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THE ANALYST.

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

ANNUAL GENERAL MEETING AND ORDINARY MEETING, HELD FEBRUARY 2, 1921.

THE Annual General Meeting of the Society was held at the Chemical Society's Rooms, Burlington House, W. 1. The President, Mr. Alfred Smetham, occupied the chair.

The minutes of the previous Annual General Meeting were read and confirmed.

Miss D. Hewer and Captain E. J. Lush were appointed scrutators of the ballot papers for the election of officers and Council for 1921.

The Hon. Treasurer presented the accounts of the Society for 1920, and votes of thanks were passed to the Hon. Treasurer, the Acting Hon. Treasurer (Mr. E. W. Voelcker), and the Hon. Secretaries.

Messrs. Marreco, Houseman, and Brandon, chartered accountants, were appointed Auditors of the Society's accounts for 1921.

The President delivered his Annual Address. Mr. G. R. Thompson proposed that a hearty vote of thanks be accorded to the President for his address and for his services in the chair, and that his permission be asked to print the address in the ANALYST. This was seconded by Dr. Bernard Dyer, and the motion was carried.

The scrutators having reported the result of their examination of the ballot papers, the President announced that the officers and Council for 1921 had been elected in accordance with the Council's nominations as follows:

President.—Alfred Smetham.

Past Presidents serving on the Council (limited by the Society's Articles of Association to eight in number).—Leonard Archbutt, Edward J. Bevan, A. Chaston Chapman, Bernard Dyer, Otto Hehner, Samuel Rideal, E. W. Voelcker, J. Augustus Voelcker.

Vice-Presidents.—W. J. A. Butterfield, C. A. Keane, G. Rudd Thompson.

Hon. Treasurer.—Edward Hinks.

Hon. Secretaries.—P. A. Ellis Richards, E. Richards Bolton.

Other Members of the Council.—F. W. F. Arnaud, B. A. Burrell, F. H. Carr, R. L. Collett, C. H. Cribb, Norman Evers, P. J. Fryer, J. H. B. Jenkins, S. E. Melling, G. W. Monier-Williams, Raymond Ross, C. J. H. Stock.

An Ordinary Meeting followed the Annual Meeting, the President, Mr. Alfred Smetham, F.I.C., being in the chair.

The minutes of the previous Ordinary Meeting were read and confirmed.

Certificates were read for the first time in favour of Messrs. Jules Cofman-Nicoresti, Walter K. Fletcher, William Singleton, Francis G. H. Tate, James Darnell Granger, Ph.D., F.I.C., Russell G. Pelly, F.I.C., and Edward B. Maxted, Ph.D. (Berlin), B.Sc. (Lond.).

A Certificate was read for the second time in favour of Mr. W. R. Schoeller, Ph.D.

The following were elected Members of the Society: Messrs. Urban Aspey, Herbert Corner Reynard, B.Sc. (Lond.), A.I.C., Edwin Burnhope Hughes, B.Sc. (Lond.), A.I.C., Harry Jephcott, M.Sc. (Lond.), A.I.C., and Arnold Lees, A.I.C.

The following papers were read: "Extract of Red Squill (*Scilla maritima*) as a Rat Poison," by F. W. Smith, B.Sc., A.I.C.; "Iodimetric Determination of the Diastatic Power of Malts," by Julian L. Baker, F.I.C., and H. F. E. Hulton, F.I.C.; and "The Composition of Harrogate Mineral Waters," by W. Lowson, B.Sc., F.I.C.

OBITUARY.

It is with great regret that we have to record the following deaths:

Professor Émile Bourquelot (January 28).

Dr. J. C. Cain, Editor of the *Journal of the Chemical Society* (January 31).

Sir Charles A. Cameron, Past-President of the Society of Public Analysts (February 27).

Dr. William Odling, Hon. Member of the Society (February 17).

Obituary notices will be published in a forthcoming issue.

THE MINISTRY OF FOOD.

The Prime Minister announced in the House of Commons on February 17 that the Ministry of Food would be brought to an end before March 31.

The Food Orders still remaining in force include the following: Dripping (standard of quality), 1919; Edible Fats (standard of quality), 1919; Manufacture of Flour and Bread, 1918.

ANNUAL ADDRESS OF THE PRESIDENT.

(*Delivered at the Annual General Meeting, February* 2, 1921.)

It has been customary in the past for the President of the Society at the Annual General Meeting to bring under survey the activities of the members and the work and progress of the Society in the official year that sees its close at the Annual Meeting; and it thus falls to my lot to-day to review the proceedings of the past year. Following as I do in the footsteps of a long array of brilliant chemists and able administrators, I feel that the task of doing adequate justice to the subject is no light one, and I would that I could relegate the duty now imposed upon me to someone better fitted for the post; but since the address must in the main be a résumé of the work of others rather than an exposition of one's own views, I have greater confidence than I should otherwise feel in imposing my remarks upon you.

During the year ending December 31, 1920, the total number of members, including eleven honorary members, has increased from 448 to 454. New members elected number twenty-six, while we have lost eight members by death, eight members have resigned for various reasons, while three members have been removed for non-payment of their subscriptions.

The names of the deceased members whom we mourn are: William Beaverly Cowie, Walter William Fisher, James Wright Gatehouse, Alfred Howard, John Ruffle, Robert Tervet, Elwyn Waller (of New Jersey, U.S.A.), and Samuel Archibald Vasey.

Obituary notices have appeared in the pages of the Analyst of Walter William Fisher and James Wright Gatehouse.

Walter William Fisher was one of the oldest members of the Society of Public Analysts, and acted as its President in 1889 and 1890. He was Public Analyst for the counties of Oxford, Berks, and Bucks, as well as for the City of Oxford, which posts he held for nearly forty years, and to within a week of his death carried out actively the duties appertaining to the posts. We deplore his death, and the many members of the Society who knew him have to lament the loss of a staunch friend.

James Wright Gatehouse died on October 16, 1920, at Bath, at the age of seventy-nine. In 1877 he was appointed Public Analyst for the City of Bath, and, eleven years later, Public Analyst for Wiltshire. In addition to his duties as Public Analyst, he carried on a private practice and did much good work in various investigations.

By the death of John Ruffle I have lost a friend of over forty years standing. Although of a gentle and retiring nature he was a man of many parts, and did much useful work. He will be best remembered, perhaps, as the originator of the Ruffle method for the estimation of nitrates by the combustion process.

During the session twenty-three papers were read, while thirty-two papers and eight "notes" were published in the Analyst.

During the year 1920 the following papers appeared in the pages of the ANALYST :

"A New Method for Detecting Adulteration in Butter and for Estimating Fats of the Coconut Group." By George Van B. Gilmour.

"A New Process for the Estimation of Arsenic, with Notes on the Chemistry of the Marsh-Berzelius Process." By B. S. Evans.

"The Estimation of Mercury." By H. B. Gordon.

"An Investigation into the Composition of the Unsaturated Hydrocarbons present in Coal Gas." By F. S. Sinnatt and L. Slater.

"The Estimation of the Available Oxygen in Sodium Perborate and in Perborate Soap Powders." By H. Trickett.

"The Differentiation between Poor and Adulterated Milk." By T. R. Hodgson.

"Machine for Washing Precipitates." By Eric Sinkinson.

"The Detection of Finger-Prints on Documents." By C. Ainsworth Mitchell.

"Photomicrography with Simple Apparatus." By Thomas J. Ward.

"Note on the Solubilities of Theobromine." By Raymond V. Wadsworth.

"A New Method for the Estimation of Methyl Alcohol." By S. B. Schryver and Cyril Christian Wood.

"Note on Opium Poisoning." By E. H. Hankin and D. Chatterji.

"An Examination of Certain Milk Records." By G. W. Monier Williams.

"An Improved Slide Rule for Dairy Calculations." By H. Droop Richmond.

"The Examination of Chinese Crude Camphor." By E. R. Dovey.

"Estimation of the Age of Ink in Writing." By C. Ainsworth Mitchell.

"A Rapid Volumetric Method for the Estimation of Iron, Applicable in the Presence of Hydrochloric Acid, Phosphorus, Oxy-acids, and Organic Matter." By H. Droop Richmond and Edith M. Ison.

"The Estimation of Nitroglycerin." By H. Droop Richmond.

"The Effect of Pressure upon the Polenske and Reichert-Meissl Values." By Vincent H. Kirkham.

"The Composition of Milk in British East Africa." By Vincent H. Kirkham and A. C. Barnes.

"Note on the Refractive Indices of Mixtures of Isopropyl Alcohol and Acetone. By Dorothy Muriel Palmer.

"The Estimation of Codeine." By H. E. Annett and Haridas Sen.

"The Influence of the Free Fatty-Acid Content in the Valuation of Chinese Wood Oil by the Browne Polymerisation Test." By Philip E. Jameson.

"Apparatus for Evolution Methods of Analysis." By E. R. Dovey.

"An Improved Form of U-tube." By E. R. Dovey.

"A Study of the Determination of Potassium as the Perchlorate, and the Separation from Sodium, etc." By R. Leitch Morris.

"Notes on Rubber Analysis." By A. R. Pearson.

"An Improvement in the Haldane General Air Analysis Apparatus." By Robert C. Frederick.

"The Gravimetric Estimation of Bismuth as Phosphate and its Application in Ore Analysis." By W. R. Schoeller and E. F. Waterhouse.

"The Position of Analytical Chemistry in France." By L. Cofman.

"Statutory Standard for Ghee." By T. K. Ghose.

In addition to the papers published, the "Notes" on analytical methods and other matters have proved exceedingly interesting and useful, and I welcome this comparatively new departure as a distinct boon to analysts generally.

During the year thirty-two books have been reviewed in the pages of the ANALYST. In my opinion these Reviews have been wholly admirable. They have been fearlessly and faithfully done by experts in the subjects reviewed whose judgment is reliable. They have brought to my notice some books of sterling value, and in other cases have saved my pockets from being depleted of cash and my bookshelves from being overloaded with trash.

Before leaving the subject of the publications in the ANALYST, I cannot refrain from mentioning the loss which the Society has sustained by the resignation of Mr. Julian L. Baker as Editor of the ANALYST to assume the Editorship of the *Journal of the Institute of Brewing*. Mr. Baker has been Editor of the ANALYST for thirteen years, during the whole of which time the Journal has been admirably conducted, and each succeeding year, thanks to his assiduous attention and genius, has seen, I think it will generally be admitted, an improvement on the previous ones. Bowing to the inevitable, we very reluctantly relinquish him, knowing that what is our loss is his and others' gain.

Fortunately, we have been able to secure in Mr. Baker's stead a new Editor, Mr. C. A. Mitchell, who is well known to us by his scientific abilities, his literary merits, and his devotion to the Society and its publication. Mr. Mitchell as an author has a high reputation, and he has been an Abstractor for the ANALYST for a long time. To him we may look with confidence to maintain the high standard and traditions of our Journal.

It was with much satisfaction that we welcomed back our Hon. Treasurer, Mr. E. Hinks, who has returned safe and sound to resume his duties. At the same time I ought to voice the thanks of the Society to Mr. E. W. Voelcker as Acting Treasurer during Mr. Hinks's absence.

Before leaving this part of my subject, I should like to take this opportunity of congratulating one of our past Presidents (Mr. A. Chaston Chapman) on his election as a Fellow of the Royal Society.

We have to regret the prospective loss, by absence abroad—we hope for a comparatively short period only—of our old and faithful friend, Otto Hehner. Mr. Hehner is too well known to all of us to render it necessary for me to recall to your minds all the posts he has held and all the work he has done to further the interests of the Society and to advance the cause of analytical chemistry.

Of the many questions which have come before your Council for consideration one has been a motion to ascertain whether the present somewhat cumbrous title could not be modified in such a way as to include all the present members, while at the same time the prestige of nearly fifty years' strenuous work and endeavour under the old title could be preserved. Legal advice has been taken, and I understand that there is no legal difficulty in altering the name of the Society, and at the same time of preserving the privileges which we at present enjoy. It is not an easy matter to select a title which will be at once descriptive, inclusive, and euphonic; but there should be no insuperable difficulty in finding a solution.

The original title of the Society of Public Analysts has become so widely known and respected that in many ways it seems a pity to hide its identity under a new title: but as the term public analyst is limited by Act of Parliament to those analysts appointed under the Food and Drugs Act—and cannot, therefore, be appropriated by practising analysts generally—there seems no alternative but to change the name or continue as at present. Doubtless some happy solution of the problem will be evolved, but of the suggestions hitherto made none seem quite to meet my æsthetic taste. There is a crispness about our original title which seems to arrest the attention at once.

The fact that the proportion of analysts other than public analysts has been steadily increasing renders the alteration in the title, if it is to be descriptive of the objects of the Society, the more necessary, and as the number of public analysts is practically stationary, while the analysts engaged in general practice and in connection with trade and manufactures are steadily increasing and, with returning trade and prosperity, are bound to increase rapidly, it seems to me that if the alteration in title is necessary or desirable the present is an opportune time to make it.

I have said that the proportion of analysts other than public analysts is in the future likely to increase at a rapid rate, and I am basing the statement on a careful observation of commercial and manufacturing conditions for a period of over forty years. When I went into practice my work consisted for the most part of analyses to assist in the control of manufacturing processes, or to help purchasers to make a selection of produce sold practically on a flat rate: and very few of the analyses were sent under contracts, the price to be decided by the contents of the valuable constituent or constituents, as the case might be.

As the years went on and rule of thumb in manufactures was replaced by more scientific control, purchasers insisted on safeguards, especially when buying forward, and by gradual evolution in nearly every branch of industry. Safeguards in contracts are inserted, and in many instances these safeguards take the form of restrictions based upon analytical control.

Concurrently with the altered conditions in manufacturing methods, and the greater demand for more definite specifications with regard to quality, especially when the goods in question have been bought to arrive, the demand has arisen for increasing the safeguards against any inferiority in the produce which may be tendered in fulfilment of a contract. This desire on the part of the more progressive merchants and manufacturers has brought into existence a considerable number of combinations of diverse interests, who, forming themselves into associations representing their respective trades or businesses, have generally controlled the transactions, especially in the case of our overseas trade. Each year sees the framing of innumerable new contract forms, and the modification of old ones, and with the increase in the stringency of the demands on the part of buyers there has been necessarily an increase in the volumes of work falling to the lot of analysts in general. And if I read the signs of the time aright it seems to me that the tide having begun to flow in this direction it will continue to do so until a high-water mark has been reached and practically the whole of our commerce brought under scientific control. The employment of men of exceptional talent by companies and associations for the

pursuit of pure research, in contradistinction to the control of manufacturing processes or business transactions, is evidence sufficient to indicate that our leaders of commerce and industry are rapidly realising, thanks partly to work done by chemists and other scientists during the war, that research work is not only a necessary adjunct to a successful business enterprise, but is at the same time a highly profitable investment.

And I am glad to see this tendency on the part of leading business men to call to their assistance the best brains of our profession, because it must inevitably have a leavening effect on the general mass of business men who, in the past, have regarded chemists, not as a necessary controlling influence in the factory or in business, but as an unavoidable adjunct to the business side of their concerns.

