with methylarsinic acid (1 mol.) to form a well-defined salt, crystallising with $2\text{H}_2\text{O}$, this being the commercial strychnine methylarsinate employed therapeutically. This product contains, not 77.49 per cent. of strychnine, as is usually supposed, but only 65.49 per cent. T. H. P.

Chemical Composition of Ergot of Diss and Ergot of Oats. G. Tanret. (*Comptes Rend.*, 1922, 174, 827–830.)—The ergots of diss (*Ampelodesmos tenax*) and of oats contain the same compounds as that of rye, but in different proportions. Ergot of diss contains, per kilo., 0.1 grm. of crude ergotinin, consisting of approximately equal proportions of the crystallised and amorphous forms, the latter being known also as hydroergotinin or ergotoxin; 1.2 grm. of ergosterol; a red pigment, sclererythrin, analogous to that of ergotised rye and precipitable by 40 per cent. sulphuric acid solution; 8.8 grms. of mannitol, 0.7 grm. of trehalose, 2.8 grms. of reducing sugar (as dextrose), and 0.4 grm. of ergothionenin. Ergot of oats contains, per kilo., 1.8 grm. of crude ergotinin, which yields 0.8 grm. of crystallised ergotinin, $[\alpha]_{\text{D}} + 369^\circ$; 0.75 grm. of a mixture of ergosterol and fongisterol; sclererythrin; 14.2 grms. of reducing sugar (as dextrose); 32 grms. of a mixture of trehalose (70 per cent.) and mannitol (30 per cent.); and 0.5 grm. of ergothionein. Ergot of oats may be used as a complete substitute for ergot of rye, which, owing to the stoppage of the Russian sources of supply, is now very dear and difficult to obtain.

T. H. P.

Analysis of Crude Chinese Camphor. K. W. Lane. (*J. Soc. Chem. Ind.*, 1922, 41, 32 T.)—The crude material is usually packed in tinned iron containers and may hold up to 10 per cent. of camphor oil and water. It is best sampled by taking a complete section with a pointed tube, which is plunged through a hole in the bottom immediately after the vessel has been turned on its side. The material is just stiff enough to stand up for sufficient time for this. The following tests may be made:—*Dirt and non-volatile substances:* The residue from the volatilisation of 2 grms. at a considerable distance above a very small flame is

weighed. *Water* is estimated by Lane and Lubatti's method (ANALYST, 1920, 45, 220), or it may be calculated from the iodine value. *Chlorides* (these indicate artificial camphor): The sample is ignited in a hard glass tube with lime, extracted with water, filtered and tested as usual. *Acidity* (for stearic acid): The alcoholic solution is tested with litmus. The following are typical results:—Dirt, 0.01 to 0.40 per cent.; water up to 9 per cent.; oil up to 10 per cent.; camphor (by difference) 82.9 to 99.9 per cent. Rotation, 6.70° to 8.23° ; sp. gr., 0.8134 to 0.8334.

H. E. C.

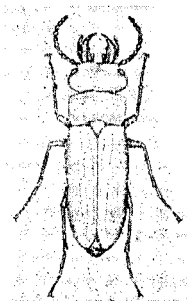
New Sources of Cantharidin. C. van Zijp. (*Pharm. Weekblad.*, 1922, 59,

285–289.)—Cantharidin, which, according to the Pharmacopoeias, may be obtained from various species of *Cantharis* or *Mylabris*, has now been isolated from two other species of beetles indigenous to Java. *Horia debyi* Fairm. (=



Horia debyi Fairm.

Cissites testaceus auct.) ranges in length from 16 to 30 mm., and in breadth from 5 to 10 mm., and is of a brick-red colour. The other species, *Cissites maxillosa*, is much greater in size, but of the same colour. Cantharidin may be separated from the male or female, or from the eggs, by moistening the finely divided material with strong hydrochloric acid, followed by sublimation, and evaporation of any condensed acid by exposing the sublimate over unslaked lime. In addition to their vesicating property, m.pt., and polarising action upon light, the crystals may be identified by their behaviour with baryta water.



Cissites maxillosa.

Aromatic Aldehydes occurring in certain Eucalyptus Oils. A. R.

Penfold. (*J. Chem. Soc.*, 1922, 121, 266–269.)—The oils from *Eucalyptus hemiphloia* and *E. polybractea* are shown to contain three aldehydes, cuminaldehyde, phellandral, and cryptal. The “aromadendral” of previous authors is a mixture of the two first-named compounds. For the separation, the fraction of the oils boiling above 185°C . is shaken with a 35 per cent. solution of sodium hydrogen sulphite, and the crystals filtered off after 24 hours. Treatment of these with sodium carbonate, followed by distillation with steam, yields aromadendral, which is again treated with bisulphite, and the crystalline compound heated to boiling for an hour with the 35 per cent. bisulphite solution. After standing, the cuminaldehyde bisulphite, which separates, is decomposed with sodium carbonate and distilled with steam; phellandral is present in the filtrate as a sulphonic acid, and is treated with sodium hydroxide. The original filtrate is again treated with bisulphite and filtered; the oil in the filtrate is removed with ether, and the aqueous solution decomposed with sodium hydroxide, which liberates the cryptal. The

use of the purest sodium bisulphite is essential. The three aldehydes have the following constants:—

	Cuminaldehyde	Phellandral	Cryptal
Boiling point °C.	110°C. at 10 mm.	90°C. at 5 mm.	98–100°C.
Density	0·982 at 15°C.	0·9412 at 20° C.	0·9442 at 20° C.
Optical rotation	inactive	–130·85°	–76·2°
Refractive index, n_D^{20}	1·5287	1·4912	1·4830
M.pt. of semi-carbazone	210–211° C.	204–205° C.	176–177° C.
„ Hydrazone	126–127° C.	122–123° C.	—
„ Oxime	—	87·88° C.	—

H. E. C.

Sensitiveness of Tests for Hydrocyanic Acid. T. Sundberg. (*Zeitsch. anal. Chem.*, 1922, **61**, 110–112.)—The results obtained by Kolthoff with the Prussian blue reaction (*Zeitsch. anal. Chem.*, 1918, **57**, 1) are confirmed. The guaiacum reaction gave good results when carried out as follows:—The material was mixed in a small conical flask with water and tartaric acid, and a strip of filter paper moistened with the freshly-prepared reagent inserted between the flask and the stopper. A solution of 0·005 mgrm. of hydrocyanic acid in 10 c.c. of water gave almost immediately a blue coloration, and 0·001 mgrm. a faint blue colour after 2 to 3 minutes. The reagent was prepared by mixing 10 parts of a solution of 0·1 gm. of guaiacum resin in 50 c.c. of 95 per cent. alcohol, with three parts of 0·1 per cent. copper sulphate solution. Neither guaiacum nor copper benzidine acetate (*Zeitsch. angew. Chem.*, 1921, **34**, 3) is a specific reagent for hydrocyanic acid, but the former gave stronger colours than the latter, and in less time.

W. R. S.

Bacteriological, Physiological, etc.