The admirable work done during the war by so many members of our profession, both at home and abroad, and the important part played by the investigations and work of our chemists in finally winning the war, has brought home to the nation at large the immense importance and possibilities of chemistry, not only in fostering the interests of our own industries, but in advancing the cause of civilisation the world over. That the ever-increasing developments of chemistry should have been so directed as to have caused such world-wide havoc is greatly to be deplored, and it is to be hoped that the effects produced and the lessons learned will have throughout the ages the effect of teaching future generations the folly of diverting our beloved science from the arts of peace to those of war.

But to revert to my theme. The formation of the numerous bodies and associations, which I have referred to, has increased the volume of analytical work largely, and to that extent it is a good thing for the profession generally, but as the effect, so far as the commercial side of our work is concerned, is to increase the number of analyses of a similar nature there is a tendency to render a good deal of our work tedious and to some extent monotonous. In the nature of things such a result is almost inevitable, as with greater proficiency and greater experience in any particular direction the confidence of one's clients in one's work is sure to grow and, snowball-like, the volume of work is sure to increase, and thus the routine of the laboratory is too apt to assume the functions of something approaching a factory rather than the purely investigational work which we usually associate with a scientific laboratory.

In this respect, however, we are not far removed from the specialists in medicine or surgery who, after a long preliminary training, find themselves in the hey-day of their prosperity dealing with special cases day in and day out.

There is, of course, in addition to the purely routine side of a practice, a considerable amount of work of a highly technical and exceedingly interesting nature which breaks the monotony of life and gives a zest to one's daily occupations.

The point which I am aiming to make clear is that, although the tendency of the age is to make specialists of us all, care must be taken to found that specialisation upon a sound scientific basis, and to avoid drifting into mere machines in controlling a limited section of trade or industry. Up to the present the policy of the trade associations has been almost universally to entrust the analytical work to trained chemists who have won the confidence of the public; and I think it will be a bad day for the trades concerned and for our profession if, as has been proposed in some

cases and adopted in others, analysts are appointed at fixed salaries, or inadequate fees, to undertake the work of the associations I have referred to.

The question of professional fees, and the remuneration of chemists in general, is a somewhat complicated one, and there does not seem to be any way in which one or the other can be standardised. With regard to the fees charged by practising analysts, I think it will be generally agreed that before the war the charges made, even by leading men, were in many directions quite inadequate. This was partly due to a keen competition amongst chemists for what little outside analytical work was required in the earlier days, when the analyses were required for private information or control purposes. In some cases the fees were cut by men who had been inadequately trained, but as often no very great degree of accuracy was required, and very little opportunity was afforded of checking the results, there was no elimination of the least capable, and the competition of these with the better trained men kept fees at a low level. In this way in many branches of work fees became more or less fixed, and by a general understanding they had to be accepted, especially by the younger members of the profession. Once fixed for any particular analysis it was very difficult for the individual to raise the fees without the risk of losing the work altogether. Thus it has happened, in my case at all events, that a very considerable part of my practice was carried on at very little profit to myself.

With the altered conditions brought about as the result of the war it became imperative that a revision of fees should be made, and even the most altruistic of us were compelled by the force of necessity to raise our fees. The Institute of Chemistry made inquiry into the matter, and in the February number of the *Journal and Proceedings of the Institute* for 1920, stated that, as the result of their investigations, "the Council are of opinion that Fellows and Associates are justified in making a corresponding increase in their fees for professional services." Although unable to recommend any definite rate of increase over pre-war rates, the Council of the Institute state that an increase of 50 per cent. cannot be regarded as excessive, while some practitioners have doubled their fees. This practically is the attitude which I myself have taken, readjusting the fees according to the work involved, but it is a matter of doubt whether the increases made in the fees cover the extra costs involved under present conditions.

With regard to chemists employed in whole-time engagements, I am afraid that in many instances the increases in remuneration have not been commensurate with the enhanced value of their services and the extra cost of living: but it is to be hoped that with the efflux of time and the stabilisation of the exchanges, the burdens at present borne will gradually be removed, and adjustments made which will remedy the present hardships.

During the past year your Council has worked assiduously, and, under the able guidance of our Secretaries, has kept the business of the Society and the interests of its members constantly in review.

One Committee, consisting of Messrs. L. Archbutt, W. J. A. Butterfield, G. Nevill Huntley, and G. Rudd Thompson, appointed by the Council to consider the desirability of making provision for supplies of standard chemical substances, has transmitted to the Council of the Institute of Chemistry a Report a summary of which appeared in the September number of the ANALYST.

The Committee is satisfied that there is a demand for Analytical Control Standards, at present being chiefly met by private enterprise and by the importation of the U.S.A. Bureau of Standards Samples, and that the demand appears reasonable for checking and educational, rather than commercial purposes.

The Committee recommend that the Society of Public Analysts should take the initiative in forming a representative Analytical Standards Committee, and the Council of the Institute of Chemistry have concurred with that recommendation, and have nominated Mr. F. H. Carr, Dr. J. T. Dunn, Mr. Lewis Eynon, and Mr. F. W. Harbord to act as its representatives.

That standards such as have been prepared or proposed would prove a great service, especially for educational purposes, scarcely admits of a doubt : but when it is suggested that these standards should be analysed side by side with commercial samples submitted for analysis, and that the fact should be stated on the certificate, I am very clearly of opinion that such use would be detrimental to the profession, and damage its prestige. In most cases the materials for which standards would be prepared would be commercial products, the analyses of which are almost invariably placed in the hands of experts, who are past-masters in the particular branch of analysis. To make any statement such as that suggested would be tantamount to an admission of incompetency.

And now, in conclusion, I have to express to our indefatigable and ever courteous Secretaries, Mr. P. A. Ellis Richards, and Mr. E. Richards Bolton, the deep debt of gratitude under which I have been placed by their many kindnesses and invaluable promptings, both with regard to procedure and policy, during the year now coming to an end.

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THE TIME FACTOR IN SAPONIFICATION.

By PERCIVAL J. FRYER, F.I.C.

(*Read at the Meeting, November*, 1920.)

Various conflicting statements have been made by observers with regard to the relative velocities of saponification of natural oils and fats under identical conditions of solvent, temperature, saponifying reagent, etc.

Thus, in the case of hydrolysis of castor bean ferment Urbain, Saigon and Feige came to the opinion that the saponification of various glycerides proceeds at the same rate (*Bull. Soc. Chim.*, **31**, 1194). Haller, on the other hand, was of opinion that glycerides of the lower fatty acids were more readily hydrolysed than those of the higher fatty acids (*Compt. rend.*, 1906, **143**, 660).

As far as the writer is aware, the only research which has been carried out using an alkali such as potassium hydroxide as a saponifying reagent for the natural oils and fats is that by Anderson and Brown (*Journ. Phys. Chem.*, 1916, **20**, 195-213), and it was mainly with a view to confirming or disproving the results obtained by those

investigators that the present research was carried out. There was also the possibility of basing an analytical test for the discrimination of oils and fats on the results obtained, in case individual oils and fats showed sufficient divergence for the purpose.

Anderson and Brown state that they find that the fats and oils investigated were all saponified at approximately the same rate, but they also conclude that the velocity increases slightly with the increase of the molecular weights of the glycerides. It is, however, fair to add, that they modified this statement by suggesting that such an apparent relationship may be due to experimental errors. Unfortunately, this comparison was based upon results with only four oils—namely, cottonseed, croton, olive, and castor—and although the velocity of saponification of butter fat was also investigated, apparently only one determination was made, and for some reason the result obtained was disregarded in arriving at their deductions. The method used by Anderson and Brown, was, in the author's opinion, unlikely to give results of sufficient accuracy on which to base conclusions as to the relative velocity of oils which resemble each other fairly closely. Thus, they did not weigh their oil, but measured it only, and no temperature is given at which the oil was pipetted. Further, it is not stated what means were taken to remove the residue of viscous oils, such as castor, which would remain in the pipette, unless special means were taken to flood the latter.

The conclusion arrived at by the writer as the result of the present investigation is that the exact opposite of the above relationship must be taken as correct—namely, that the velocity of saponification of oils and fats from the point of view of the amount of free alkali removed from the reacting solution is in inverse ratio to the saponification equivalent or to the mean molecular weight of fatty acids of the glycerides composing the natural oils and fats.

The statement is made in this form because previous investigators, including Anderson and Brown, have, in all cases, measured the velocity of saponification in terms of the free alkali removed from the solution by the glyceride. In terms of the weight of oil or fat employed, the results show that all oils and fats, and in all probability all esters, of whatever constitution, are saponified at approximately equal rates under the same conditions. Thus, using a given solvent and a given concentration of potassium hydroxide, the same percentage of the weight of an oil such as coconut is saponified in a given time as in the case of, say, rape oil, but in terms of the free alkali absorbed the former case shows much more rapid velocity of saponification than the latter. Incidentally, it may be here pointed out that the results obtained by Anderson and Brown with butter fat, which is the only oil or fat employed containing glycerides of low molecular weight, confirmed the author's work, and show a proportionately higher velocity of saponification, although, as previously stated, the authors appear to ignore this in their deductions.

In their investigation as to the nature of the reaction (which they prove to be bimolecular in character) they obtained comparative results with methyl acetate, and the figures given show that this ester also conforms to the rule stated above—namely, that the velocity of saponification is in inverse ratio to the molecular weight, from the point of view of the saponifying reagent, or, in terms of the weight of ester, is saponified at a rate uniform with all other esters.

In a recent investigation, Franck (*Seifen Fabr.*, 1920, **40**, 293-4) ascertained the relative velocities of saponification of linseed oil, its glycol ester, and its ethyl ester, the two latter synthetically prepared, but found that there were small differences in the speed of the reaction, the relative velocities being in the order: (1) Linseed oil; (2) glycol ester; (3) ethyl ester.

Here, again, the relative velocity appears to be in the inverse order of the molecular weight.

The oils and fats employed in this investigation were typical of the various groups of oils and fats as follows:

Marine oils		Whale oil.
Drying oils		Linseed.
Semi-drying oils		Cotton.
Non-drying oils	Group I.	Rape.
	Group II.	Olive.
	Group III.	Castor.
Vegetable fats	Group I.	Cacao butter.
	Group II.	Palm oil.
	Group III.	Coconut oil.
Animal fats	Group I.	Tallow.
	Group II.	Butter fat.

The author's work confirmed that of previous investigators, in showing that the velocity was influenced very greatly by small differences in temperature. To such an extent is this the case that it appears very difficult to obtain reliable comparative results, unless all the oils investigated are saponified side by side, under identical conditions as to temperature. Thus, an increase of about 7-8° in temperature results in doubling the velocity of saponification. As regards the effect of the solvents on the velocity of saponification, the alcohols show an increased velocity in direct proportion to their molecular weights: thus the velocity as given in ethyl alcohol is over ten times that in methyl alcohol, and in amyl alcohol is about double that in ethyl alcohol.

If amyl alcohol be used, no other solvent need be employed for the oil or fat; the only oil which can be saponified in solution, using ethyl and methyl alcohols, is castor oil. The solvent employed in the author's investigations of the comparative velocities of the typical oils and fats was a mixture of ether and absolute alcohol, in which they all readily dissolved.

The velocity is also increased by an increase in the concentration of alkali, and the effect of this increase in alkali is less pronounced if water is present with the alcohol. This latter is obviously due to the different degree of ionisation of the potassium hydroxide.

Laboratory Test.

As a comparatively simple and rapid test, involving no heating or special apparatus, one on the following lines might be found of some utility.

A convenient quantity, say 2 grms., of the fat to be examined is weighed out into a flat-bottomed flask of, say, 100 c.c. capacity. This is dissolved in, say, 20 c.c. of ether and securely corked. The same weight of a pure ester (for convenience

amyl acetate) is weighed out and dissolved separately in the same volume of ether. To each is added an equal volume (say, 25 c.c.) of $\frac{N}{2}$ alcoholic potassium hydroxide solution (all the liquids should be at identical temperatures, and remain so); the two flasks are then securely corked and allowed to stand for, say, thirty minutes. At the end of this time an accurately measured excess of $\frac{N}{2}$ hydrochloric acid is run into each and the mixture back-titrated with $\frac{N}{2}$ alkali.

The mean molecular weight of the glycerides of the oil is then ascertained by comparison with the known molecular weight of amyl acetate, or the result may be expressed in terms of the saponification value, given that of amyl acetate as equivalent to 637·5.

IODIMETRIC DETERMINATION OF THE DIASTATIC POWER OF MALTS.

By JULIAN L. BAKER, F.I.C., and HENRY F. EVERARD HULTON, F.I.C.

(*Read at the Meeting, February* 2, 1921.)

The determination of diastase in malt cannot, as is well known, be made directly, but is always effected by measuring the capacity of the enzyme to produce sugar from starch. This reaction was first put on a scientific and quantitative basis by Kjeldahl (*Comptes rend. Trav. Lab.*, Carlsberg, 1879, **1**, 109–157), who formulated his well-known "law of proportionality" as follows:

"The relation between two malt extracts (and consequently between two malts) as regards their diastatic powers may be expressed by the copper oxide reducing powers which they exhibit when both act on the same quantity of starch at the same temperature, provided the copper oxide reducing power, $k = 25$–30, is not exceeded."

Since it is customary in modern starch work to express reducing powers in terms of maltose (R), and not dextrose (k), it may be stated that k 25–30 = R (maltose) 40 to 48.

The method now in general use is that of C. J. Lintner (*Zeitsch. ges. Brauw.*, 1885, **8**, 281), which is based on Kjeldahl's work, and involves the use of Lintner's soluble starch (*J. prakt Chem.*, 1886, 2, **34**, 378–394). By this method malt is said to have a diastatic capacity Lintner of 100 when 0·1 c.c. of 5 per cent. cold water extract of the malt, if allowed to act for one hour at 70° F. upon 10 c.c. of 2 per cent. soluble starch solution, produces enough maltose to reduce completely 5 c.c. of Fehling's solution.

The working details of the Lintner "tube" method (*loc. cit.*) are so well known that a description in this paper is unnecessary, as are also those of the modification devised by A. R. Ling and adopted by the Malt Analysis Committee of the Institute of Brewing (*J. Inst. Brew.*, 1906, **12**, 6). The latter method has now been in general use in most laboratories associated with the fermentation industries for many years with entirely satisfactory results. The point of complete reduction of the Fehling's solution, even when using the thiocyanate indicator described by Ling and

Jones (ANALYST, 1908, **33**, 161) may present, however, some difficulties to those who only occasionally determine the diastatic activity of materials, and we consider the process we are about to describe is easier, as the end point is indicated by the disappearance of the characteristic blue of starch iodide.

It is known that maltose is oxidised quantitatively to maltobionic acid by iodine in presence of caustic soda (Judd, ANALYST, 1920, **45**, 224; Baker and Hulton, *Biochem. J.*, 1920, **14**, 754). Another method thus becomes available for the determination of diastatic capacity, as the maltose formed by the action of the diastase can be determined iodimetrically. Miss Judd and we (*loc. cit.*) find that 1 grm. of anhydrous maltose requires 0·745 grm. of iodine for oxidation to maltobionic acid—*i.e.*, 1 c.c. of $\frac{N}{10}$ iodine is equivalent to 0·017 grm. of maltose, and 5 c.c. Fehling are equivalent to 2·4 c.c. $\frac{N}{10}$ iodine. In practice excess of iodine is employed, and the iodine used up is determined by titrating back with $\frac{N}{20}$ sodium thiosulphate in the usual manner. The excess of soluble starch remaining in the products of the action of diastase on starch serves as an indicator in the titration, and a sharp end point is obtainable with 0·05 c.c. of $\frac{N}{20}$ sodium thiosulphate.

In using the iodimetric method the preliminary stages should be carried out exactly as in the Ling modification—*i.e.*, 1, 2, or 3 c.c. of extract are allowed to act for one hour at 21° C. on 100 c.c. of 2 per cent. soluble starch. The action is stopped at the end of the one hour by adding 10 c.c. of $\frac{N}{10}$ caustic soda solution; the whole is then diluted to 200 c.c. For the titration 50 c.c. of the conversion products are placed in a wide-mouthed stoppered vessel; 20 c.c. of $\frac{N}{10}$ iodine solution are then added, followed by 30 c.c. of $\frac{N}{10}$ caustic soda, the whole allowed to stand for ten minutes at air temperature, then acidified with 4 c.c. of $\frac{N}{1}$ sulphuric acid, and the excess iodine found by titrating with $\frac{N}{20}$ sodium thiosulphate solution. If these conditions are adhered to, the diastatic capacity may then be found from the formula: $D.P. = \frac{16{\cdot}7\ Y}{X}$, where Y = c.c. of $\frac{N}{10}$ iodine used up in oxidising the maltose, and X = c.c. of 5 per cent. malt extract originally taken for the conversion.

TABLE I.

R (Maltose Percentage on Starch).	$\frac{R}{N}$ (N = c.c. of Diastase Solution employed).	Percentage fall in Diastatic Power.
13	12·7	—
24	12·0	5·5
34	11·7	7·9
40	11·5	9·4
45	11·0	13·4
61	10·2	20
68	6·5	50

To check the reducing power (R) of the conversion when 50 c.c. are used for the iodimetric determination as above, the value may be found from the formula

$R = Y \times 3{\cdot}4$. From this it is evident that if Y exceeds 10, then R will exceed 34 How important it is to be sure that this limit is not exceeded will be seen from the figures in Table I., obtained from an ordinary pale malt, which show that at R 34 there is already a fall in the diastatic power of 8 per cent. as compared with the diastatic power found when the reducing power as maltose is not allowed to exceed 13.

The expression $\frac{R}{N}$ should be a constant if the maltose formed is a linear function of the quantity of diastase present, but this is never quite the case, although the departure is but slight in the earlier stages. Special stress is laid on this point, since it is often overlooked by writers on the subject (ANALYST, 1910, **35**, 360; 1920, **45**, 453).

The volume of conversion used (50 c.c.) for the titration may, of course, be halved, in which case 10 c.c. of $\frac{N}{10}$ iodine and 15 c.c. $\frac{N}{10}$ NaOH would be sufficient, and the necessary corrections must then be made in the formulæ.

In Table II. will be found the results of some determinations made by the Ling and iodine methods, a portion of the same conversion products being tested both with iodine and Fehling's solution.

TABLE II.

	R (Maltose per Cent.).	Diastatic Power.	
		Ling.	Iodine.
Pale Ale English malt	16	40·8	39·6
Pale Ale English malt	21	34·5	34·5
English Mild Ale malt	19	31·8	32·0
Californian malt	19	31·8	31·5
American malt	21	105·3	106·7
Green malt (5 days' germination) ...	34	55·5	56·0
Malted rye	9	87·0	86·7

It will be seen that a diastatic value is assigned to a sample of green malt. Doubt has been cast upon the applicability of the Kjeldahl law of proportionality to such material (Ling, *J. Inst. Brew.*, 1902, **8**, 444), since it has been stated that the $\frac{R}{N}$ value (see Table I.) falls somewhat rapidly. We have not investigated this point in the case of green malt, but have found (*J. Soc. Chem. Ind.*, 1908, **27**, 370) that both wheat and barley flour show a more marked fall in the value of this constant than is the case with barley malt. The fact that maltase occurs as an endocellular enzyme in green malt (Davis, *Biochem. J.*, 1916, **10**, 31–48; also Daish, *ibid.*, 1916, **10**, 56–76) may possibly account for this discrepancy since any formation of dextrose from maltose—if it occur—will upset the linear relationship of "apparent maltose" to "enzyme present" upon which the Kjeldahl law is based.

In conclusion, it may be stated that neither the Fehling nor the iodine method is accurate if any reducing sugar other than maltose be formed in the course of the conversion, as is the case, for example, with taka diastase, where both maltose and

dextrose are formed (ANALYST, 1914, **39**, 312; 1920, **45**, 141 and 453). Since both these sugars react with Fehling's solution and with iodine and the percentage amount of each sugar present varies with the stage of the conversion, it is evident that the reducing power alone of the solution cannot be a measure of the quantity of enzyme present.

The advantages claimed for the iodine method are the greater accuracy with which the iodine titration may be carried out as compared with Fehling's solution, the elimination of an external indicator, and that artificial light can be used for the final titration.

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NOTE.

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.

ZEISS BUTYRO-REFRACTOMETER—SETTING OF SCALE.

DURING the war it was impossible to obtain a standard liquid for setting the scale, but now a standard liquid paraffin of refractive index 1·474 at 15° C. is procurable. As 15° C. is not a convenient temperature for standardisation, readings were taken at other temperatures with the standard paraffin, the refractive index of which was kindly confirmed by Professor G. T. Morgan at the Birmingham University.

In the table below the figures under "A" were obtained with the liquid paraffin, the scale being set at 72·7 at 15° C., which is equivalent to refractive index 1·474; those under "B" with the same scale setting, and with the standard fluid obtained from Messrs. Zeiss about eight years ago. Fresh fluid was used for each reading, as continued heating may cause alteration in the reading.

The figures under "C" for 15°–30° C. are taken from the pamphlet supplied by that firm, whilst the other figures are calculated on the assumption that the alteration of values is in the same straight line.

C	A.	B.	C.
15°	72·7	78·2	77·3
20°	69·5	75·2	74·3
25°	66·5	72·1	71·2
30°	63·3	68·9	68·1
35°	60·5	65·8	65·1
40°	57·7	62·8	62·1
45°	55·0	60·0	59·1

The values under "B" and "C" should be identical, but there was a difference of nearly a unit. Therefore, a refraction obtained with an oil would be nearly a unit lower if the Zeiss fluid had been used for setting the scale than if the paraffin had been used. Whether these differences are due to the Zeiss liquid having deteriorated or to an original error in its composition, we are unable to say.

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ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

FOOD AND DRUGS ANALYSIS.

Detection of Beef Fat in Lard. Vitoux and C. F. Muttelet. (*Ann. Falsif.*, 1920, **13**, 593-601.)—As shown by Bömer (ANALYST, 1913, **38**, 204), lard contains α-palmitodistearin, m.-pt. 68·5° C., and beef fat β-palmitodistearin, m.-pt. 63·3° C. For the detection of beef fat in lard, the authors propose a method which depends on the crystallisation of a fraction from the fat under examination, the m.-pt. of this fraction showing which of the two above-mentioned glycerides predominates. Fifty grms. of the fat are dissolved in 50 c.c. of acetone, the mixture being heated slightly to aid solution, and then allowed to cool and, after one hour, the crystalline mass is collected on a filter. As much as possible of the liquid is removed by suction; the crystals are then dried over sulphuric acid and recrystallised from 50 c.c. of ether, and the new crystals collected and dried. In the case of pure lard the m.-pt. of the crystals lies between 62° and 65° C., whilst the crystals obtained from beef fat melt at about 58·5° C. If a portion of the crystals be saponified and the fatty acids liberated and separated, their m.-pt. will be about 58° C. for lard, and 55° C. for beef fat. For pure lard, the expression $2G - A$ is not less than 68; G is the m.-pt. of the crystals and A that of the fatty acids. W. P. S.

Prickly Pear Seed Oil. S. Lomanitz. (*J. Ind. Eng. Chem.*, 1920, **12**, 1175.)—The seeds yielded 11 per cent. of a greenish-yellow, semi-drying oil, having the following characters: Specific gravity at 15·5° C., 0·9294; refractive index at 40° C., 1·46764; acid value, 3·09; saponification value, 189·5; iodine value, 116·3; Reichert-Meissl value, 2·8; insoluble fatty acids, 93·8 per cent. W. P. S.

Identification of Soya Bean Oil. C. A Newhall. (*J. Ind. Eng. Chem.*, 1920, **12**, 1174-1175.)—Five c.c. of the oil are shaken thoroughly with 5 c.c. of chloroform, a few drops of gum arabic solution, and 5 c.c. of 2 per cent. uranium nitrate or uranium acetate solution. Crude and refined soya bean oil yields a characteristic lemon-yellow emulsion, whilst earthnut oil, cottonseed oil, sesamé oil, rape oil, coconut oil, etc., give a white or slightly coloured emulsion. The test will detect the presence of 5 per cent. of soya bean oil in these oils. With linseed oil the test is not so sharp, since linseed oil gives a slightly brownish emulsion. The yellow emulsion is not obtained with bleached and deodorised soya bean oil or soya bean oil fatty acids. W. P. S.

Oils from Chinese Colza Seed (*Brassica campestris chinoleifera*). **A. Viehoever, J. F. Clevenger, and C. O. Ewing** (*Jour. Agric. Science*, 1920, **20**, 117-139.—The volatile oil was prepared by macerating the ground seed for two hours at 37° C., distilling it with steam, saturating the distillate with sodium chloride and extracting it with ether. The ethereal solution was dried by means of anhydrous sodium

sulphate, distilled to remove most of the ether, and exposed to air to allow the remaining ether to evaporate spontaneously. The residue obtained had a sp. gr. of 0·960 at 25° C., and distilled between 165° and 172° C. at 754 mm. Determination of the composition and constants of the thiourea and phenylthiourea compounds of the oil showed it to consist of crotonyl isothiocyanate. The fixed oil obtained by expression of the seeds had the following characteristics: Sp. gr. (25° C.) 0·9097; iodine value (Hanus) 100·3; saponification value 174; refractive index (25° C.) 1·4695; and Hehner value 96·1 per cent. The insoluble acids had a neutralisation value of 172·6, mean molecular weight 325, and iodine value 104. The percentage of liquid acids present was 75·82, and of solid acids 19·52, these having an iodine value of 55·2. The seeds contain 0·4 to 0·6 per cent. of volatile oil, and from 40 to 50 per cent. of fixed oil. The paper contains a botanical description of Chinese colza and its seeds, and is illustrated by numerous photographs. T. J. W.

Orange Vinegar: Its Manufacture and Composition. H. D. Poore. (*J. Ind. Eng. Chem.*, 1920, **12**, 1176–1179.)—Brief descriptions are given of the two processes used to produce orange vinegar, one in a small way by the barrel or roller method, and the other on a larger scale by the well-known acetifier method. The composition of the orange-juice, the fermented juice and vinegar prepared from the same by the acetifier method, is shown in the following table, the figures representing grms. per 100 c.c., except for the alcohol, which is per cent. by volume:

	Fresh Juice.	Fermented Juice.	Vinegar.
Total acid, as citric acid	1·14	1·13	—
Total acid, as acetic acid	—	—	4·74
Fixed acid, as citric acid	1·12	1·03	1·07
Volatile acid, as acetic acid	—	0·09	3·74
Total solids	13·39	3·64	4·34
Total sugars, as invert sugar	9·91	—	0·20
Alcohol	—	5·73	0·43
Total ash	—	0·48	0·61
Water-insoluble ash	—	0·10	0·17
Water-soluble ash	—	0·38	0·44
Alkalinity of soluble ash (c.c. of $\frac{N}{10}$ acid per 100 c.c.)	—	51·20	55·20

Orange vinegar resembles apple vinegar in colour, odour, and taste; the total acidity of the two classes of vinegar is about the same, but orange vinegar contains more fixed acid. Orange vinegars made by the barrel method are rather higher in acidity. W. P. S.

Estimation of the Extract of Coloured Malts. C. G. Matthews. (*J. Inst. Brewing*, 1921, **27**, 22–25.)—The following method is advocated by the author for the analysis of "crystal" and black malts in preference to that adopted by the Institute of Brewing, Malt Analysis Committee (*J. Inst. Brewing*, 1906, **12**, 6), on the

grounds that the latter method requires much time, a large quantity of standard malt, and tends to yield low results, besides giving variable extracts in the hands of different analysts: Forty grms. of standard malt, having a diastatic power between 35° and 45° Lintner, are ground in a Seck mill set to 25° and mixed with 10 grms. of the malt under examination ground in a similar manner (black malts may also be ground in a coffee-mill without any effect upon the final result). The mixture is mashed, cooled, and filtered according to the Committee's method, and the extract and colour determined in the usual manner by appropriate calculation. The use of a standard malt having a diastatic power above 55° Lintner yields abnormal results by both methods. Four tables giving the results of experiments obtained with different malts and with various modifications of method indicate that the procedure recommended by the author is reliable. T. J. W.

Bracken Rhizomes. J. Hendrick. (*Chem. News*, 1921, **122**, 5–7.)—Bracken rhizomes resemble potatoes in composition, but the "soluble carbohydrates" of the former consist largely of substances of undetermined nature. Meal prepared by drying the rhizomes in a kiln and grinding was found to have the following composition: Moisture, 9·81; ether extract, 2·54; albuminoids, 9·56 (containing total nitrogen, 1·53, and protein nitrogen, 1·49); soluble carbohydrates, 41·26; fibre, 20·49; and ash, 16·34 (containing 11·26 per cent. of siliceous matter). Preliminary feeding experiments upon animals are described which indicate that the rhizomes may be of use for maintenance purposes, but are not very palatable to certain classes of stock. T. J. W.

New Reagent for Bitter Lactarius and Russula Species. Barlot. (*Comptes rend.*, 1921, **172**, 87–89.)—With various fungi, methyl (or other) alcoholic solutions of methyl chloroantimonate containing 20–30 per cent. of chlorine give colorations, which are especially pronounced with *Lactarius* and *Russula*, the bitter species of these two genera behaving similarly. Thus, any part of the carpophore of *Russula emetica* or *Lactarius piperatus* assumes an intense leaden-grey coloration after contact for a few seconds with the reagent. The bitter principles of these two species were isolated, and appear to be identical. All the bitter *Russulæ* give a similar coloration with varying intensity, whereas the edible species either produce no colour or else gradually give rise to a transient blue coloration. *Russula rosea* forms an exception, yielding immediately an intense grass-green coloration. T. H. P.