Biochemical Evaluation of the Vitality of Seeds. A. Němec and F. Duchoň. (*Comptes Rend.*, 1922, **174**, 632–634.)—The activity of the catalase in seeds may be determined as follows (*cf.* ANALYST, 1922, 29): Two grms. of the finely ground material are mixed with 20 c.c. of distilled water in a flask closed by a rubber stopper traversed by a tapped funnel and by a gas-delivery tube leading beneath a graduated tube filled with water; 15 c.c. of 3 per cent. hydrogen peroxide solution, previously neutralised, are introduced into the flask by means of the funnel, and the volumes of gas liberated at the end of 5 and 15 minutes measured. These volumes are corrected in accordance with the result of a similar measurement made on 2 grms. of the meal heated with 20 c.c. of water for 20 minutes on a boiling water-bath and then cooled. The results of tests made in this way on oats and peas of different years (1891–1920) and of germinative capacity varying from 0 to 100 and from 0 to 98 per cent. in the two cases show that the catalytic activity is closely connected, and varies continuously, with the vitality of the seeds. In the case of oily seeds rich in catalase, 1 gm. should be taken for the test.

T. H. P.

Determination of Germinative Capacity otherwise than by Germination. P. Lesage. (*Comptes Rend.*, 1922, 174, 766-767.)—In view of the work of Němec and Duchoň (preceding abstract), the author recalls his experiments (1911 and 1917), in which he showed that seeds of *Lepidium sativum* incapable of germinating give a yolk-yellow coloration with potassium hydroxide solutions of concentrations between $2^{-5} N$ and $0.752^{-9} N$, whereas those able to germinate yield no coloration. Similar results were obtained with seeds of 18 different kinds.

T. H. P.

Estimation of the Antiscorbutic Vitamin (Vitamin C). H. C. Sherman, V. K. LaMer and H. L. Campbell. (*J. Amer. Chem. Soc.*, 1922, 44, 165-172.)—Relative amounts of antiscorbutic vitamin in foods may be measured by estimating the quantity of the food under examination necessary to prevent scurvy in guinea-pigs, when these are fed on a diet free from the vitamin other than the quantity added in the test. Alternatively, the measurement may be made by determining the severity of the scurvy produced when less than the minimum protective dose is supplied to the animal, the points noted being the weight, duration of life, symptoms, and, especially, the autopsy findings of guinea-pigs of standard initial age and weight. A vitamin-free diet, which supports excellent growth up to the time of the onset of scurvy, consists of ground oats, 59, skimmed milk powder (heated previously at $110^{\circ} C.$ in open trays), 30, fresh butter fat, 10, and sodium chloride, 1 per cent.

W. P. S.

Influence of the Diet of the Cow upon the Quantity of Vitamins A and B in the Milk. C. Kennedy and R. A. Dutcher. (*J. Biol. Chem.*, 1922, 50, 339-359.)—By feeding rats upon a basal vitamin-free diet, in conjunction with varying quantities of milk derived from cows provided with rations of various kinds, the authors have shown that the vitamin content of milk is dependent upon the amount of vitamins contained in the food given. Indications were obtained that cows store vitamins A and B in their tissues, and gradually excrete them in the milk for several weeks after a change from diet containing a high vitamin content to one containing a small proportion of vitamin. The reverse change of diet produces no corresponding increase in the vitamin content of the milk for a similar period. Stall-fed cows often give milk deficient in vitamin, but this may be remedied by a proper combination of grains and leafy food. Since the vitamin content of growing grass is variable, the access of cows to pasture will not necessarily lead to an increase in the vitamin content of the milk. The daily administration of 10 c.c. of milk derived from cows provided, during winter or summer, with an adequate supply of vitamin-containing food, supplies sufficient vitamins A and B to produce satisfactory growth in rats. The appetite of the rat remains approximately constant, whether sufficient vitamin is supplied just to maintain weight, or an increased amount, leading to growth, is given. The paper includes a large number of curves illustrating the results obtained in the experiments.

T. J. W.

New Quantitative Method for the Estimation of Iron in the Blood.

A. L. Brown. (*J. Amer. Chem. Soc.*, 1922, **44**, 423-425.)—Proteins are precipitated, and the iron dissolved by hydrochloric acid and potassium chlorate, and then estimated colorimetrically in the bleached liquor. To 4 c.c. of water are added 0.5 c.c. of blood, then 1 c.c. of hydrochloric acid, and about 10 mgrms. of potassium chlorate; the mixture is warmed in boiling water until colourless, or light yellow, cooled, filtered and washed, and the filtrate made up to 15 c.c. Into one tube of a colorimeter is put 1.5 c.c. of the filtrate, and into the other 0.25 c.c. of standard iron solution; slight excess of 0.1 *N* potassium permanganate solution is added to each, then 5 c.c. of 5 *N* ammonium thiocyanate solution. The standard is diluted to 25 c.c., and the sample diluted to match it. If any brown precipitate forms, it may be dissolved by the addition of hydrochloric acid. The standard iron solution is prepared by dissolving 0.7 gm. of ferrous ammonium sulphate in dilute sulphuric acid, oxidising it with permanganate, and diluting to one litre (1 c.c. 0.0001 gm. Fe.).

H. E. C.

Microchemical Colorimetric Method for Estimating Tyrosine, Tyramine and other Phenols.

M. T. Hanke and K. K. Koessler. (*J. Biol. Chem.*, 1922, **50**, 235-270.)—An extensive investigation into the production of coloured substances by the combination of *p*-phenyldiazonium sulphonate (diazobenzenesulphonic acid) with phenols and other classes of organic compounds has shown that these reactions may be applied to the quantitative estimation of phenol, *o*-, *m*-, and *p*-cresols, *p*-oxyphenylacetic, *p*-oxyphenylpropionic and *p*-oxyphenyl-lactic acids, tyrosine and tyramine in alkaline solutions. In the method adopted the *p*-phenyldiazonium sulphonate reagent is run into a solution of sodium carbonate contained in a colorimeter cylinder, and, one minute later, the phenol or other solution is added, and the colour rapidly compared with that of a standard solution containing one or more indicators, such as phenol red, methyl orange or Congo red. The estimations of tyrosine and tyramine are modified by the further addition of solutions of sodium hydroxide and hydroxylamine hydrochloride, in order to produce a colour of greater stability. The accuracy of the tyrosine estimation is greatly reduced by the presence of ammonium salts, hydrogen peroxide, formaldehyde, acetaldehyde, acetone, acetoacetic acid, amyl alcohol and amino acids, but is unaffected by alkali salts of the common inorganic and organic acids or by dextrose. The estimations may be made on quantities of the phenols ranging from 0.001 to 0.005 mgrm. with an accuracy of from 0.5 to 3.0 per cent. The colours obtained are somewhat fugitive, and close attention must be given to the time of addition of the various reagents.

T. J. W.

Quantitative Estimation of Phenols in Blood.

K. F. Pelkan. (*J. Biol. Chem.*, 1922, **50**, 491-497.)—The following method is a modification of one described by Folin and Denis (*J. Biol. Chem.*, 1916, **26**, 507; **27**, 305) for the estimation of phenols in urine. Ten c.c. of blood are mixed with 50 c.c. of distilled water, and treated with 10 c.c. of 10 per cent. sodium tungstate solution and 10 c.c. of 3-27 per cent. sulphuric acid, and the flask vigorously shaken for a few seconds.