Estimation of Acetic Acid in Pyroligneous Acid. V. E. Grotlisch. (*J. Ind. Eng. Chem.*, 1920, **12**, 1183-1186.)—The method consists in distillation of the acetic acid with xylene, neutralisation of the distillate, and oxidation of the distilled impurities (tars, phenols, aldehydes, etc.) with permanganate; after removal of the oxidised impurities, the residual sodium acetate is distilled with phosphoric acid as usual. Ten c.c. of the sample are distilled with 120 c.c. of xylene (pumice-stone being added), until the distillate measures about 75 c.c., consisting of 10 c.c. of an aqueous layer and 65 c.c. of xylene; the distillate is diluted with water and titrated with $\frac{N}{2}$ sodium

hydroxide solution, phenolphthalein (in methyl alcohol) being used as indicator. The xylene is then separated, and the aqueous portion is evaporated to 70 c.c.; 100 c.c. of water are added, the mixture again evaporated, and these operations are once more repeated. The residual solution is rendered slightly alkaline and potassium permanganate is added, the mixture heated on a water-bath for several hours, then cooled, diluted to 300 c.c. and filtered; 200 c.c. of the filtrate are evaporated to 75 c.c., cooled, a few drops of sulphuric acid and hydrogen peroxide are added, followed by a slight excess of barium hydroxide solution; the mixture is evaporated to a small volume and filtered, the filtrate is distilled with the addition of phosphoric acid, and the acetic acid in the distillate is titrated. W. P. S.

Review of Tests for Methyl Salicylate in Gaultheria and Birch Oils. C. H. LaWall. (*Amer. J. Pharm.*, 1920, **92**, 891-895.)—Since oil of gaultheria contains 99 per cent., and oil of birch over 99·5 per cent., of methyl salicylate, it is improbable that any infallible method exists for detecting the presence of one of these oils, even in large proportion, in the other. The only likely distinguishing reactions are colour reactions, which are usually uncertain, and, when used for quantitative purposes, rarely accurate. These observations apply to the suggestion to treat the oils with reagents for furfuraldehyde; with aniline acetate, for example, gaultheria oil gives an immediate intense red coloration, birch oil a pronounced red coloration, more slow to appear, and methyl salicylate a negligible reaction. With mixtures, however, such a test is valueless, and is easily defeated by the addition of a small proportion of furfuraldehyde to the methyl salicylate used as adulterant. The negative optical rotation required of gaultheria oil by the U.S. Pharmacopœia does not appear to be a distinctive character of this oil. T. H. P.

Estimation of Hydrocyanic Acid. R. L. Morris. (*Amer. J. Pharm.*, 1920, **92**, 908-916.)—The results of the author's experiments show that, when properly conducted, Liebig's method for estimating cyanides by titrating the alkaline cyanide solution with standard silver solution gives quite satisfactory results. Deficiency of sodium hydroxide in the solution leads to low results, whilst any great excess of the alkali delays the end point and thus causes high results. The uncertainty occurring when too much alkali is employed may be avoided by replacing the sodium hydroxide by borax solution as proposed by Guérin (1906). Comparison of the B.P. process with that of the U.S.P. and the French Codex shows that the first apparently prescribes too little potassium iodide; if, however, the amount of the latter be increased two or three times the process agrees well with the gravimetric results.

T. H. P.

Content of Aconitine in some Samples of Tincture of Aconite Leaves. A. Richaud. (*J. Pharm. Chim.*, 1921, **23**, 15-16.)—Estimation by the silico-tungstic acid method of the aconitine in four samples of tincture of aconite leaves obtained from four of the best-known druggists in Paris gave the respective amounts per grm. as: 0·409, 0·172, 0·139, and 0·167 grm. T. H. P.

Method for the Assay of Aconite Preparations. E. J. Chappel and N. L. Allport. (*Amer. J. Pharm.*, 1920, **92**, 922–923.)—In the assay of tincture and liniment of aconite, first made official in the 1914 edition of the British Pharmacopœia, the analyst is left to base his process upon that described for the root, the liquid preparation being evaporated to dryness at a temperature not exceeding 60° C., and the solid residue then dissolved in $\frac{N}{50}$ sulphuric acid. Since filtration of the resulting solution is often very slow, and since, also, extraction of the unfiltered acid liquid with ether yields troublesome emulsions, the authors have tried petroleum spirit with good results. Fifteen c.c. of the liniment, or 100 c.c. of the tincture, are evaporated at a low temperature to remove the bulk of the alcohol, the residue treated with 5 c.c. of 10 per cent. sulphuric acid solution diluted with 20 c.c. of water and the whole transferred to a separating funnel with the help of a glass rod to break the separated resin; the dish is then rinsed carefully with a little water. About 20 c.c. of petroleum spirit (b.-pt. 40°–60° C.) are introduced into the funnel and the latter shaken, rapid separation occurring; the aqueous liquor is drawn off and again shaken with petroleum spirit, the two petroleum liquors being then mixed and washed twice with water, and the washings added to the acid liquid, which is then rendered alkaline with ammonia and extracted four times with ether. The ethereal extracts are washed successively with the same portion of water, after which they are run into a flask and evaporated to dryness. The alkaloidal residue is dried at a low temperature to ensure removal of ammonia, and then titrated in the usual manner. The process may be applied to the assay of the root by first preparing a tincture as directed in the Pharmacopœia. The results furnished by this modified method are to all intents and purposes identical with those given by the more lengthy B.-P. process. T. H. P.

Chemistry of Digitalis. H. C. Hamilton. (*J. Ind. Eng. Chem.*, 1920, **12**, 1180-1181.)—The author has isolated two active principles from digitalis, one substance being soluble in chloroform and the other insoluble; the insoluble substance is more active, physiologically, and there appears to be a tendency for the soluble substance to become less soluble on repeated applications of the solvent. Attention is directed to the difficulty of separating chloroform-soluble constituents from those insoluble in chloroform and of proving the latter to be less well adapted to therapeutical use. W. P. S.

BACTERIOLOGICAL, PHYSIOLOGICAL, ETC.

Colostrum. C. Porchet and L. Panisset. (*Comptes rend.*, 1921, **172**, 181–183.)—Colostrum is considered to be a residue of milk which has been formed previously in the udder and is the result of leucocytic action. The lactose is re-absorbed rapidly, proteins more slowly, and the fat remains. These changes may be observed when milk is injected into the peritoneal region of guinea-pigs, but in this case the products are not affected by the continual secretion of fresh quantities of milk as occurs in the udder. The residual fat globules, particularly the smaller ones, combine with the leucocytes yielding clusters of cells known as Donné's "corps granuleux," which are characteristic of colostrum. W. P. S.

An Epidemic of Ropy Milk. H. A. Harding and M. J. Prucha. (*Univ. of Illinois, Agric. Exper. Stat., Bull.* No. 228, June, 1920.)—During the summer of 1919 the attention of the authors was drawn to a severe outbreak of ropiness in milk which assumed the character of an epidemic, as it involved more than one hundred farms. The cause was not definitely ascertained, but the organisms causing the ropiness were found in the water supply, and this infected the dairy utensils. Disinfection of the latter and of the cowsheds usually results in the disappearance of the trouble. The organisms are destroyed at 130° F., and if milk be pasteurised for thirty minutes at this temperature it will not become ropy, although it may have been infected. W. P. S.

Influence of the Diet of the Cow upon the Nutritive and Anti-scorbutic Properties of the Cow's Milk. R. A. Dutcher, C. H. Eckles, C. D. Dahle, S. W. Mead, and O. G. Schaefer. (*J. Biol. Chem.*, 1920, **45**, 119-132.)—From feeding experiments upon a Jersey and a Holstein cow, described in detail, the conclusion is drawn that the vitamin content of cow's milk depends upon the proportion of vitamin in the fodder. It was found that 20 c.c. of summer milk were superior in nutritive value and anti-scorbutic power to 60 c.c. of winter milk.

Relation of Fodder to the Anti-scorbutic Power and Salt-Content of Milk. A. F. Hess, L. J. Unger, and G. C. Supplee. (*J. Biol. Chem.*, 1920, **45**, 229-235.)—Five Holstein cows were fed for three weeks on dry fodder and then placed on pasture, with the addition of concentrated food, for three weeks. The milks at the close of the two periods differed to a pronounced extent in their content of anti-scorbutic vitamins, as indicated by the results of feeding experiments on guinea-pigs. The composition of the milk as affected by the fodder is shown by the following percentage results:

	Water.	Total Solids.	Fat.	Total Proteins.	Casein.	Albumin.	Lecithin.	Lactose.	Citric Acid.	Ash.	P_2O_5.
Anti-scorbutic-free fodder	88·38	11·62	3·37	2·82	2·28	0·42	0·069	4·73	0·08	0·606	0·158
Pasture	88·19	11·81	3·44	2·93	2·32	0·49	0·7	4·56	0·13	0·670	0·190

In view of the pronounced variation in the amount of citric acid in the two milks, the conclusion is drawn that normal figures which have been established without regard to the fodder of the cows must be regarded as incomplete. The results also show the danger of setting up rigid standards for milk constituents without full data as to the food of the animals.

Growth promoting Factors in Lower Vegetable Organisms. P. Goy. (*Comptes rend.*, 1921, **172**, 242-244.)—Yeasts, mould fungi, and bacteria contain a growth-promoting substance which is distinct from the vitamins *A* and *B* in higher plants. This substance, as isolated from a culture of *Mucor mucedo* by extraction with ether, and purified by crystallisation, is a carbon compound free from phosphorus and nitrogen. It melts at about 175° C., and is not precipitated by phosphotungstic

acid. It only exerts its growth-promoting function after its solution has been heated to 85°-90° C., and loses its power at about 168°-170° C. Analogous results have been obtained by means of extracts of vegetable tissues, only the juice of the lemon and orange being active without previous heating. This substance has also been found in decorticated rice. It is not indispensable to the life of lower vegetable organisms, but has a pronounced stimulative action upon their growth.

Globulin from the Cohune Nut. C. O. Johns and C. E. F. Gersdorff. (*J. Biol. Chem.*, 1920, **45**, 57-67.)—Cohune nut globulin has been isolated by dialysis, and found to contain all the basic amino acids known to exist in proteins, being particularly rich in arginine and lysine. Tryptophane is also present. Cohune nut globulin closely resembles coconut globulin in composition.

Detection of Castor Oil Seeds in Feeding Cake. C. Brioux and M. Guerbet. (*Ann. Falsif.*, 1920, **13**, 150-160.)—The presence of castor seed as an impurity in oil cake may be detected by microscopical examination of the residue, and particularly the black particles left after repeated extraction of the powdered cake with boiling 2 per cent. potassium hydroxide solution. The distinctive appearance of the husk of the castor seed may be readily recognised. Ricin, the blood-coagulating toxin of castor seeds, may be isolated by treating 30 grms. of the powdered cake for several hours with 150 c.c. of 0·5 per cent. sodium chloride solution, and 5 c.c. of xylene, filtering the extract, heating it at 70° C. for an hour, and again filtering it. The new filtrate is saturated with ammonium sulphate, the resulting precipitate washed with 20 drops of water and dissolved in a 0·9 per cent. solution of sodium chloride at 37° C., and the solution filtered. On treating defribinated blood with the filtrate, coagulation will take place within ten minutes if the original cake contained 2 per cent. or more of castor seeds. Cake containing even less than this amount of castor seed is poisonous to animals.

Colorimetric Estimation of Tryptophane. O. Fürth and F. Lieben. *Biochem. Zeitsch.*, 1920, **109**, 124-152.)—Voisenet's reaction has been adapted to the estimation of tryptophan in proteins, etc. Two c.c. of the solution are treated with a drop of 2 per cent. formaldehyde solution and about 15 c.c. of concentrated hydrochloric acid. After about ten minutes 10 to 12 drops of a 0.05 per cent. solution of sodium nitrite are added, and then sufficient strong hydrochloric acid to make 20 c.c. in all. The violet coloration which appears after the liquid has stood for a short time is compared with that given under the same conditions by a 0·1 per cent. solution of tryptophane. The amounts of tryptophane thus estimated in various proteins are recorded, and it is shown that the method is also applicable in the case of insoluble and coagulated proteins. In test estimations the method showed an error of about 10 per cent.

Creatinine and Creatine in the Blood. C. C. Wang and M. L. Dentler. (*J. Biol. Chem.*, 1920, **45**, 237-243.)—The creatinine and creatine in the blood of twenty-four normal women was estimated by the method of Folin and Wu (*J. Biol.*

Chem., 1919, **38**, 81.)—The amounts of creatinine ranged from 0·96 to 1·65 mgrms. (average 1·30 mgrms.) per 100 c.c., and thus did not support the suggestion that blood creatinine is lower in women. The creatine varied from 2·23 to 4·65 mgrms. per 100 c.c., which is slightly lower than the recorded range. The accuracy of creatinine estimations is affected by excessive sugar diet, owing to the additional colour caused by the dextrose.

Estimation of Chlorides in Blood. A. S. Wetmore. (*J. Biol. Chem.*, 1920, **45**, 113-118.)—The method is based on the precipitation of protein by copper hydroxide, followed by precipitation of the oxalate and most, if not all, of the phosphate by excess of calcium hydroxide, and volumetric estimation of the chlorides: Two c.c. of the plasma (or 2 c.c. of blood) are diluted with 15 c.c. of water (or 10 c.c. in the case of blood), and treated with 4 c.c. (or 8 c.c.) of a 1·5 per cent. solution of copper sulphate and 10 c.c. (or 20 c.c.) of $\frac{N}{10}$ sodium hydroxide solution, and the flask heated for about a minute in boiling water, being meanwhile rotated. After cooling the liquid is made up to 50 c.c., thoroughly shaken and filtered, and 0·5 grm. of powdered calcium hydroxide is added to about 35 c.c. of the filtrate, which is then filtered after standing for one minute. The filtrate (25 c.c.) is treated with 5 c.c. of standard silver nitrate solution ($AgNO_3$ 7·2653 grms., concentrated nitric acid 150 c.c., per litre) (1 c.c. = 2·5 mgrms. NaCl), and 2 c.c. of a 10 per cent. solution of ferrous ammonium sulphate, and the excess of silver nitrate titrated with standard potassium thiocyanate solution (1·6 grms. per 800 c.c. diluted until 12·5 c.c. react with 5 c.c. of the silver nitrate solution—*i.e.*, 1 c.c. of thiocyanate solution = 1·0 mgrm. of sodium chloride).

New Biological Reaction for Blood. R. Guyot. (*Ann. Chim. Anal.*, 1921, [ii.], **3**, 27-28.)—The reagent employed consists of *Boletus* tincture, prepared by heating slices of *Boletus cyanescens* in water until the latter boils, and then macerating them for forty-eight hours in 60 per cent. alcohol. This liquid soon turns blue, but becomes colourless when exposed to sunlight; it is then filtered. The reaction is carried out as follows: Two c.c. of a mixture of 2 drops of blood with 50 c.c. of distilled water are placed in a test-tube, into which are pipetted, carefully and without mixing with the liquid, a little of the above tincture, and then one or two drops of hydrogen peroxide solution. A greenish coloration soon forms at the surface of contact of the two liquid layers and afterwards changes to blue. The same reaction is given with hæmoglobin solution and with fresh hæmoglobinuric urines, but it is not given by blood treated with carbon monoxide; in the case of ordinary blood it becomes attenuated or disappears as the hæmoglobin molecule changes. The reagent is not specific for blood, but is applicable to all oxydases, including that of *Boletus* itself. T. H. P.