Ten c.c. of alumina cream are run in, and the flask is again shaken, after which the contents are transferred to a tube and centrifuged for 45 minutes. The supernatant liquid is filtered, and 45 c.c. are treated with 5 c.c. of a 5 per cent. solution of silver lactate in 5 per cent. lactic acid, the mixture being well shaken for one minute, centrifuged and filtered. The free phenols are estimated by adding 1 c.c. of "phenol reagent" to 15 c.c. of the filtrate, shaking and filtering the mixture. Ten c.c. of this filtrate are treated with 5 c.c. of 20 per cent. sodium carbonate solution, the mixture allowed to stand about 20 minutes, and the resulting colour compared with a standard. The total (free + combined) phenols are estimated by adding 5 drops of concentrated hydrochloric acid to 15 c.c. of the above filtrate, heating the mixture in a boiling water-bath for 10 minutes, and, after cooling, adding 1 c.c. of "phenol reagent," the subsequent procedure being the same as for the free phenols. The standard is prepared by adding 0.5 c.c. of concentrated hydrochloric acid and 10 c.c. of the silver lactate-lactic acid solution to 5 c.c. of a stock solution containing 5.81 mgrms. of resorcinol (*J. Biol. Chem.*, 1918, **36**, 95), filtering the liquid, and treating the filtrate as above. The phenol reagent is prepared by boiling 100 grms. of sodium tungstate, 20 grms. of phosphomolybdic acid, 50 c.c. of phosphoric acid (85 per cent.), 100 c.c. of concentrated hydrochloric acid, and 750 c.c. of water for two hours, under a reflux condenser, cooling the liquid, and diluting it to 1 litre.

T. J. W.

Colorimetric Estimation of Inorganic Phosphorus in Small Quantities of Serum. F. F. Tisdall. (*J. Biol. Chem.*, 1922, **50**, 329-337.)—One c.c. of serum is treated in a centrifuge tube with 5 c.c. of 6 per cent. trichloroacetic acid solution, the liquids thoroughly mixed, allowed to stand for four minutes and centrifuged, and 5 c.c. of the supernatant liquid transferred to a second centrifuge tube. One c.c. of water is added, and then 2 c.c. of strychnine molybdate reagent, drop by drop, with frequent shaking. After standing 10 minutes, the tube is centrifuged, the supernatant liquid poured off, and the precipitate washed twice with 3 c.c. portions of water and dissolved by the addition of 2 c.c. of 1 per cent. sodium hydroxide solution. The volume is made up to 10 c.c. by the addition of water, and the whole transferred to a 100 c.c. graduated flask, into which are afterwards put 20 c.c. of 20 per cent. potassium ferrocyanide solution and 10 c.c. of concentrated hydrochloric acid. After being mixed and left for 10 minutes, the solution is diluted to 100 c.c., and again mixed, and the colour compared with that of a standard in a colorimeter. The standard is prepared by adding 1 c.c. of a 0.02193 per cent. solution of potassium dihydrogen phosphate to 5 c.c. of water contained in a centrifuge tube, and treating the mixture as described above. The strychnine molybdate reagent is prepared by adding four volumes of 1.5 per cent. strychnine nitrate solution to a mixture of three volumes of 33.3 per cent. ammonium molybdate solution and 9 volumes of 45 per cent. nitric acid. This reagent is ready for use after standing for 24 hours, and will keep for at least one month. The results obtained are accurate within ± 5 per cent. of the amount of inorganic phosphorus present, and are unaffected by sodium, potassium, calcium,

magnesium, dextrose, urea, uric acid, acetoacetic acid, creatinine, or creatine, when present in the amounts found in normal and pathological sera. The amount of inorganic phosphorus present in normal adult sera ranges from 3.5 to 4.0 mgrms. per 100 c.c., but is much higher in the sera of normal infants. T. J. W.

Rapid Estimation of Calcium in Urine. A. T. Shohl and F. G. Pedley. (*J. Biol. Chem.*, 1922, **50**, 537-544.)—One hundred c.c. of urine are run into a flask, and 5 c.c. of concentrated nitric, or sulphuric acid, and 3 to 4 grms. of ammonium persulphate are added. The mixture is heated and kept near to the boiling point until no effervescence is produced on agitating the flask, after which 10 c.c. of 2.5 per cent. oxalic acid solution are run in, and the liquid cooled. One drop of methyl red indicator is added, followed by ammonium hydroxide until the solution is neutral in reaction, when it is again cooled and allowed to stand overnight. The mixture is filtered through a hardened filter paper, and the flask and precipitate washed three times with distilled water, after which the precipitate is washed into the original flask with water and hot dilute sulphuric acid so as to give a volume of approximately 100 c.c. Ten c.c. of concentrated sulphuric acid are then added, and the solution warmed to 75° C. and titrated with 0.05 *N* potassium permanganate solution, the end-point being indicated by the persistence of a pink colour for 15-30 seconds. The method yields results accurate within 1 per cent., and in close agreement with those given by McCrudden's gravimetric method (*J. Biol. Chem.*, 1911-12, **10**, 187). The presence of uric acid has no effect upon the accuracy of the results. T. J. W.

Agricultural Analysis.

Characterisation of Clay. N. Comber. (*J. Soc. Chem. Ind.*, 1922, **41**, 77-80 T.)—Definitions of clay based on chemical formulæ or on the conventional grading according to the size of the particles are unsatisfactory, and suggestions are put forward for defining the essential differences between clay and all other siliceous mineral systems, such as silt, and the differences expressed by the terms "fat" and "lean" clay. Consideration of the permeability, rate of evaporation, depression of the freezing point of the water present, and flocculation of soils, leads to the conclusion that clay particles have a water-imbibing, emulsoid surface; moreover, the flocculation of clay by calcium hydroxide is abnormal, in that electro-negative suspensions are usually flocculated by acids and deflocculated by alkalis. The constitutional characteristic of clay is that in it the properties of the emulsoid surface outweigh those of the suspensoid core, whereas in silt, etc., the properties of the core predominate. Fatness of clay is connected with the proportion of emulsoid surface to suspensoid core, and may be demonstrated by the following test:—Two 0.5 gm. portions of the clay are mixed with 10 c.c. of water in similar test tubes. To one portion are added two drops of standard ammonia solution; after 5 minutes 1 c.c. of 0.1 *N* calcium nitrate solution is added to each tube, the contents mixed and allowed to stand, and the volume of the coagulum compared with that from the neutral suspension. With Farnley fireclay

and bauxitic Ayrshire clay, both lean clays, there is little difference, but with a fat Dorset clay and a very fat purified Halifax clay the coagula in the tubes containing ammonia are 50 per cent. and 150 to 200 per cent. respectively greater in volume than the neutral coagula.

H. E. C.

Organic Analysis.

Detection of Oxygen in Organic Compounds. J. Piccard. (*Helv. Chim. Acta*, 1922, 5, 243-244.)—The test is based on the fact that iodine dissolves in oxygen-free solvents and gives a violet coloration, whilst it gives a brown colour with liquids containing oxygen. The sensitiveness is increased by making the ratio Iodine:Oxygen as small as possible, and by viewing a long column of the liquid. A solution of iodine (1 in a million) in pure benzene is observed in a flat-bottomed glass tube 90 cm. long; on the addition of a soluble substance containing oxygen the violet colour changes distinctly to brown. A quantity of oxygen considerably less than can be estimated by combustion may be detected in this way.