Volumetric Method of Estimating Reducing Sugars in Blood and Pathological Fluids. A. Jonescu and V. Vargolici. (*Bull. Soc. Chim. Romania*, 1920, **11**, 102-106.)—The method is a modification of one previously described (ANALYST, 1920, **45**, 339), based on the reduction of ferricyanide to ferrocyanide by

reducing sugars. From 1 to 10 c.c. of the sugar solution is added to an excess of potassium ferricyanide solution (3 to 4 c.c.), diluted with 5 c.c. of water, and the liquid is then boiled for one minute, and after cooling is diluted with 100 c.c. of water and acidified with sulphuric acid (20 per cent.). The ferrocyanide formed is then titrated with permanganate solution (10·6 grms. per litre), which is conveniently standardised against a known solution of dextrose, and adjusted so that each c.c. corresponds to 0·001 grm. of dextrose. Tests with solutions of reducing sugar at concentrations of 0·1 to 1·0 per cent. gave accurate results. Trichloracetic acid solution (20 per cent.) was used as a defæcating agent in the proportion of 1 : 1 for blood and 1 : 4 for pathological fluid, the filtered solution being neutralised with sodium hydroxide before estimating the reducing sugars. R. G. P.

Separation of Ptomaines and Alkaloids in Toxicological Analysis. A. Jonescu. (*Bull. Soc. Chim. Romînia*, 1920, **11**, 82-89.)—Experiments on the action of various enzymes upon morphine, strychnine, and coniine, and upon cadaveric ptomaines prepared by Dragendorff's method, showed that the hydrolytic enzymes, invertin and amylase, have no action on ptomaines, and that pepsin has only a weak action, lessening the reducing power of ptomaines without influencing their alkaloidal character. The oxidising enzymes, tyrosinase and hæmoglobin, have a definite action on ptomaines, and remove their reducing powers without affecting their alkaloidal character. Enzymes did not cause any important change in the alkaloids used in the experiment; even morphine, which, according to Bourquelot and Bougault, is greatly affected by tyrosinase, was only slightly modified under the experimental conditions. The retention or disappearance of the reducing power of a supposed alkaloidal residue in the presence of hæmoglobin may therefore serve to distinguish its nature. It is suggested that other enzymes and different conditions of experiment may destroy both the reducing power and the alkaloidal character of ptomaines. R. G. P.

Bacteria in Non-Alcoholic Drinks. L. Gershenfeld. (*Amer. J. Pharm.*, 1920, **92**, 803-806.)—The author has examined various manufactories in which non-alcoholic beverages are prepared, and concludes that in most cases the water supply is satisfactory, and that bacterial contamination is due to careless washing of containers or the use of infected flavouring syrups. Beverages prepared under clean conditions are lower in bacterial content than the water used in their preparation. Out of fifteen samples of non-alcoholic beverages six showed the presence of *B. coli* in 10 c.c. portions, whilst one sample, although free from this organism, contained another sewage bacterium, *B. Welchii*. Total bacterial counts obtained on agar, when incubated for forty-eight hours at 37° C., gave two samples with less than 100 per c.c., three less than 300 per c.c., three ranging between 500 and 1,000 per c.c., whilst the remaining seven yielded above 1,000 bacteria per c.c. Nearly all samples gave a somewhat higher count at 20° C. than at 37° C. Among the organisms identified were *B. coli*, *B. Welchii*, *B. cloacæ*, *B. subtilis*, *B. mycoides*, *B. mesentericus vulgatus*, and various streptococci, diphtheroids, and streptothrices. It is suggested that more attention should be given to this problem from a sanitary point of view.

T. J. W.

Bacteriology of Canned Olives. S. A. Koser. (*J. Agric. Research*, 1920, **20**, 375–379.)—Recent outbreaks of botulism traced to the consumption of ripe olives led to a bacteriological investigation of nearly five hundred containers of preserved olives. The cans or jars were opened under aspetic conditions, and from 1·5 to 2 c.c. of the liquor was removed, 0·5 c.c. of this being spread upon a dextrose-agar slope, and the remainder added to a tube containing dextrose-beef broth under oil, the cultures being then incubated at 37° C. One hundred and ninety-nine of the containers showed the presence of living organisms, and seven of the spoiled glass jars contained *B. botulinus*. In most of the samples of normal appearance the contents were sterile, but a small proportion yielded cultures of aerobic bacilli, cocci, or dormant members of the coli group. The majority of organisms identified belonged to the coli group, but members of fourteen other types were recognised. A report referring particularly to *B. botulinus* has already been made. (See *J. Amer. Med. Assoc.*, **74**, 1220, 1920.) T. J. W.

Germicidal Value of Some Chlorine Disinfectants. F. W. Tilley. (*J. Agric. Research*, 1920, **20**, 85–110.)—A detailed account is given of numerous experiments made to ascertain the antiseptic value of chloramine T, Dakin's solution, eusol, and chlorine water upon various bacteria, and determinations of the carbolic acid coefficients were made by the Rideal-Walker method. The results show that with comparisons based upon the available chlorine in each antiseptic chloramine T is more efficient against *Staphylococcus aureus*, approximately equal in value against *B. typhosus* and much less efficient than the other compounds against *B. pyocyaneus*. *B. tuberculosis* is unaffected by any of these compounds when in a concentration of 1 in 200 of available chlorine. None of these substances has such a rapid action upon anthrax spores as is generally believed, and several days may be required to secure complete sterilisation with concentrations of 1 per cent. The addition of ammonia to chlorine or hypochlorite solutions greatly increases their antiseptic properties and tends to prevent their deterioration in the presence of organic matter. T. J. W.

WATER ANALYSIS.

Detection of Indican as a Criterion of the Purity of Water. A. Jolles. (*Ber. Deut. Pharm. Ges.*, 1920, **30**, 421-442.)—From 3 to 4 litres of the water are evaporated to 250 c.c., and any nitrite present removed by the addition of 3 grms. of ferrous ammonium sulphate for each 0·1 grm. of nitrite in a litre of the sample. The liquid is then concentrated to 10 c.c. and filtered, and the filtrate tested with 1 c.c. of a 5 per cent. alcoholic solution of thymol or α-naphthol and 10 c.c. of concentrated hydrochloric acid containing 5 grms. of ferric chloride per litre. If the original water contained indican (potassium indoxyl sulphate) a coloration due to the formation of indolignone will be produced after the mixture has been left for fifteen minutes, with frequent shaking. Any colouring matter thus formed is extracted by shaking the liquid with 4 c.c. of chloroform, and if a reddish or bluish violet extract be obtained, the presence of indican is definitely indicated. The detection of even a trace of indican affords a proof that the water was contaminated with animal excreta.

Substances Dissolved in Rain and Snow. W. A. Moore and G. Browning. (*Chem. News*, 1921, **122**, 51-52.)—The rain which fell between May and August, 1920, at Mount Vernon, Iowa, eighteen miles from the nearest manufacturing town, frequently contained traces of phosphates and sulphates, but was free from chlorides. Carbon dioxide was sometimes present, especially when the wind was from the manufacturing centre. Two precipitations on the same day contained respectively 0·001 and 0·0009 parts of nitrites, and 0·3 and 0·005 parts of nitrates per million, and a similar decrease was always observed in the rain following the rainfall of a previous day. The average rain of the summer months contained 0·28 part of ammonia, 0·35 part of nitrate, and 0·23 part of carbon dioxide (*cf.* ANALYST, 1914, **39**, 190, 501).

ORGANIC ANALYSIS.

Estimation of Carbon Dioxide in Coal. F. S. Sinnatt and W. Harrison. (*Lancs. and Cheshire Coal Research Assoc., Bull.* No. 7, 1920, 15 pp.)—The apparatus devised for the estimation of carbon dioxide in carbonates (ANALYST, 1913, **38**, 136) has also been found suitable for coal. From 0·5 to 5 grms. of the coal pulverised to pass through a $\frac{1}{90}$-mesh sieve are introduced into the decomposition flask B (see diagram, *loc. cit.*), and covered with twice its volume (5 to 15 c.c.) of water, and the contents of the flask gently boiled for about twenty minutes to expel occluded gases. The flask is then connected with the apparatus, the flask E of which has previously been exhausted by means of an ordinary water pump, the carbon dioxide in the flask being thereby reduced to a negligible amount. Hydrochloric acid (5 per cent.) or dilute phosphoric acid (1 : 4) is allowed to run on to the coal from the cup L, and air drawn through the apparatus at a constant speed. After about ten minutes the decomposition flask is gently heated and its contents kept at 50° C. for thirty minutes, and finally boiled for ten minutes. Air is meanwhile swept through the flask at the rate of about 2 litres per hour, and the evolved carbon dioxide is collected in the flask E and estimated by means of standard barium hydroxide solution, as in Pettenkofer's method. The following amounts of carbon dioxide were found in Lancashire coals from which the white partings (ankerites) had not been separated: Mountain mine, 0·50; Arley, 0·18; Ravine, 0·36; Abnormal sample I., 6·85; Abnormal sample II., 18·32; Pemberton, 2 feet, 0·72; Garswood, 9 feet, 0·44; and Hoo cannel, 1·84 per cent.

Detection of Oils other than Linseed Oil in Paints by Means of the Hexabromide Test. H. Bailey and W. D. Baldsiefen. (*J. Ind. Eng. Chem.*, 1920, **12**, 1189-1194.)—The following method gives more concordant results than some of the older methods: One grm. of the linseed oil fatty acids, prepared in a current of carbon dioxide, is treated with 25 c.c. of ether previously saturated with linolenic hexabromide at 0° C., cooled to about −10° C. in a bath of ice and hydrochloric acid, and brominated with a mixture of 5 c.c. of bromine and 25 c.c. of glacial acetic acid, which is added at the rate of one to two drops per second, with shaking after each addition, until the solution becomes permanently orange. The tube is left for sixteen hours in an ice-box, the precipitate then broken up, the tube centri-

fuged and again cooled in an ice-bath, and the ether decanted. The precipitate is washed with successive portions of 20 c.c. of the chilled saturated ether, and is finally dried for fifteen minutes at 60° C. under a reduced pressure of 30 to 40 mm. Seven samples of pure linseed oil fatty acids yielded from 41·1 to 44·1 per cent. of hexabromide, whilst commercial "boiled" linseed oil prepared without much heating (iodine value 173·8) yielded 42·6 per cent. Five samples of genuine soya bean oil yielded from 4·2 to 7·3 per cent. of insoluble bromides, whilst menhaden oil gave 35·9 per cent. Taking the average hexabromide value of linseed oil fatty acids as 42, and that of pure soya bean oil fatty acids as 6, it was possible to estimate fairly closely the proportion of linseed oil in mixtures of the two oils. Fish oils yield octobromides insoluble in ether, but these may be readily separated from the hexabromides of vegetable oils by their insolubility in warm chloroform. In the examination of samples of paints the conclusion may be drawn that when the oil, after a correction has been made for the unsaponifiable matter (about 1 per cent. in linseed oil), gives a hexabromide value of 39 or less, the presence of oils, other than linseed oil, is indicated. The changes that take place when linseed oil is oxidised in the air at high temperatures (400° F.) cause a decrease in both the hexabromide and iodine values, but not in the same proportion, and preliminary experiments have indicated that it may be possible to establish a relationship between the two values which will afford the means of distinguishing oxidised linseed oil from mixtures of such oil with other oils.

Disodium Hydrogen Phosphate as a Catalyst for the Oxidation of Dextrose with Hydrogen Peroxide. E. J. Witzemann. (*J. Biol. Chem.*, 1920, **45**, 1-22.)—The author has determined the effect of various substances and other factors upon the oxidation of dextrose by hydrogen peroxide, and has given a detailed discussion of the results obtained. No definite method appears to have been worked out for the estimation of dextrose, but it is shown that this sugar may be quantitatively oxidised to carbon dioxide by the action of hydrogen peroxide in a solution containing a mixture of monosodium and disodium hydrogen phosphates. Since the carbon dioxide is evolved continuously during the course of the reaction, the phosphate mixture may be used repeatedly for additional quantities of dextrose, thus resembling a catalyst in its action. The phosphate mixture behaves only as a peroxidase, and does not catalyse the action of atmospheric oxygen. The action observed does not depend only upon the decomposition of hydrogen peroxide by the phosphate, since other substances more effective in decomposing the peroxide diminish the oxidation of dextrose. Sodium carbonate and bicarbonate, when in the same molecular proportions as the two phosphates, do not cause the oxidation of dextrose under similar conditions, and free alkali has no influence upon the oxidation. It is of interest biologically that disodium hydrogen phosphate is the only chemical substance known which is necessary to organic life processes, and which is capable of catalysing the quantitative oxidation of dextrose to carbon dioxide. T. J. W.

Preparation of Hydrazines. L. Thompson. (*Chem. News*, 1921, **122**, 40-43.)—As a reduction agent in the preparation of hydrazines, sodium hydrosulphite

is superior to bisulphites or stannous salts, as its action is more energetic and promotes better yields. Phenylhydrazine hydrochloride may be prepared directly by reduction of benzene diazonium chloride with sodium hydrosulphite in presence of hydrochloric acid: $C_6H_5N_2Cl + 2\,Na_2S_2O_4 + 4H_2O = C_6H_5NH.NH_2.HCl + 4NaHSO_3$. If solid sodium hydrosulphite be used, the reaction does not take place quantitatively, a small quantity of a red compound, presumably azobenzene *p*-hydrazine-sulphonic acid, being produced. With only one molecule of the hydrosulphite, sodium phenylhydrazine sulphonate is first formed; on boiling with concentrated hydrochloric acid and cooling to 0° C., an 85 per cent. yield of phenylhydrazine hydrochloride is obtained. Hydrazine compounds are employed in the estimation of aldehydes and ketones, especially carbohydrates; *p*-nitrophenylhydrazine is a suitable reagent for the identification of oxycellulose. W. J. W.

Examination of Wood Cellulose. F. Lenze, B. Pleus, and J. Müller. (*J. prakt. Chem.*, 1920-1921, **101**, 213-264.)—Digestion of cellulose with 17 per cent. sodium hydroxide solution, for the separation of normal cellulose, effects solution of its other constituents, such as oxycellulose, hydrocellulose, cellulose dextrin, hemicelluloses, pectin, lignin, resins, and fats; for the determination of these the solution is first treated with acids and alcohol. For the estimation of oxycellulose, 10 grms. of air-dried cellulose are treated with 100 c.c of 17 per cent. sodium hydroxide solution for one to two hours, 100 c.c. of water are then added, the mixture is passed through a porcelain filter, and 100 c.c. of the clear filtrate transferred to an Erlenmeyer flask. The residue on the filter is washed with water, digested with 5 per cent. acetic acid, washed till neutral, and then treated twice more with sodium hydroxide solution as before, 100 c.c. from each filtrate being added to the original amount in the flask. The solution is neutralised with concentrated nitric acid and then heated on a water-bath for three hours with 125 c.c. of 20 per cent. nitric acid and 500 c.c. of water. The residue is collected on a tared filter, washed with warm water till neutral, dried at 100° C. till constant, and weighed. This method is preferable to the determination of the copper number, which gives only empirical results. Hemicelluloses are identified by converting them into sugars by heating for five hours with 4 per cent. hydrochloric acid. For the estimation of xylose, derived from xylan by the furfural distillation, an improved apparatus has been devised. It comprises a 300 c.c. round-bottomed flask with a long neck, into which the still-head is closely fitted by means of a ground-glass joint and maintained in position by a spring-clip. The still-head is bulb-shaped and terminates above in a funnel and stopcock. A lateral tube is fused into the bulb with its end projecting slightly into the interior and bent upwards, and the other end of the tube has a bead at a right angle passing through a rubber bung into a Liebig condenser. A graduated measuring flask receives the distillate. The heating bath consists of calcium chloride solution with a surface layer of vaseline or paraffin to check evaporation. The furfural-yielding constituents of cellulose exist partly as xylan and partly as a more firmly combined complex compound. The presence of mannan is indicated by the formation of mannose on hydrolysis with weak hydrochloric acid; mannan is more easily separated than xylan. W. J. W.