H. E. C.

Titration in Ethyl Alcohol as Solvent. E. R. Bishop, E. B. Kittredge and J. H. Hildebrand. (*J. Amer. Chem. Soc.*, 1922, 44, 135-140.)—Hydrogen-electrode titration curves are given for a number of reactions in ethyl alcohol solution, together with a table of indicators for use in such reactions. The hydrogen ion concentration was measured by means of a hydrogen electrode against a standard mercurous bromide electrode. The values are given in terms of electromotive force. Colour changes of indicators in ethyl alcohol solution are as follows, the figures giving the E.M.F. (in volts) of the change:—Bitter almond oil green: green, 0.69 colourless; brom-phenol blue: yellow, 0.34 green, 0.47 blue; cresol red: 0.20 pink, 0.30 orange; curcumin: greenish-yellow, 0.66 red, 0.85 orange, 0.91 golden; cyanine: colourless, 0.24 blue; gallein: rose, 0.68 violet-blue; iodeosin: golden-brown, 0.20 pink; methyl green: blue, 0.66 lavender; methyl orange: pink, 0.20 orange, 0.23 yellow; methyl violet: violet, 0.95 colourless; methyl red: red, 0.54 orange, 0.62 yellow; naphthol-benzoin: light brown, 0.70 blue; *p*-nitrophenol: colourless, 0.61 yellow-green; phenolphthalein: colourless, 0.68 red; resorcinol blue: red, 0.39 blue; rosolic acid: golden, 0.58 orange, 0.65 pink; sodium alizarin sulphonate: greenish-yellow, 0.50 orange, 0.57 rose, 0.82 violet; thymol blue: red, 0.30 golden; thymolphthalein: colourless, 0.82 blue; trinitrobenzene: colourless, 0.68 golden-orange; tropæolin: salmon pink, 0.20 orange, 0.23 golden; tropæolin 00: pink, 0.15 orange, 0.20 yellow.

W. P. S.

Relation between the Refractive Index and the Chemical Characteristics of Oils and Fats. G. F. Pickering and G. E. Cowlshaw. (*J. Soc. Chem. Ind.*, 1922, 41, 74-77 T.)—Owing to the effects of oxidation and polymerisation, there is no obvious relation between the iodine values of commercial oils and their refractive indices, but, when freshly prepared oils from good material

are examined, the higher iodine value corresponds with the higher refractive index. Factors which affect the refractive index are: the acid value (A.V.), saponification value (S.V.), oxidised and hydroxylated acids, and unsaponifiable matter. It is shown on theoretical grounds that the following equation connects the refractive index and the iodine value (I.V.):—

$$n_D^{40} = 1.4643 - 0.000046(\text{S.V.}) - 0.0096(\text{A.V./S.V.}) + 0.0001171(\text{I.V.}).$$

If it is found that the refractive index of a sample is higher than that calculated from this equation, it indicates that the oil is not fresh, or has been prepared from damaged material. Experiments on the oxidation of the fatty acids of oils with permanganate show that the refractive index of the total fatty acids rises, and that of the normal (*i.e.* soluble in petroleum spirit) fatty acids falls. With the acids from the distillation products of fatty acids, the refractive index of the total fatty acids rises, and that from the normal fatty acids first rises, then falls, possibly as a result of polymerisation.

H. E. C.

Extraction of Oils and Fats from Chrome-Leather. D. Woodroffe.

(*J. Soc. Leather Trades Chem.*, 1922, **6**, 97–102.)—After a review of previous work on this subject it is suggested that petroleum spirit, the solvent usually employed at present, should be replaced by chloroform, which is a more efficient solvent than the former for the materials usually employed for fat-liquoring chrome-leathers (chrome-sole, box-calf, glacé kid, etc.). These materials include neatsfoot, rape, fish and linseed oils, dégras, wool-grease, resin and sulphonated oils. Ether is not desirable on account of its solubility in water. Carbon tetrachloride, benzene, and trichlorethylene are unsuitable because of their higher boiling points, and the consequent necessity for heating the extracted substances to 105° C., which might cause increase of weight through oxidation.

R. F. I.

Estimation of Free Sulphuric Acid in Leather. C. van der Hoeven.

(*Collegium*, 1921, 458; *J. Soc. Leather Trades Chem.*, 1922, **6**, 117.)—This estimation is becoming more important now that synthetic tannins are being more widely used. The method of Thomas (*J. Amer. Leather Chem. Assoc.*, 1920, 504) is modified as follows:—A weighed quantity of fine leather-parings is treated in an extraction apparatus, at a definite temperature, with a solution of sodium dihydrogen phosphate, which, after some hours, extracts the whole of the sulphuric acid. The extract is made up to a definite volume, and the total sulphuric acid estimated in an aliquot portion by means of barium chloride. The neutral sulphuric acid is estimated in the ash of the original sample, care being taken to oxidise any reduced sulphate by means of iodine or bromine water. The difference between the two figures gives the free sulphuric acid.

R. F. I.

Quantitative Method for the Separation and Estimation of Phenols.

M. T. Hanke and K. K. Koessler. (*J. Biol. Chem.*, 1922, **50**, 271–288.)—The following method is applicable to the examination of media in which bacteria have been grown in the presence of salts, glycerol or glucose, but is not adapted to the investigation of urine or blood. The liquid containing the phenols is acidified

and distilled under ordinary pressure. Phenol and *p*-cresol distil quantitatively, and, if one only is present, it may be estimated by the method already described (see preceding abstract), but this procedure is useless if the distillate contains both. The residue, after evaporation to a small volume, is extracted ten times with ether, which removes the aromatic hydroxy-acids quantitatively, and they are then dissolved in dilute phosphoric acid and estimated. The particular hydroxy acid present (if one only) may be identified, and the amount estimated, by the colour developed on the addition of the reagents and the time required for the development of its maximum intensity. The aqueous solution, after extraction with ether, is made alkaline with sodium carbonate and extracted six times with amyl alcohol, which removes tyramine, this extract afterwards being shaken several times with *N* sulphuric acid, in which the colorimetric estimation of the phenol is made. The aqueous residue from the amyl alcohol extraction contains tyrosine; it is treated with excess of concentrated hydrochloric acid, evaporated, the residue dissolved in water, and the tyrosine estimated colorimetrically. Experimental details are given of work carried out in the development of these methods

T. J. W.

Electrometric Titration of Azo Dyes. D. O. Jones and H. R. Lee. (*J. Ind. Eng. Chem.*, 1922, 14, 46-48.)—Sufficient (approximately one grm.) of the finely powdered dye to require for reduction from 30 to 45 c.c. of 0.25 *N* titanous chloride solution is weighed out, 25 c.c. of distilled water are added, and the flask is heated on a steam bath for about 10 minutes. Twenty-five c.c. of 40 per cent. sulphuric acid are run in, the flask is stoppered, and a current of carbon dioxide is passed through it for five minutes. From 35 to 50 c.c. of 0.25 *N* titanous chloride solution are added, the mixture is boiled for five minutes and cooled to 30° C., and the excess of titanous chloride titrated with 0.05 *N* ferric alum solution as follows:—The reaction flask, provided with one calomel electrode and one platinum electrode, is connected with a potentiometer, and the voltage produced by each addition of the ferric alum solution is noted. On reaching the end point the connections with the electrodes are reversed, and the addition of the ferric alum solution continued. A curve of the reaction is drawn with voltage readings as ordinates and c.c. of ferric alum solution as abscissæ, from which the end point is determined and the amount of titanous chloride solution used is deduced. For routine work sufficient accuracy will be attained by taking a large deflection of the galvanometer needle as the end point, after adjustment to zero at the commencement of the back titration.

T. J. W.

Estimation of the "Bromine Figure" or "Chlorine Factor" of Pulp. A. Tingle. (*J. Ind. Eng. Chem.*, 1922, 14, 40-42.)—An investigation of the action of approximately normal solutions of bromine upon cellulose and on unbleached sulphite spruce pulp has shown that accurate results are obtainable only when the substance under examination is in solution; no reaction occurs between bromine and cellulose within thirty minutes; pulp containing lignone appears to react with bromine in definite steps, one of which is completed in thirty minutes, and the

results obtained bear a definite and simple ratio to the amount of chlorine used in bleaching. For the method adopted the following solutions are used:—*Bromine solution*: Eight grms. of bromine are added to 100 c.c. of *N* sodium hydroxide solution, and the mixture is shaken until solution is complete and is then boiled. After cooling, the liquid is made up to one litre, and is then standardised by the addition of hydrochloric acid and potassium iodide and titration with 0.1 *N* sodium thiosulphate solution. *Acid solvent*: Fifty c.c. of concentrated sulphuric acid are slowly added to 450 c.c. of hydrochloric acid (sp. gr. 1.19). From 0.6 to 0.75 gm. of the dry pulp, contained in a stoppered bottle, is dissolved by agitation with 30 c.c. of the acid solvent until a homogenous mixture is obtained. To the solution 20 or 25 c.c. of the bromine solution are added, and the bottle thoroughly shaken, and subsequently gently agitated at intervals for thirty minutes. Twenty-five c.c. of 8 per cent. potassium iodide solution are run in, and the mixture is well diluted and titrated with 0.1 *N* sodium thiosulphate solution, starch solution being added as partial indicator. The end point is indicated by the disappearance of the red tint due to the combination of iodine with the cellulose, which occurs shortly after the vanishing of the starch-iodide blue. The "bromine figure" is obtained by dividing the weight of pulp taken by the number of c.c. of sodium thiosulphate solution used, and the "chlorine factor" from the expression

$$\frac{\text{C.c. of thiosulphate solution} \times 0.00355 \times 100}{\text{Weight of pulp taken}}$$

T. J. W.

Inorganic Analysis.

Estimation of Traces of Oxygen in Hydrogen. A. T. Larsen and E. C. White. (*J. Amer. Chem. Soc.*, 1922, 44, 20–25.)—The oxygen is combined with the hydrogen by passing the mixed gases over platinised platinum gauze at 275°–300° C., and the rise of temperature is measured by a thermocouple: The apparatus is calibrated by passing a purified hydrogen-nitrogen mixture through it at the rate of 500 c.c. per minute; a small electrolytic cell containing concentrated potassium hydroxide solution has its outlet connected with the tube leading to the catalytic chamber; and, since each milli-ampère of current passed through this cell liberates 82.9×10^{-6} mgrm. of oxygen per second, it is a simple matter to admit known amounts of oxygen to the hydrogen-nitrogen mixture per minute. The catalytic chamber contains a pre-heating coil and is surrounded by a heating jacket containing diphenylamine (b. pt., 305° C.). Concentrations of oxygen as low as 0.001 per cent. may be estimated readily, the error being about 3 per cent. when a high-sensitivity galvanometer is employed.

W. P. S.

Comparative Values of Different Specimens of Iodine for use in Chemical Measurements. C. W. Foulk and S. Morris. (*J. Amer. Chem. Soc.*, 1922, 44, 221–229.)—Iodine, as ordinarily prepared for use as a standard in volumetric analysis, has been compared with special iodine of "atomic weight" purity, and it is found that there is close agreement, with a maximum deviation of 0.024 per

cent. It is shown, however, that, when iodine condenses in contact with liquid water, it occludes a small quantity so tenaciously that it is not completely dehydrated after prolonged exposure over desiccating agents. Complete removal of the water requires dry sublimation in the presence of the desiccating agent. For some unknown reason the results of the titration of iodine with standard thiosulphate solution are very slightly high. A rubber stopper may safely be used for closing a flask in which iodine is being titrated. H. E. C.

Test for Antimony. P. Haferkorn. (*Chem. Zeit.*, 1922, **46**, 186.)—In the familiar test—production of a black stain by treating the solution on platinum foil with metallic zinc—the use of platinum may be obviated by substituting copper foil coated with mercury. This is prepared by cleaning the copper with hydrochloric acid, immersing it in mercuric chloride solution, and polishing the deposit with a cloth. Solutions of antimony give a black adherent stain; tin and arsenic do not react. W. R. S.

Rapid Iodimetric Estimation of Copper and Iron in Mixtures of their Salts. I. W. Wark. (*J. Chem. Soc.*, 1922, **121**, 359–363.)—If sodium phosphate is added to a solution of copper containing ferric iron, the ferric phosphate does not liberate iodine from potassium iodide in the presence of acetic acid, and the copper may be estimated by titration with thiosulphate; if mineral acid is then added, there is a further liberation of iodine corresponding to the iron present, which may be titrated. For the iodimetric estimation of iron the solution should be fairly concentrated, 3 grms. of potassium iodide for each 0.1 gm. iron present and a small quantity of dilute sulphuric acid should be added. The iodine liberated may be titrated without an indicator after an interval of about five minutes. When both copper and iron are present, ferrous iron, if any, is oxidised by bromine (which must be entirely removed by boiling), mineral acid is neutralised with ammonia, then 3 grms. of potassium iodide and 5 c.c. of acetic acid are added for each 0.1 gm. of total metal present, and 2 grms. of sodium phosphate for each 0.1 gm. of iron present. The iodine liberated is titrated after five minutes, the liquid being warmed to 50° C. if the amount of copper is very small, then dilute sulphuric acid in the proportion of 10 c.c. of 6 N sulphuric acid for each 0.1 gm. iron is added, and the iodine equivalent liberated is titrated after a further five minutes. The limit of accuracy is about 0.5 per cent. of the metal present. (*Cf. also ANALYST*, 1918, **43**, 41; 1922, 36.) H. E. C.