Estimation of Hydrochloric Acid and Neutral Chlorides in Leather. A. W. Thomas and A. Frieden. (*J. Ind. Eng. Chem.*, 1920, **12**, 1186-1188.)—*Total Chloride*: One grm. of the leather is mixed with 200 c.c. of 0·1*M* sodium dihydrogen phosphate solution and heated for two hours in a boiling water-bath. The mixture is then diluted to 250 c.c., and filtered. Two hundred c.c. of the filtrate are acidified with nitric acid, silver nitrate solution is added, and, after the addition of 20 c.c. of concentrated nitric acid, the mixture is evaporated in the dark to about 50 c.c. in order to oxidise and dissolve organic matter which is precipitated with the silver chloride; the solution is diluted and the silver chloride collected, dried, and weighed. *Neutral Chloride:* Another portion of 1 grm. of the sample is digested at 75° C. with 200 c.c. of 95 per cent. alcohol for two hours, cooled, diluted with alcohol to 250 c.c., and filtered; 200 c.c. of the filtrate are rendered alkaline with sodium hydroxide, evaporated to expel alcohol, the residual solution is acidified with nitric acid, treated with silver nitrate and nitric acid, and the estimation finished as described above. The amount of silver chloride obtained in this estimation is equivalent to the neutral chlorides present, and the difference between the amount of neutral chloride and total chloride is a measure of the acid chloride present in the leather. W. P. S.

Qualitative Detection of certain Naphthalene Disulphonic Acids. J. A. Ambler. (*J. Ind. Eng. Chem.*, 1920, **12**, 1194.)—A portion of the acetone-insoluble dry β-naphthylamine salts of the acids is boiled with 5 c.c. of 80 per cent. alcohol, the solution, if not clear, is filtered and allowed to cool; the β-naphthylamine salt of 2-7-disulphonic acid crystallises out. Another portion of the dry salts is boiled with a small quantity of water and β-naphthylamine removed by titrating the solution with $\frac{N}{1}$ sodium hydroxide solution, phenolphthaleïn being used as indicator. The separated amine is filtered off, the filtrate evaporated to dryness, and the residue is dissolved in a volume of water equal to that of the sodium hydroxide solution used for the neutralisation. The mixture is then treated with its own volume of concentrated sulphuric acid, cooled, and placed aside for several hours. The sodium salt of the 1-6-disulphonic acid crystallises out slowly, whilst the 2-7-acid remains in solution. W. P. S.

Analysis of Commercial Casein. R. H. Shaw. (*J. Ind. Eng. Chem.*, 1920, **12**, 1168-1170.)—The following procedure is recommended for the estimation of moisture, ash, sugars, fat, phosphorus, and calcium in casein: *Moisture.*—A weighed portion of the sample is heated at 100° C. under reduced pressure until constant in weight. *Ash.*—Three grms. of the sample are moistened in a silica basin with 5 c.c. of calcium acetate solution (yielding 0·15 grm. CaO per 5 c.c.), the mixture is dried, charred carefully, and then heated at a low red heat until a white ash is obtained; the amount of CaO introduced as calcium acetate is deducted from the weight of the ash. *Fat.*—A slight modification of the Rose-Gottlieb method is used: One grm. of the casein is shaken for fifteen minutes with 10 c.c. of water; 2 c.c. of ammonia are then added, followed after ten minutes by 10 c.c. of 95 per cent. alcohol, and the process is completed in the usual way. *Sugar.*—Ten grms. of casein are shaken for

four hours with 250 c.c. of 50 per cent. alcohol, the mixture allowed to stand for several hours, the liquid portion then submitted to centrifugal action, and the clear solution obtained is used for the estimation. *Phosphorus and Calcium.*—Phosphorus is best estimated by the official (American) method for the estimation of total phosphorus in fertilisers; all the calcium is found in the ash and its estimation presents no difficulty. W. P. S.

Standardisation of the Borax Solubility Test for Commercial Caseins. H. F. Zoller. (*J. Ind. Eng. Chem.*, 1920, **12**, 1171-1173.)—Fifteen grms. of the casein, ground to pass a 40-mesh sieve, are mixed with 100 c.c. of 0·2*M* borax solution at 30° C. (76·32 grms. of crystallised borax per litre) and the mixture is stirred every five minutes for half an hour. The character of the solution is observed during this period; the relative various caseins gave the following results:

Commercial sulphuric acid casein (made at 120° F.; ash, 5·04 per cent.): After 15 minutes, stiff, clear, gel undissolved; after 30 minutes, stiff, clear, gel not completely dissolved. *Natural sour casein* (made at low temperature; ash, 3·69 per cent.): After 15 minutes, smooth, mucilaginous, largely dissolved; after 30 minutes, smooth, mucilaginous solution. *Kahlbaum's casein* (low temperature): After 15 minutes, smooth, clear, mucilaginous solution; after 30 minutes, smooth, clear, mucilaginous solution. *Natural sour casein* (high fat): After 15 minutes, gelatinous, undissolved, milky white; after 30 minutes, mostly dissolved, milky, poor cohesion. *Grain curd hydrochloric acid casein* (made at 95° F.; ash, 2·55 per cent.): After 15 minutes, clear, smooth, mucilaginous solution; after 30 minutes, clear, smooth, mucilaginous solution. *Natural sour buttermilk casein* (made at 120° F.; fat, 4·0 per cent.): After 15 minutes, stiff gel, undissolved, slightly milky; after 30 minutes, gelatinous, mostly undissolved, poor cohesion.

The viscosity curve of casein in borax solutions shows that the maximum viscosity is obtained at a hydrogen ion concentration of P_H 8·15, whilst at P_H 9 the viscosity is less but constant, owing to the buffer effect of the borax in this region. The differences in the physical structure of caseins have greater influence on their viscosity than have the normal contaminating substances present in commercial caseins. W. P. S.

Micro-sections Cut from Vulcanised Rubber Articles. H. A. Depew and I. R. Ruby. (*J. Ind. Eng. Chem.*, 1920, **12**, 1156-1159.)—Microscopical examination of sections cut from rubber articles affords useful information regarding the quality of the substance; flocculated pigment (which accounts for the heating up of tyre treads heavily compounded with carbon black) is readily detected, as is also the presence of reclaimed rubber, fibre, etc. In some cases the source of the pigment may be ascertained by microscopical examination; for instance, chemical analysis shows no difference between *blanc fixe* and ground baryta, but they are readily distinguished under the microscope. The sections are best cut after the rubber has been fixed to a slide with glycerol-water (9 : 1) solution and then frozen, first by expansion of compressed carbon dioxide, and then with liquid air; the freezing must be just sufficient to destroy the elasticity of the rubber, and yet not make it too hard. W. P. S.

Relation of Soil Solution to the Soil Extract. D. R. Hoagland, J. C. Martin, and G. R. Stewart. (*J. Agric. Research*, 1920, **20**, 381–395.)—Soil extract contains the soluble matter present in the soil solution in addition to other substances derived from adsorbed or readily soluble soil components. The amounts of the latter substances depend upon the concentration and composition of the soil solution, since the soil constituents appear to be less soluble when large amounts of soluble substances are present. The detailed investigations of the authors indicate that soil extracts should be made with a small proportion of water, such as 1 part of water to 1 of soil where practicable, and for a short period only. It is probable that the ratios between the soil solution and the concentrated soil extracts are similar for the majority of the important elements present, and analyses and freezing-point determinations of suitable soil extracts enable the approximate concentration and composition of soil solutions to be estimated. T. J. W.

A New Indicator. R. W. Kinkead. (*Chem. News*, 1921, **122**, 4-5.)—The new compound was prepared by gradually adding one equivalent of ethyl nitrate to one equivalent of phenyl magnesium bromide cooled in ice, when in a short time a vigorous reaction took place. On the following day ice was added, the precipitate allowed to settle, and the ethereal layer evaporated. Water and solid sodium carbonate were then added and the solution extracted with chloroform, the blue sodium salt remaining in the aqueous layer. Since the colouring matter is unstable, except in very dilute aqueous solution, the blue solution was acidified and extracted with ether, the etheral solution being suitable for use as an indicator. The substance has not been prepared in a pure condition. The indicator gives a sharp end point, changing from red to blue on the addition of 0·05 c.c. of $\frac{N}{10}$ sodium hydroxide, but is useless in the presence of carbon dioxide. Sulphur dioxide reduces the substance both in acid and alkaline solution, but hydrogen peroxide does not appear to affect it. T. J. W.

INORGANIC ANALYSIS

Determination of the Conductivity of Electrolytes. A. H. W. Aten. (*Chem. Weekblad*, 1921, **18**, 51-52.)—The conductivity of electrolytes has been determined by a method the essential feature of which is the employment of a differential galvanometer and a variable resistance, and in which certain disadvantages of the Kohlrausch method are overcome. Errors arising from polarisation and the heating effect of the current may be reduced by increasing the surface of the electrodes and the volume of the electrolyte, and become smaller with higher resistance. Comparison of this method with Kohlrausch's method indicates that with a resistance not below 100 ohms an accuracy of 0·3 per cent. is obtainable. The method has a special application in certain technical analyses, such as estimation of the ash in sugar and of chlorides in drinking water, the determination of carbon dioxide in chimney gases, and the selection of the end point in the evaporation of condensed milk. W. J. W.

Catalysis in Permanganate Titrations. P. H. Segnitz. (*J. Ind. Eng. Chem.*, 1920, **12**, 1196-1197.)—Results of experiments indicate that the addition of

manganous sulphate to a solution to be titrated with permanganate solution accelerates the reaction velocity, so that the time of the peroxide-permanganate titration can be reduced from about forty-five minutes to eight seconds, and that of the cold oxalate-permanganate titration from over an hour to six minutes. The use of the catalyst does not interfere with the end point of the titration. W. P. S.

Preparation of Anhydrous Stannic Chloride. C. van Loon. (*Chem. Weekblad*, 1920, **17**, 664.)—In the preparation of anhydrous stannic chloride (*Chem. Weekblad*, 1920, **17**, 610) in small amounts, quantitative results may be obtained by using a round-bottomed flask instead of the wide tube employed by Lorenz (*Zeitsch. anorg. Chem.*, 1895, **10**, 44). W. J. W.

Solubility of Metals in Acids containing Formaldehyde. R. C. Griffin. (*J. Ind. Eng. Chem.*, 1920, **12**, 1158-1160.)—The presence of 1 per cent. of formaldehyde in dilute sulphuric acid (sp. gr. 1·075) and in dilute hydrochloric acid (1 : 1) considerably decreases the solvent action of these acids on wrought iron, cast iron, and steel, the corrosion loss being diminished 50 to 95 per cent. The effect in the case of other metals (manganese, bronze, tin, brass, nickel, etc.) is much less, and it is also less with 10 per cent. nitric acid, possibly on account of secondary reactions. W. P. S.

Gasometric Estimation of Nitrogen. R. L. Stehle. (*J. Biol. Chem.*, 1920, **45**, 223-228.)—The sample is digested with a small quantity of sulphuric acid and a crystal of copper sulphate, and on cooling the solution is diluted to 100 c.c. Ten c.c. are run into a nitrometer containing mercury, and connected at the lower end by a long indiarubber tube to an adjustable mercury reservoir, and dissolved air is liberated by reducing the pressure and expelled from the apparatus. A strong solution of alkali is run in to neutralise the acid, and 2 c.c. of a solution prepared by mixing equal volumes of 28 per cent. sodium hydroxide and a solution containing 12·5 per cent. of sodium bromide and 12·5 per cent. of bromine, the mixture being diluted with three volumes of water, are added. The pressure in the reaction chamber is reduced, and the nitrogen is completely evolved by shaking the nitrometer for a minute. Since a small amount of oxygen is liable to be set free, this gas is absorbed by running in 1 c.c. of sodium pyrogallate solution. The mercury is adjusted until the volume of nitrogen is exactly 1 c.c., and the weight of nitrogen present is calculated from the observed temperature and pressure. The method yields excellent results with substances of known nitrogen content, but a maximum error of about 8 per cent. is shown by comparison of this method with the usual Kjeldahl estimation when estimating the non-protein nitrogen in blood.

T. J. W.

Properties of Pure Hydrogen Peroxide. O. Maass and W. H. Hatcher. (*J. Amer. Chem. Soc.*, 1920, **42**, 2548-2569.)—Pure (99·9 per cent.) hydrogen peroxide was prepared from an impure 3 per cent. solution by concentration in a sulphuric acid vacuum concentrator (ANALYST, 1920, 68), distillation, and

fractional crystallisation. It is almost insoluble in anhydrous ether, dissolves various anhydrous salts readily, and, on heating, is decomposed in contact with glass. Most metals cause decomposition of the pure substance, but not explosively. Pure aqueous solutions in a suitable container keep indefinitely, but are decomposed by foreign substances gaining access to the solution. Strong solutions are more stable than dilute, as the former more readily destroy impurities, and thus prevent further decomposition. Investigation of so-called " anti-catalysers " showed that in all cases these substances acted by destroying others, which caused decomposition, and that spontaneous decomposition of pure hydrogen peroxide did not occur (*cf.* ANALYST, 1896, **20**, 38). T. J. W.

Micro-chemical Identification of Gaseous Ammonia as Hexamethylenetetramine Picrate. C. Kollo and V. Teodossiu. (*Bull. Soc. Chim. România*, 1920, **11**, 100-102.)—When a drop of a solution of formaldehyde (commercial formalin), together with a drop of a 1 per cent. solution of picric acid, is exposed to ammonia, hexamethylenetetramine is produced, and combines immediately with the picric acid to form characteristic crystals of the picrate. The test is not sufficiently delicate when carried out in this way, as ammonia picrate is formed in the presence of much ammonia, whilst in the presence of small amounts of ammonia the formation of hexamethylenetetramine picrate only takes place on rubbing, and the crystals break up and lose their characteristic form. A highly sensitive reagent is prepared by saturating a solution of formaldehyde in the cold with picric acid, and then saturating this with hexamethylenetetramine picrate. The ammonia liberated from 1 mgrm. of ammonium chloride may be detected by exposing one drop of the reagent for five to six minutes to the action of the gas under examination. R. G. P.