Analysis of Ferruginous Tin Alloys. A. Meyer. (*Chem. Zeit.*, 1922, **46**, 209.)—The presence of only 0.5 per cent. of iron in tin alloys prevents the quantitative precipitation of stannic acid when the alloy is treated with nitric acid. The following method is satisfactory: One gm. of drillings is treated with 10 c.c. of strong nitric acid in a covered dish. When strong action has ceased, 10 c.c. of hydrochloric acid are added; after subsidence, the cover is removed, and the bulk of acid expelled on the water-bath, without attaining dryness, to prevent loss of tin by volatilisation. Seventy c.c. of water are added, any silver chloride

being allowed to coagulate by keeping the liquid hot. It is transferred or filtered into a 200 c.c. flask and made up to the mark; 100 c.c. are diluted with an equal bulk of water, heated to 70° C., made alkaline with sodium hydroxide, and digested at boiling heat with 20 c.c. of strong sodium sulphide solution. The clear liquid is decanted through a filter; the precipitate is thoroughly washed with dilute sodium sulphide solution, ignited to oxides, and dissolved in *aqua regia*, and the solution analysed for copper, iron and nickel. The alkaline filtrate containing tin is acidified with hydrochloric acid and boiled, and the precipitated stannic sulphide filtered off and ignited to oxide.

W. R. S.

Estimation of Aluminium in Tungsten. V. and K. Froboese. (*Zeitsch. anal. Chem.*, 1922, **61**, 107–110.)—The finely powdered metal (2–3 grms.) is strongly ignited for one hour in a platinum crucible, and the resulting oxide fused with sodium potassium carbonate. The mass is boiled with water in a porcelain basin, and the solution filtered into another basin. The insoluble residue (containing nearly the whole of the alumina) is ignited in a platinum crucible, evaporated with hydrofluoric and sulphuric acids, and fused with bisulphate. The mass is digested with hot, dilute sulphuric acid, and the liquid filtered to eliminate traces of tungstic acid. The filtrate is boiled with strong potassium hydroxide solution, and the ferric hydroxide filtered off; the filtrate is acidified, and made just ammoniacal, to precipitate the alumina. The filtrate from the carbonate fusion (which may contain traces of alumina) is evaporated to dryness with hydrochloric acid, the residue taken up with dilute acid, and the tungstic acid filtered off. The filtrate is made slightly alkaline with ammonia and any precipitate collected. The two precipitates are ignited together, treated with hydrofluoric acid, and weighed as alumina. If slightly contaminated with tungstic acid (shown by a yellow tinge), the precipitate is again fused with bisulphate, etc., as directed above.

W. R. S.

Estimation of Carbon Dioxide in Mineral Carbonates. L. A. Sayce and A. Crawford. (*J. Soc. Chem. Ind.*, 1922, **41**, 57–58 T.)—Comparative estimations were made by the following methods:—Ignition in a “Teclu” furnace; decomposition by dilute (a) sulphuric acid, (b) hydrochloric acid in Schrötter’s apparatus; and in Armstrong’s simplified form of this; by Garrett’s apparatus, consisting of a test tube, fitted with a Y-piece, one arm of which is connected with a tap-funnel containing dilute acid, the other being provided with a combined condenser and drying tube connected with soda-lime tubes; and by Collins’ “Calcmeter” (*J.S.C.I.*, 1906, **25**, 518). The minerals employed for the estimations were calcite, witherite, dolomite, cerussite, and chalybite. Consistent results can be obtained by the ignition method when the mineral can be decomposed at a sufficiently low temperature, and no complicating reactions occur. The method is unsuitable for witherite, cerussite and chalybite. Schrötter’s apparatus with sulphuric acid gives unreliable results with carbonates yielding insoluble or slightly soluble sulphates, and the use of hydrochloric acid is liable to cause error, owing to the risk of volatilisation of the acid. The Armstrong modification yields

fairly accurate results, and is inexpensive. For some unexplained reason the Garrett apparatus gave inconsistent results with calcite, but when fitted with a soda-lime tube it yielded excellent values with witherite. Collins' calcimeter is very suitable for readily soluble carbonates and is easily operated, the time occupied for one complete estimation being about twenty minutes, and the estimation being accurate to within 0.1 or 0.2 per cent. T. J. W.

Colorimetric Estimation of Phosphorus. L. Losana. (*Giorn. Chim. Ind. Applic.*, 1922, 4, 60-62.)—This method is based on the fact that treatment of ammonium phosphomolybdate with hot sodium thiosulphate yields a moderately stable, intensely blue solution, which may be compared with that obtained from a solution of known phosphorus content. Uniformity of the coloration depends on various factors: The best concentration of the thiosulphate solution is 12-15 per cent.; the phosphomolybdate precipitate must be thoroughly washed and devoid of free acidity, since, otherwise, sulphur will be deposited; the best temperature for the reaction is 70-80° C., and 90° C. must never be exceeded. Owing to the intensity of the coloration, ordinary Eggertz tubes are applicable with low phosphorus contents. The procedure is as follows: The precipitate is collected in a small Gooch crucible, washed once with 1 per cent. nitric acid solution, and repeatedly with 1 per cent. potassium nitrate solution, until the washing liquid remains perfectly neutral. The asbestos and precipitate are washed with water into a small beaker and mixed with 20 c.c. of 15 per cent. sodium thiosulphate solution, the beaker being immersed in a water-bath at 80° C. for 10 minutes. The liquid is filtered into a 100 c.c. flask, the filter being washed with hot water and the filtrate cooled, made up to volume and mixed. The solution for comparison is prepared in a similar manner from 0.0618 gm. of pure ammonium phosphomolybdate, corresponding with 0.001 gm. of phosphorus. Proportions of phosphorus (up to 5 per cent.) may be estimated accurately with the help of a special colorimeter of which a description and diagrams are given. T. H. P.

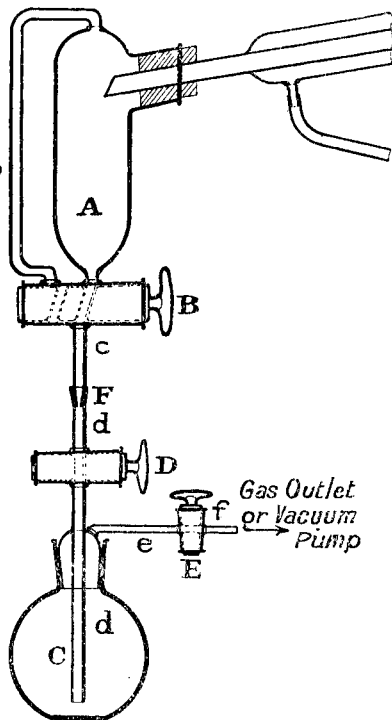
Physical Methods, Apparatus, etc.

Autoclave Test for the Grading of Chemical Glassware. W. L. Baillie and F. E. Wilson. (*J. Soc. Chem. Ind.*, 1922, 41, 45-56 T.)—Specimens having an area of 3-4 sq. dm. were cleaned by immersion in cold 5 per cent. acetic acid, washing in cold water and drying with alcohol and ether, afterwards being heated to 50° C. for 15 minutes and cooled in a desiccator. Subsequent handling was performed with platinum-tipped tongs to avoid contamination. The weighed specimens were placed on copper gauze in a silica beaker, provided with a perforated cap, and standing on a brass tripod contained in an autoclave, together with one litre of ammonia-free distilled water, the surface being below the level of the bottom of the beaker. After the lid of the autoclave had been closed, the whole was heated until a pressure of 90 lbs. per sq. in. was obtained, this being maintained for 3 hours, when steam was immediately blown off, and the apparatus allowed to cool to 30° C. After removal, the specimens were thoroughly washed

with ammonia-free distilled water, the rinsings being collected in the silica beaker, transferred to a 250 c.c. silica flask, and made up to the mark. The durability of the glass is estimated by the degree of clouding observed on drying the washed specimens, and by the alkalinity of the washing water, which is estimated by titration with 0.002 *N* sulphuric acid, 20 c.c. of an ethereal solution of iodeosin being used, as indicator, and the results are expressed as mgrms. of sodium oxide per sq. dcm. of glass surface. The degree of clouding is expressed empirically thus: A = unaffected or slightly affected, B = appreciably affected, C = severely affected; and these grades are further subdivided by the addition of + or - to each. It is suggested that the following classification of glasses should be adopted:—(a) "Resistance": alkalinity below 0.3, clouding less than A +; (b) "More durable": alkalinity 0.3–0.8, clouding less than B; (c) "Less durable": alkalinity 0.8–2.0, clouding less than B +, and (d) "Soft" (unsuitable for laboratory use): alkalinity exceeding 2.0, clouding exceeding B +. Details are given of various tests made upon other criteria of durability, and a close correlation is shown between all the results obtained. It was found that a close correspondence existed between the durability and hardness of glass and its alumina content. T. J. W.

A Receiver for Fractionation in a Current of Gas or under Reduced Pressure. T. S. Wheeler and E. W. Blair.

(*J. Soc. Chem. Ind.*, 1922, 41, 59–60 T.)—The apparatus figured is self-explanatory, F being a ground glass joint to which several flasks with tubes, as shown, may be successively fitted. When in use, stopcock B is turned to connect tubes *b* and *c* at the same time closing the outlet from A, in which the first fraction of the distillate is collected. Meanwhile, the current of gas passes into C, thus displacing air. By turning B the distillate is allowed to run into C, when stopcocks D and E are closed, and the flask removed by opening the joint F, another empty flask being then substituted. Several flasks may be filled with gas, or exhausted in readiness for use, by connecting them in series with the outlet *f*. T. J. W.



Measurement of the Mean Penetrating Power of a Beam of X-Rays by a New Radiochromometric Method.

M. de Laroquette. (*Comptes Rend.*, 1922, 174, 604–607.)—Since the values of the penetrating power of X-rays furnished by Benoist's radiochromometer are lacking in precision, the author has devised an apparatus capable of yielding accurate results. Use is made of two series of

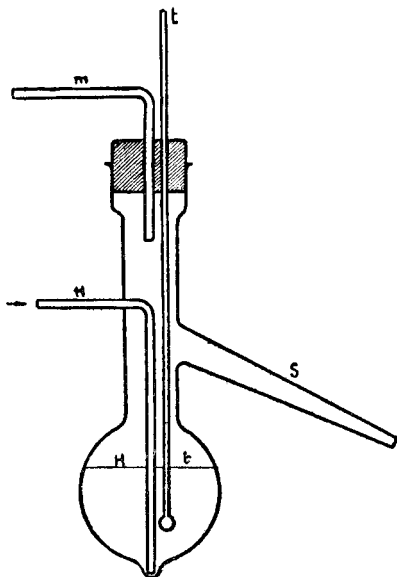
radiographic tints obtained simultaneously on a surface under the radiation to be measured, the one series without filtration and with different but exact times of exposure, and the other with a constant period of exposure, but with aluminium filters, varying in thickness from 0 to 66 millimetres. Comparison of the two series of tints shows, for example, what thickness of filter corresponds with 20, 10, 5, etc., per cent. of the total radiation incident on the surface. The arrangement used consists essentially of a sheet of lead pierced with holes, and known as a sclerometric grating (*grille*). Over one hole is fixed Benoist's radiochromometer with its central disc and its twelve aluminium wings. Sixteen other holes are covered by different numbers of metallic plates with filtering power varying up to 66 mm. of aluminium. On one side is the chromometric scale, the holes of this remaining free, but being covered successively by a sheet of lead during the radiographic test. To use the grating, it is placed on a sheet of sensitised paper under a black envelope, the anti-cathode being at 20 or 30 cm., the intensity 2 to 4 mm., and the time of exposure 100–200 seconds; the holes of the chromometric scale are covered after the lapse of 1, 2, 3, 5, 10, 15, 20, 30, 40, and 50 per cent. of the total time of exposure. After development, the chromometric scale is cut off and superposed on the scale of filtration tints. By this procedure a scale of degrees

of penetration has been established, which corresponds approximately with Benoist degrees, but extends beyond XII B and applies to all radiations. The grating may be simplified, if thought desirable.

T. H. P.

Apparatus for Hydrogenation at High Temperatures without Pressure. J. Klimont. (*Chem. Zeit.*, 1922, 46, 275.)—A round-bottomed glass flask of about 150 c.c. capacity, shaped as in the figure, is used, and may be heated directly over a flame. The tube, m, is connected with a water manometer indicating the pressure, and hydrogen is passed in by the tube, h; the stream of gas serves to prevent the powdered catalyst from settling to the bottom.

H. E. C.



Reviews.

HANDBOOK OF CHEMISTRY AND PHYSICS. By C. D. HODGMAN, assisted by M. F. COOLBAUGH and C. E. SENSEMAN. Eighth Edition. Pp. 711. Cleveland, Ohio; The Chemical Rubber Co., London; Chapman & Hall. 1920-1921. Price 24s. net.

This volume is a useful collection of mathematical, chemical and physical tables intermediate in bulk between the large volumes such as those of Castell-Evans or Landolt-Bornstein and the small manuals such as Johnson's *Laboratory Companion*; it contains almost all data that are required in the laboratory. The range of information given is remarkably wide and embraces many subjects not commonly found in books of this kind, including dietary standards, laboratory arts, chemical equations, a brief outline of chemical theories, trigonometrical formulæ, standard forms of the calculus, and the Greek alphabet. A useful section contains definitions of nearly all chemical, physical and mechanical terms, units and quantities, and physical formulæ. The form and arrangement of the tables are convenient, and there is a fairly good index, though here there is much room for improvement; many more references in the index would add much to the utility of the book to those not familiar with its contents and arrangement. For instance, Nessler's or Fehling's solutions are not indexed as such, but have to be sought in the pages devoted to "Reagents." The nomenclature and spelling are English generally, but in a few places objectionable Americanisms, such as "sulfate," appear in contrast to the usual spelling of the same words in other parts of the book. The American origin of the work is also noticeable in the geographical and magnetic tables, where nearly all the data refer to American places.

A careful examination of some of the tables failed to reveal any inaccuracy, showing that considerable care has been taken in the compilation, and the passage of the book through seven editions should have done much to eliminate mistakes. A few have been noted, however; *e.g.* on page 319 the calorific power of anthracite appears as 70,000 to 84,000 calories per grm., and on page 444 high grade anthracite is given the value 7417 calories; the former value is clearly a misprint, and the latter value is rather low.