New Method for the Separation and Estimation of Iron and Manganese. C. Kollo. (*Bull. Soc. Chim. România*, 1920, **11**, 89-95.)—The method of separation is based on the precipitation of ferric hydroxide when hexamethylenetetramine is added to a slightly acid solution of an iron salt, the manganese forming soluble double salts of the type $Mn(CH_2)_6N_4 2H_2SO_4$, manganese oxide only being precipitated in the presence of hexamethylenetetramine from a neutral solution on boiling. To carry out the separation the solution of ferric and manganese salts is slightly acidified, and a 10 per cent. solution of hexamethylenetetramine is added until the supernatant liquid does not change the colour of Congo-red paper, after which the liquid is warmed gently on a water-bath to cause the ferric hydroxide to flocculate. After removal of the manganese salts by washing on a filter, the iron is determined gravimetrically as usual, or by dissolving the ferric hydroxide in hydrochloric acid, adding excess of potassium iodide and titrating the liberated iodine with standard thiosulphate solution. The manganese in the filtrate may be determined as manganese sulphate after evaporation and ignition, or by Volhard's method after the destruction of organic matter by evaporation with sulphuric acid. The following results were obtained by these methods:

Salts.	Weight taken.	Weight found—	
		Gravimetrically.	Volumetrically.
	Grm.	Grm.	Grm.
$FeSO_4.7H_2O$	0·1298	0·1300	0·1284
$MnSO_4.4H_2O$	0·1406	0·1374	0·1412
$FeCl_3.12H_2O$	0·4950	0·5139	0·5101
$MnSO_4.4H_2O$	0·2200	0·2300	0·2285

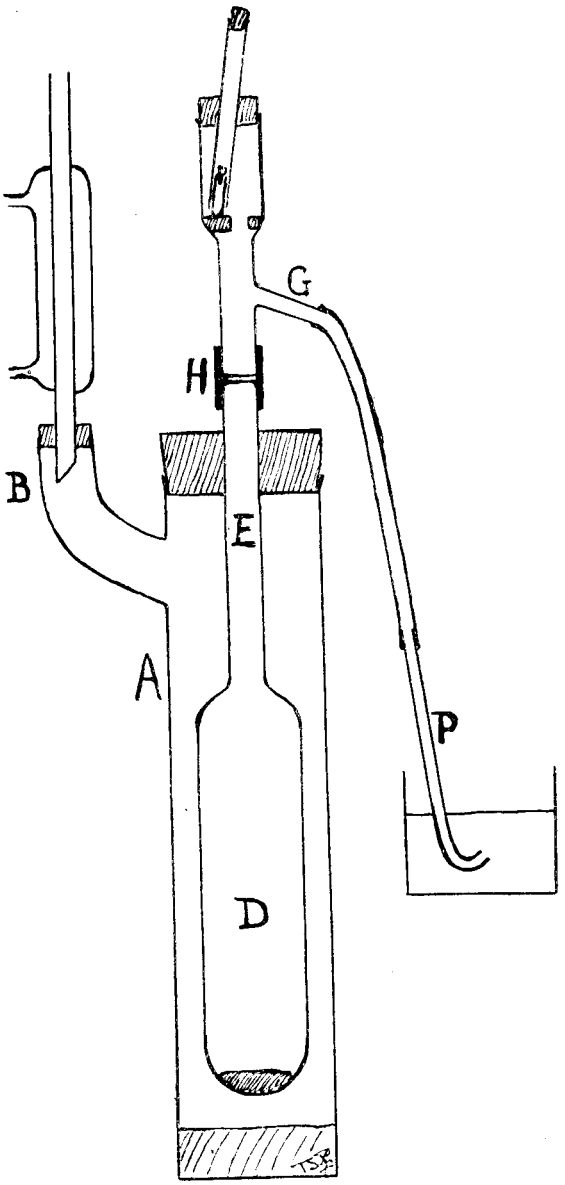
R. G. P.

The Use of Phenolphthaleïn and Diphenylamine in the Estimation of Manganese by the Persulphate Method. D. H. Wester. (*Rec. Trav. Chim. Pays-Bas*, 1920, **39**, 600-602.)—The substitution of an alkaline phenolphthaleïn solution for permanganate (Tillmans and Mildner, *J. Gasbeleucht. u. Wasserversorg.*, 1914) in the estimation of manganese gives inaccurate results, probably owing to variation in the alcoholic strength of the phenolphthaleïn; in extreme cases this may be 2 per cent. to 25 per cent. With constant alkaline concentration, the violet coloration is affected more by the content of water than of phenolphthaleïn in the solutions, and increase of the phenolphthaleïn does not, therefore, give a proportionately deeper intensity of colour. No better results are obtained with diphenylamine. The blue coloration disappears rapidly, and there is no relation between its intensity and the amount of manganese. W. J. W.

Micro-chemical Identification of Potassium and Sodium in Presence of Magnesium. E. Ludwig and H. Spirescu. (*Bull Soc. Chim. România*, 1920, **11**, 78-82.)—Calcium, strontium, and barium are first removed by precipitation with ammonium carbonate or with ammonium oxalate and sulphuric acid, the filtrate evaporated, and the residue ignited until free from ammonium salts and used for the detection of potassium and sodium. The complex nitrite $K_2CuPb(NO_2)_6$ is employed as a reagent for potassium, the test for which is carried out by placing a drop of sodium nitrite solution (20 grms. in 75 c.c. of water), and a drop of copper and lead acetate solution (copper acetate 9·1 grms., lead acetate 16·2 grms., acetic acid 2 c.c., water 75 c.c.) on the slide and adding a fragment of the residue under examination. In the presence of potassium the complex nitrite is precipitated in the form of cubic black crystals, even in the presence of large amounts of magnesium, whilst the reaction is more delicate than that with platinic chloride. For the detection of sodium by means of potassium pyroantimoniate, the soluble magnesium salts (which interfere with the reaction) are converted into insoluble basic magnesium carbonate by adding a drop of concentrated potassium carbonate or bicarbonate to a fragment of the residue and evaporating the mixture to dryness on the slide. On adding a drop of potassium pyroantimoniate solution, a characteristic precipitate of sodium hydrogen antimoniate ($Na_2H_2Sb_2O_7$) is formed. R. G. P.

APPARATUS, ETC.

Modification of Victor Meyer's Vapour Density Apparatus. T. S. Patterson. (*Chem. News*, 1920, **121**, 307.)—The apparatus described is stated to yield very accurate results. The outer glass jacket is replaced by a cylinder of copper, having the lower end closed by brazing, and provided near the top with a short side tube, into which is fitted a small condenser. To facilitate the fitting of the large jacket cork the inner tube is cut into two pieces a short distance below its side tube, the upper and lower portions being again joined by a piece of stout indiarubber tubing. The small tube containing the substance under examination is allowed to fall down the inner tube by means of an ingenious device previously described by the author (ANALYST, 1908, **33**, 207), fracture being prevented by a small quantity of mercury at the bottom of the inner tube. T. J. W.



Apparatus for Generating Hydrogen Sulphide. V. B. Connell. (*Pharm. J.*, 1921, **106**, 17.)—The apparatus comprises two wide-mouthed bottles, having well-fitting rubber bungs with two perforations, one bottle being inverted above the other. The lower bottle contains a layer of asbestos and ferrous sulphide lumps, and is half filled with a mixture of 1 part of sulphuric acid and 3 parts of water. A U-tube passes through the bung of the upper vessel with its long limb reaching nearly to the top, and another U-tube passes just through the bung of the lower vessel and is connected externally, by means of

tubing and pinchcock, to a delivery tube. Communication between the two bottles is established by a tube reaching to the bottom of the lower one and just extending through the bung of the upper one. In operation, when the pinchcock is closed, the pressure of the gas generated in the lower bottle forces the liquid into the upper one and expels the air through its U-tube. When the pinchcock is opened the liquid falls again and thus expels the gas through the delivery tube, after which evolution of gas recommences. W. J. W.

Michell's Cup and Ball Viscosimeter.* **T. C. Thomsen.** (*Report of Lubrication Inquiry Committee, Dept. Scientific and Ind. Research*, 1920, **15-16**, 103-110.)—This apparatus consists of a steel cup and a loose steel ball about $\frac{3}{4}$-inch in diameter. A few drops of oil are introduced into the cup, and the ball inserted and pressed firmly into position, three pegs standing out from the surface a few thousandths of an inch separating it from the wall of the cup. After removal of the surplus oil the apparatus is inverted, the ball being meanwhile kept in position with the finger, and a note is taken of the time before the ball falls out of the cup. The results obtained with this instrument are calculated into seconds on Redwood's viscosimeter by means of the formula—$ktd = n$, where k is the constant; t, time of outflow; d, the sp. gr. at the time of outflow; and η, the absolute viscosity. The readings are greatly influenced by variations in the temperature, especially in the case of oils of high viscosity, and are sometimes as much as 15 per cent. above the true viscosity. By immersing the instrument in oil, however, and keeping the temperature at 70° F. for about half an hour, results may be obtained agreeing within 1 per cent. of the true viscosity, as measured by standard instruments for oils with absolute viscosity ranging from 0·8 to 5.

Deeley's Oil-Testing Apparatus.* (*Report of Lubrication Inquiry Committee, Dept. Scientific and Ind. Research*, 1920, **15**, 101-103.) — This machine consists essentially of a horizontal disc, about 3 inches in diameter, resting in a circular pan secured to the end of a vertical spindle, which can be rotated by hand or mechanically. Upon the horizontal disc rest the lower flat surfaces of three vertical pegs secured to an upper disc, to which is fixed two or more uprights, and the two discs are pressed together by means of weights placed upon the upper one. Above the weights and concentric with the power spindle is a vertical shaft, with which is connected a coil spring, an indicating finger, a free train of wheels, and a cross arm forming a universal joint which engages with the uprights secured to the loaded disc. The extent to which the spring is coiled affords a measure of the friction between the disc and the pegs, and this is shown by the indicating finger upon a scale. Oscillation of the finger through rapid changes of friction is prevented by the free train of wheels. The apparatus is suitable for the measurement of static and low-speed kinetic friction between flat surfaces of metals when dry or fully lubricated and under various loads. Results obtained with different oils have proved that vegetable oils have smaller frictional resistance than mineral oils, which is in accordance with the fact that has long been known from practical experience that the lubricating value of the former is greater.

* By permission of H.M. Stationery Office.

REVIEWS.

ORGANIC MEDICINAL CHEMICALS. M. BARROWCLIFF, M.B.E., F.I.C., AND FRANCIS H. CARR, C.B.E., F.I.C. INDUSTRIAL CHEMISTRY SERIES. Edited by S. RIDEAL, D.Sc., F.I.C. Pp. 331. London: Baillière, Tindall and Cox. Price 15s. net.

A few months ago, the present writer had the pleasant task of reviewing the "Extra Pharmacopœia" of Martindale and Westcott for the ANALYST; his present duty is similar in some respects, in others very different. Messrs. Barrowcliff and Carr treat the subject chiefly as a branch of manufacturing chemistry, and our technical literature receives a welcome addition.

General Preface and Author's Preface are followed by a short Introduction, which, brief as it is, shows clearly how the development of Organic Chemistry and the treatment of disease go forward hand in hand. The work itself is divided into eleven sections, dealing respectively with (I.) Narcotic and General Anæsthetics; (II.) Naturally occurring Alkaloids and their Derivatives; (III.) Natural and Synthetic Local Anæsthetics; (IV.) Antipyretics and Analgesics; (V.) Organic Antiseptics and Disinfectants; (VI.) Purgatives; (VII.) Vaso-Constrictors and Vaso-Dilators; (VIII.) Diuretics and Uric Acid Solvents; (IX.) Organo-Metallic Compounds; (X.) The Digitalis Group, Skin Irritants, Glucosides, and Neutral Principles; (XI.) Other Substances of Interest.

It will be noticed that the classification of subject-matter is more in accordance with the uses for which the materials are employed than with their chemical structure, and for most purposes this is the more convenient course to follow. The authors leave no doubt, however, that the work deals with a branch of Industrial Chemistry of which they possess a very expert knowledge, and directions are given for the preparation of most of the compounds described in the book. Reference is made to the literature of the subject, whether it has appeared in purely scientific journals or in patent specifications, though much of the information is evidently derived from first-hand knowledge, and is especially useful in a book of this description.

As an example of the method followed by the authors one may take the case of Beta-eucaine (Benzoylvinyl-diacetonalkamine). A scheme of synthesis is placed first, showing that the necessary organic materials are acetone, acetal, and benzoyl chloride. Then follows the preparation of diacetonamine from acetone and ammonia, Everest's method being employed; the conversion of diacetonamine acid oxalate into vinyl-diacetonamine oxalate according to the patent of King, Mason, and Schryver comes next, then the reduction to the alkamine (Robinson's Communication to the Royal Society Committee), and finally the benzoylation is described.

The book will be very useful, for it is well written, well indexed, and illustrated by twenty-five drawings or diagrams of plant. J. T. HEWITT.

THE YEAR-BOOK OF PHARMACY. Pp. 594. London: J. and A. Churchill. 1920. Price 12s. 6d. net.

To review a work which has been published annually for so many years might seem a work of supererogation, were it not for the fact revealed by a glance at the list of members of the British Pharmaceutical Conference, of which the Year-Book is the organ, that comparatively few public analysts give their support to this body. Public analysts are appointed under the Sale of Food and Drugs Act, and it is hard to see how they can do without the annual volume, which epitomises the year's work on Pharmacy, Materia Medica, and Chemistry of Drugs; at least half this book contains matter in which the public analyst will find a direct interest, while the remainder will help him to understand how the pharmacist carries on his business, a knowledge which may have a real importance when the question is considered of advising as to what action should be taken as the result of analysis of a sample.

The plan of the book is somewhat unusual, in that the Abstracts of papers contributed to scientific journals from July 1, 1919, to June 30, 1920, occupy the first portion; the first section deals with chemistry, divided into convenient sub-sections, and this is followed by Materia Medica and Pharmacy, each similarly split up in sub-sections, and a very useful research list; as is only to be expected with the advance of knowledge, the last is a little out of date, more than one of the subjects suggested for investigation having been elucidated by work which is later than the middle of 1920.

The remainder of the book consists of the Transactions of the British Pharmaceutical Conference at Liverpool in July, a list of members, and a good and efficient index.

H. DROOP RICHMOND.

PRACTICAL PHYSIOLOGICAL CHEMISTRY. By SYDNEY W. COLE, M.A. Sixth Edition. Cambridge: W. Heffer and Sons, Ltd. Price 15s. net.

As Professor Hopkins points out in his introduction to this volume, there are periods in the growth of any branch of knowledge when the development of technique becomes the most pressing of needs, and its success the best measure of progress. Physiological chemistry has in recent years been passing through such a stage, and its methods have been very largely multiplied and improved. Hence the necessity of a sixth edition of this deservedly popular book only a year after the publication of the fifth, which itself included a very considerable amount of new material. In the main the book represents the course in practical physiological chemistry for medical students at Cambridge, and contains not only all the common biochemical methods required by the medical student, but also the more important of those used in medical diagnosis and biological researches. The methods described have been thoroughly tested in the laboratory; older methods have been modified in detail as a result of experience of their use in class, and not a few of the processes described are original —indeed, the book has been used as a medium for the publication of much patient research. The most important additions to the fifth edition were chapters on the properties of solutions, in which particular attention is paid to hydrogen ion concentration and properties of colloids; on the preparation and properties of amino acids;

on the preparation and hydrolysis of nucleic acid; and on the action of oxidase systems and new quantitative methods related to enzyme action and blood, urinary and gastric analyses.