A survey of the book from the chemist's point of view suggests a few criticisms; the table of antidotes to poisons is very incomplete; such common ones as strychnine and phosphorus find no mention, and, where antidotes are named, it is not sufficiently explained how they should be prepared or administered. The reviewer sees little utility in the chapter on the solving of chemical problems which are mainly of the examination type dealt with in the ordinary text-books, and not those commonly met with in the chemical laboratory; in the place of these space might be found for other tables; for instance, tables are given for the conversion of pounds to kilograms, but none for converting grains to grams. The table of specific rotations is fragmentary and should be amplified; several sugars are

omitted, including one of such common occurrence as invert sugar; a table of cupric reducing powers and copper oxide factors would also be useful in the laboratory. A good list of factors for gravimetric analysis is given, but volumetric factors are wanting.

The book is well printed on good paper, bound in flexible covers, is of convenient size, and is likely to be very useful in chemical and physical laboratories.

H. E. Cox.

ORGANIC ANALYSIS, QUALITATIVE AND QUANTITATIVE. By E. DE BARRY BARNETT, B.Sc., F.I.C., and P. C. L. THORNE, M.A., A.I.C. Pp. xi+128. University of London Press. 1921. Price 7s. 6d. net.

This volume is of a more advanced type than many introductory manuals, and should prove of great value in the second and following years of a course of organic chemistry. The identification of an unknown substance is placed on a scientific basis, and made as systematic as possible, with a view to avoiding that haphazard lack of method so easily caused by the great number and frequent complexity of organic compounds.

The first part is qualitative, dealing with the determination of physical properties, the detection of the elements present, and the description of preliminary tests of a general character. Substances are conveniently divided into four classes according to the elements found to be present, and these classes are then subdivided into groups, such as phenols, carboxylic acids, chlorine compounds, amines, etc. To each group is attached a list of its chief representatives, with their physical constants and more important reactions; these lists include all the compounds that the student is likely to meet in ordinary analytical work.

The second part describes the quantitative estimation of carbon, halogens, nitrogen, etc., and the determination of molecular weights; detailed instructions then follow for the estimation of a number of radicals and individual substances. In an appendix the Richter system of indexing compounds is explained, so that his Lexikon may readily be consulted with regard to the less familiar bodies not included in the list for each group. A number of good illustrations, a variety of cross references, and a seven page index, all assist in making this book a convenient and thoroughly practical guide to organic analysis.

A. F. KITCHING.

ELEMENTARY CHEMICAL MICROSCOPY. By ÉMILE M. CHAMOT, B.S., Ph.D. Second Edition. Pp. xv+479. New York: Wiley & Sons; London: Chapman & Hall. 1921. Price 25s.

This volume, the first edition of which was reviewed in 1915 (*ANALYST*, 1915, 40, 426), is intended as an introduction to the use of the microscope and its accessories for the determination of the physical and chemical characteristics of substances in small amounts.

Notwithstanding the enormous developments in the application of the microscope to industry during the last few years, science students in this country, although generally well trained in the preparation of microscopic objects, often show but slight familiarity with the manipulation of the instrument by which these objects are examined. Such a regrettable state of affairs would be obviated by a course of training similar to that described in the volume now under review, which is based upon the instruction provided for the students of Cornell University.

It is assumed by the author that the students who will make use of this work have previously completed a course in physics, optics and crystallography, and no valuable space has been occupied by elementary instruction in these subjects.

The first four chapters deal in detail with microscopes, objectives and oculars, and the various methods of illuminating opaque and transparent objects, these being followed by separate chapters on ultramicroscopes, microscope accessories, and micrometric procedure. Chapters VIII. to XIV. provide full details for the determination of the physical constants and chemical identification of microscopic fragments of material, and the principles underlying the preparation of metals and alloys for microscopical examination are described in a very practical way in the last chapter.

The information provided throughout the book is accurate and reliable, with very few exceptions which are referred to below. This is to be expected from an author who possesses a wide knowledge of the subject, and who restricts his descriptions to apparatus which he has personally examined and tested. Unfortunately, owing to his inability to obtain a tungsten "Pointolite" lamp, no description of this very effective illuminant is given, but this will no doubt be remedied in future editions.

We have for so many years been incorrectly informed by numerous textbooks that saturated solution of alum is particularly effective in cutting out heat rays from a luminous beam, that it is pleasing to find the true statement given on page 160, "a solution of alum or ferrous sulphate is no better than pure water alone."

The first item given in the list of "Contents" refers to a frontispiece entitled "Optics of the Compound Microscope," but, in the volume before the reviewer this diagram is missing, nor is there any indication that it had ever been inserted. On pages 41 and 47 "Rheinberger" should be "Rheinberg," and Spitta's *Microscopy* was published much more recently than the year 1099. On page 4 the methods of correction for cover glass thickness are described both by means of objectives provided with correction collars and by adjustment of the draw-tube of the microscope, but no indication is given as to how the student is to determine when the adjustment has been correctly made. Since this requires more practice than is usually obtainable during classes, a printed description would be of value to one working alone. Perhaps the weakest part of the book is the table of melting points provided in the Appendix; thus, ammonium nitrate is stated to melt at

152° C. instead of 166° C., and both potassium iodide and metallic lead have 625° C. assigned to them, whereas the correct temperatures are 685° C. and 327° C. respectively. As the volume is provided with an appendix, the tables of refractive indices on pages 244–248 might have been inserted therein, and would, perhaps, have been more readily available than in their present position. However, in spite of these minor defects, the book, as a whole, is a most valuable compilation, the information provided being conveyed in an agreeable manner, and the comprehensive collections of diagrams and descriptions given enabling the reader to obtain a useful conception of most pieces of apparatus he is likely to meet with in the course of his work. Apart from its directly instructional value, the practical work described in this volume will provide valuable training in delicate manipulation, and, at the same, time develop the student's powers of observation. The type, diagrams, and general style of the volume are excellent, a complete and accurate index is provided, and the book may be strongly recommended to all interested in modern applications of the microscope.

T. J. WARD.

Publications Received.

A CONCISE HISTORY OF CHEMISTRY. By T. P. HILDITCH, D.Sc., F.I.C. Second Edition. London: Methuen. 1922. Price 6s.

POWER ALCOHOL: ITS PRODUCTION AND UTILISATION. By G.W. MONIER-WILLIAMS, O.B.E., M.C., M.A., F.I.C. Pp. 323. Oxford University Press. 1922. Price 21s net.

A TEXT-BOOK OF INORGANIC CHEMISTRY. By A. F. HOLLEMAN, Ph.D., LL.D. Issued in English in Co-operation with H. C. COOPER. Sixth Edition. Pp. 528. New York: Wiley & Sons; London: Chapman & Hall. 1921. Price 19s. net.

TECHNICAL PAPERS. DEPT. OF THE INTERIOR. BUREAU OF MINES, U.S.A.

No. 278. THE SUGAR-TUBE METHOD OF DETERMINING ROCK DUST IN AIR. By A. C. FIELDNER, S. H. KATZ and E. S. LONGFELLOW. 1921. Price 10 cents.

No. 281. THE USE OF ELECTROLYTES IN THE PURIFICATION AND PREPARATION OF CLAYS. 1922. By H. G. SCHURECHT. Price 10 cents.

No. 284. COAL AND COKE MIXTURES AS WATER-GAS GENERATOR FUEL. By W. W. ODELL. 1921. Price 10 cents.

No. 297. ACCIDENTS AT METALLURGICAL WORKS IN THE UNITED STATES DURING 1920. By W. W. ADAMS. 1922. Price 5 cents.