The chapters on solution and on amino acids afford perhaps the best examples of the way in which Mr. Cole tests all processes described. The preparations of the amino acids are given with such a wealth of essential detail that even a beginner could scarcely fail to carry them out successfully.

A welcome feature of the present edition is the introduction of several methods of micro-analysis. It may perhaps be open to doubt how far such methods can be introduced with advantage into an elementary course, but there can be no doubt that the more advanced student should have practice in well tried micro-methods and gain a practical knowledge of the precautions and care necessary to attain reliable results and of their limitations, since such methods are often the only ones available in the study of the biochemistry of the living subject without terminating the life of the animal or injuring the human subject.

Among the more important of the methods described we may mention a modification of McLean's method for the determination of blood sugar devised by the author, and what he states has been used for the past year in his classes with very concordant results. It is offered as a substitute for Bang's micro-method, which, though it may be reliable in the hands of a practical analyst, is probably beyond the powers of the average student.

The hypobromite method for estimating urea, omitted in the former edition, has been again included, though the results are unreliable, on the ground that it is sufficiently accurate for most clinical work and demands very little equipment. The use of the enzyme urease, which has rendered obsolete a large number of methods for the estimation of urea in urine is illustrated by Van Slyke's micro-method. The urease method on the ordinary scale is not mentioned, though it was described in this country before Van Slyke's micro-method was published.

We hope that the author in his next edition will see his way to extend the chapter on fats, which by comparison with some of the other subjects seems to us to be dealt with rather inadequately. Though the aim of the book is essentially practical there is judicious reference to theory, and, without undue consumption of space, to the significance of results. In our opinion the book is a contribution of substantial importance in connection with the teaching of biochemistry. It should be of great use to all students of this subject, whether their ultimate aim be medicine, or agriculture, or the career of a professional analyst. It should also be a welcome addition to the library of all who may have occasion to seek for accurate and full descriptions of biochemical methods outside his own special field.

S. B. Schryver.

A Textbook of Organic Chemistry. By A. F. Holleman. Edited by A. Jamieson Walker. London: Chapman and Hall. 1920. Price 18s. 6d. net.

This textbook is too well known and too widely used to be in need of much further recommendation.

In the present new edition numerous small alterations have been made, the out-

standing one being the additional space devoted to the applications of physico-chemical methods in organic chemistry. The importance of such properties as refraction, absorption, and viscosity in organic chemical research is, as the author remarks, steadily increasing.

One of the most valuable features of the book is the attention which is given to considerations of the structure of most of the representative compounds; an excellent example of the thoroughness with which this important subject is dealt is to be seen on pp. 152-158, where the structure of unsaturated compounds is passed under review.

The chapter on the constitution of benzene has been enlarged, and contains a short account of Willstätter's attempted synthesis of cyclo-hexatriene; the fact is emphasised that the compound he obtained resembled benzene in all respects, whereas cyclo-octatriene prepared in a similar manner by Willstätter is a highly unsaturated compound. The conclusion is drawn from this and other considerations that Thiele's modification of Kekulé's formula is the best available representation of the structure of the benzene molecule.

At the end of the section dealing with optically active compounds a very brief account has been introduced of Werner's theory of the stereoisomerism of complex derivatives of certain metals.

The difficult subject of the Walden inversion has been given a little more space so as to include a short account of Stark's hypothesis, according to which the union of carbon atoms is due to "valency electrons."

The arrangement of the material is good, the style is flowing and easy, the print is clear and pleasing to the eye, and a comprehensive index is provided. Altogether author, editor, and publishers, have combined to produce an excellent and eminently readable volume.

JOSEPH KENYON.

THE VOLATILE OILS. By GILDEMEISTER and HOFFMANN. Second Edition by E. GILDEMEISTER, translated by EDWARD KREMERS. Vol. II. Pp. xx + 686. London: Longmans, Green and Co. Price 32s. net.

This volume of the well-known German work on Essential Oils deals, in a series of monographs, with the first half of the essential oils grouped according to Engler's "*Syllabus der Planzenfamilien.*" Analytical methods are only dealt with incidentally as occasion requires. It will be well to remember the position of this volume in the series. Volume I., published in 1910, deals with the history of certain essential oils, the constituents of essential oils, synthetic perfumes, and the analysis of essential oils, to which about a hundred pages are devoted. The present volume was written in 1913-14, printed in 1916, and published at the end of 1920. Volume III., which completes the study of the individual essential oils, appeared in German during the period of the war.

The work is one of such a high degree of merit, so free from mistakes, so thorough and exhaustive that no commendation can be too high for it, the only hostile criticism possible being that the present volume, published in 1920, is practically seven years out of date, so that, although accurate and complete in 1914, it is now so full of omissions and of statements which the last seven years' work

has shown to be inaccurate or insufficient, that as a work of reference it must be taken with considerable care and reserve. This, however, refers to the study of the individual essential oils, rather than to analytical methods, and therefore need not be here discussed further.

From a market point of view, no essential oil is of such importance in regard to its analysis as oil of turpentine. We should therefore expect the most exhaustive treatment of the matter here. The iodine absorption of this oil has received a considerable amount of attention, and the determination of this value on the highest fraction of the oil shows so large a difference between normal oil of turpentine and so-called "stump" turpentine, due to the accumulation of practically saturated bodies in the last fraction in the case of stump turpentine, that it may almost be regarded as the decisive feature of the analysis. This is not referred to, although the iodine value of the oils themselves is mentioned. The information under Russian turpentine oil will not give the slightest assistance to the analyst who has to deal with market samples of this oil. Yet very full information on the characters and analysis of this oil was published some ten years ago on samples brought from Russia by Professor Schindelmeiser, and on market samples, in comparison.

It is a matter of regret that the acetylation process is still described as it was in the first volume in 1910, where equal volumes of the oil and of acetic anhydride are directed to be used. In dealing with oils containing 80 to 90 per cent. of acetylisable constituents, there is no doubt that this results in too low values, and 10 volumes of the oil and 15 volumes of acetic anhydride must be used. Still higher results are obtained if the amount of acetic anhydride be further increased, but as this is possibly due to secondary reactions, 10 and 15 volumes have been universally agreed to in this country, and, we believe, in America.

Considering the indefinite nature of most organic processes of analysis, together with the personal error, it seems rather absurd to give the figure 0·19974314 as the figure to multiply the "amount of iodine consumed" to obtain the corresponding amount of methyl salicylate. We should have preferred the simpler 0·2!

On page 481 it is stated that the percentage of alcohol (linalol) in cayenne linalol oil can be determined by acetylating for seven hours in xylene solution. No acetylation of linalol is accurate, although in xylene dilution it becomes more nearly correct, and it should be mentioned that this figure is merely an approximation.

Otto of rose is, of course, a most difficult oil upon which to express an opinion, but the upper limit of specific gravity for Bulgarian oil—namely, 0·862 at $\frac{30°}{15°}$—indicates, almost with certainty, that the oil is adulterated. The presence of gurjun balsam oil as an adulterant in otto of rose was first proved by Schimmel and Co., after having been indicated by the reviewer, and confirmed by Umney. This body appears to have found its way into otto of rose through being used as an adulterant of palmarosa oil, which is commonly used as the source of geraniol for adulteration purposes. It can be detected with certainty by a well-marked colour reaction, but this is not referred to, although no other means of detection, except by tedious research on large quantities of the oil, is available. There is a good deal in the subject-matter of otto of rose with which the reviewer disagrees, but it does not come within the scope of this review.

Apart from a few matters such as those indicated and the fact of the book being six or seven years out of date, one can only say that this is a work of very high merit, which will, as a matter of course, take its place on the bookshelf of everyone interested in essential oils. ERNEST J. PARRY.

FIRST INTERNATIONAL CHEMICAL CONFERENCE.

THE first International Chemical Conference was held in Rome from June 22 to June 24, 1920, under the presidency of Professor Charles Moureu. The Council of the International Union of Pure and Applied Chemistry, composed of representatives of Belgium, France, Great Britain (Sir William Pope and Mr. Hay), Italy, and the United States, with Mr. J. Gerard as General Secretary, admitted Canada, Czecho-Slovakia, Denmark, Greece, Holland, Poland, and Spain to the Union, and the General Assembly was then opened.

The Union is administered by a Council composed of delegates from each of the adherent countries, its executive power being entrusted to a Bureau which works through a permanent International Office of Chemistry with a general secretary. A joint Session of the Council, Permanent Committee, Consulting Committee, and General Assembly is to be held each year under the title of the "International Chemical Conference."

The Conference decided that the Council of the Union should organise a bureau of standards, the three sections of which (chemical standards, pure products for research, and technological products) should be entrusted to Belgium, Great Britain, and France, respectively, with the United States forming an allied branch. A sub-committee was appointed to deal with the subject of thermo-chemical standards. Problems relating to patents and the question of the establishment of an international patent bureau were placed in the hands of an Italian Committee.

It was agreed to form an International Committee on atomic weights, upon which Sir Edward Thorpe and Messrs. Clarke and Urbain should be invited to serve. The following motions were carried: (1) That atomic weights be revised decennially. (2) That Dalton's proposal, accepted by Avogadro and Cannizzaro, of basing the atomic weights upon hydrogen, $H = 1$, be again adopted as the basis of the system.

In accordance with a motion of the English Chemical Society, the Union was requested to ask the Chemical Associations and journals of the countries within the Union to republish the lists of physico-chemical symbols adopted by the old International Association of Chemical Societies at the third Session of their Council in Brussels in 1913.

It was decided to accept the invitation of the Polish Government to hold the next Conference in 1921 at Warsaw.

INTERNATIONAL PHYSICO-CHEMICAL SYMBOLS.

SYMBOLS suggested, but not definitely recommended, and alternative symbols suggested for use where there is a possibility of confusion are placed in brackets.

1. *General Physics and Mathematics.*—Acceleration due to gravity, g; Angström unit (10^{-10} metre), Å; Area, q; Base of natural logarithms, e; Co-ordinates, variables, x, y, z; Critical quantities: pressure, p_c, volume, v_c, temperature (Centigrade), t_c, temperature (absolute), T_c, density, d_c; Density (mass per unit vol.), d; Diameter, (d); Differential sign, total, d; Differential sign (partial), ∂; Fluidity, (ϕ); Force, f; Gas constant per mole, R; Height, h; Increment, Δ; Length, l; Mass, m; Mean free path, λ, (λ_f); Micron, μ; Millimicron, $\mu\mu$; Number (of terms, etc.), number of molecules, n; Number of moles, N; Pressure, p; Pressure, osmotic, P; Radius, r; Ratio of circumference to diameter, π; Reduced quantities: pressure, p_r, volume v_r, temperature, T_r, density, d_r; Summation sign, Σ; Surface tension, γ (σ); Time, t; van der Waal's constants, a, b; Variation sign, δ; Velocity, u; Velocity, angular, ω; Velocity components in three directions, u, v, w; Viscosity, η; Volume (in general), v; Volume, specific, v_s; Volume, atomic, v_a; Volume, molecular, v_m; Weight, as gravitational force, w; Work, W.

2. *General Chemistry.*—Atomic weight and gram-atomic weight, A; Concentration (units not specified), C; Equilibrium constant, K; Mole fraction, x; Molecular and gram-molecular weight, M; van't Hoff coefficient, i; Velocity coefficient, k.

3. *Heat and Thermo-Dynamics.*—Energy in general, (E); Entropy, Φ; Intrinsic energy, U; Latent heat, per grm., l; Latent heat, per mole, L; Mechanical equivalent of heat, J; Molecular heat, S; Molecular heat at constant pressure, S_p; Molecular heat at constant volume, S_v; Quantity of heat, Q; Ratio of specific heats, ($= s_p/s_v$) γ; Specific heat, s; Specific heat at constant pressure, s_p; Specific heat at constant volume, s_v; Temperature, Centigrade, t or $t°$ (θ, when time occurs in the same expression); Temperature, absolute, T.

4. *Optics.*—Intensity of illumination, I (I_L); Refractive power, specific (Gladstone and Dale), r_G $[r_G]^{\circ}_D$; Refractive power, specific (Lorentz and Lorenz), r_L $[r_L]^{\circ}_D$; Refractive power, molecular, R_G R_L $[R_G]^{\circ}_D$ $[R_L]^{\circ}_D$; Angle of optical rotation, α; Rotatory power, specific, $[\alpha]$; Rotatory power, molecular ($M[\alpha]$); Velocity of light, (v); Wave-length of light, λ.

5. *Electricity and Magnetism.*—Capacity (electric), C; Charge, unitary (charge on an electron), e; Conductivity (specific conductance) κ; Conductivity equivalent, Λ; Conductivity equivalent at different dilutions—vols. in litres containing 1 grm. equivalent, Λ_{10}, Λ_v, Λ_∞; Conductivity, equivalent of cation and anion, Λ_C, Λ_A; Conductivity of specified ions, $\Lambda_{K^\cdot}$ $\Lambda_{Cl^\cdot}$; Current, I; Dielectric constant, K (as abbreviation, *D.C.*); Dissociation, electrolytic, degree of (degree of ionisation), α: Electromotive force, E; Faraday's constant, F; Permeability, magnetic, μ (μ_f); Potential, single electrode, or decomposition potential of anion, ϵ $K^\cdot$, Cl'; Potential measured against the hydrogen or calomel electrode respectively, which is taken as unity, ϵ_h, ϵ_c; Quantity of electricity, Q; Resistance, R (R_W); Susceptibility, magnetic, κ;

Transport number of cation and of anion, n_c and n_A; Velocity of cation and of anion in cm./sec. when the potential gradient is 1 volt/cm., U_c U_A; Velocity of specified ions under unit potential gradient, U_K. $U_{Cl'}$.

IMPORTATION OF ORGANIC INTERMEDIATE PRODUCTS.

THE following letter has been received by the Registrar and Secretary of the Institute of Chemistry:

BOARD OF TRADE
(INDUSTRIES AND MANUFACTURES DEPARTMENT),
GREAT GEORGE STREET, LONDON, S.W. 1.
February 8, 1921.

SIR,—With further reference to your letter of January 28 regarding the Dyestuffs (Import Regulation) Act, 1920, I am directed by the Board of Trade to state that, whilst it is not possible to regard small quantities of organic intermediate products which may be required for research purposes as being outside the scope of the Act, the Board will be prepared to issue general licenses for the importation of such products to approved research institutions, covering periods of three months and limited only as to total quantities. This procedure will obviate the necessity for separate applications for a large number of small items, but it will be a condition of the issue of any general license that a detailed return shall be furnished, at the end of the three months during which the license is in operation, of the quantities of each product actually imported under it.—I am, sir,

Your obedient servant,

(Signed) PERCY ASHLEY.

THE REGISTRAR AND SECRETARY,
INSTITUTE OF CHEMISTRY OF
GREAT BRITAIN AND IRELAND,
30, RUSSELL SQUARE, W.C. 1.