

# THE ANALYST

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

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AN Ordinary Meeting of the Society was held at the Chemical Society's Rooms, Burlington House, on Wednesday, May 7th, 1924. The President, Mr. G. Rudd Thompson, F.I.C., was in the chair.

Certificates were read for the first time in favour of:—Messrs. Johan Ernst Nyrop, Cand. Polyt. (Copenhagen University), and Clifford Padgett Thorpe, B.Sc. (Manc.).

Certificates were read for the second time in favour of:—Messrs. George William Clough, D.Sc. (Birm.), James Porter Shenton, F.I.C., and William Stanley Wood.

The following were elected members of the Society:—Messrs. John Joseph Bryant, Edgar Wilfred Deag, Harold Wilton Hewis, B.Sc. (Lond.), A.I.C., Ernest Wilfrid Jackson, F.I.C., Thomas McGrath, and Alfred Scholes, F.I.C.

The following papers were read:—"Estimation of Sugar in Urine by means of Fehling's Solution with Methylene Blue as Internal Indicator," by J. H. Lane, B.Sc., F.I.C., and L. Eynon, B.Sc., F.I.C.; "Simple Forms of Hydrogen Electrode," by J. J. Considine; "Note on the Recognition of Hydrogenated Oils," by K. A. Williams, B.Sc., and E. R. Bolton, F.I.C.; "Estimation of Copper and Tin and Copper-Tin Alloys," by A. T. Etheridge, M.B.E., B.Sc., F.I.C.; and "Notes on the Analysis of Milk Powders and Condensed Milks," by D. W. Steuart, B.Sc.

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## Report on the World's Dairy Congress.

By JOHN GOLDING, D.S.O., F.I.C.

*(Made at the Meeting, April 2, 1924.)*

GENTLEMEN,

As your delegate at the World's Dairy Congress, I have the honour to present the following report on my visit to the United States and Canada:

The Congress was a great success and was a triumph of organisation. Very great hospitality was shown to the delegates, and special facilities were offered for showing everything which was of special interest.

Upwards of 40 nationalities were represented, and the attendance from the United States of America included the leading scientific workers on every aspect of the industry.

The first meetings were held at Washington, where President Coolidge and other members of the Government welcomed the delegates on October 2nd and 3rd. The Sessions of the Congress were continued at Philadelphia on October 4th, and at Syracuse, New York, from the 5th to the 10th. From October 11th to the 13th excursions were arranged to Geneva and Cornell University, after which I visited New York. From October 18th to the 27th, I visited laboratories and colleges in America and Canada, leaving Montreal on October 27th. Other excursions were arranged by the Congress, but these I was unable to attend.

At Syracuse five Sessions were held simultaneously, and it was necessary to miss a great many of the 237 papers which were communicated. Most of these will, however, be published *in extenso*, and I only propose to refer briefly to a few of those which I had the privilege of attending.

A very excellent series of papers were contributed on the unidentified Dietary Factors or Vitamins, in which many of the leading authorities on this subject in America took part.

To the four previously defined vitamins or accessory food factors, a fifth was added by H. M. Evans (175). This new dietary factor, which he designated "X," was shown to be indispensable for reproduction. The factor is present in green leaves, cereals and fresh meat. Its further distribution in natural foods is being studied.

There is a definite, though low, quota of the needed substance X in a high proportion of milk fat; by feeding rats with milk fat in the proportion of 24 per cent. of the diet fertility may be secured in those animals. Commercial casein also contains the substance.

Discussions indicated a general acceptance of the reality and importance of these accessory factors in a complete and natural diet. No indication of their nature was suggested, and the term vitamin was provisionally accepted as a convenient designation of an unknown but essential dietary factor.

The occurrence of all the known vitamins in milk was accepted, but it was shown by R. A. Dutcher (179) and J. Golding (32) that the potency of milk in this respect varied considerably, and was dependent on the nature of the food supply of the cow. Other causes of variation had been studied, and C. Kennedy (33) concluded that drying and condensing milk will not destroy the vitamins it contains, though exposure to heat and oxidation in some processes of dry milk production may tend to diminish their content of vitamin C.

The value of milk as a food for children and as a cure for deficiency diseases, was illustrated by E. V. McCollum (70), who found an Institution where orphan children had been fed on white bread and a soup made from peas, beans, tuber and root vegetables, and muscle meats. For 48 of these children the diet was modified by the inclusion of a suitable amount of dried milk. The results fully corroborated the deductions drawn from experiments on animals.

La Fayette B. Mendel reviewed the causes of the value of milk as a food. He stated that the possible physiological properties of milk sugar remain to be elucidated, and spoke of the value of "sour milk" in this connection.

C. E. Bloch (74), of Copenhagen, reported medical evidence to show that blindness in children may be caused as a result of deficient nutrition.

H. C. Sherman discussed the optimum amount of milk for children, and as the result of a thorough experimental study of children receiving varying proportions of milk, concluded that for children of 3 to 14 years of age, one American quart (approximately  $\frac{4}{5}$ ths of an English quart) per day must be given to insure the optimum storage of calcium and phosphorus.

The problem of the mineral requirements of milch cows formed the subject of three papers.

E. B. Forbes (176) gave results of experiments showing that fresh forage is more favourable to calcium storage than is dry hay, and hay cured in cocks under caps or covers is more favourable than is hay cured by direct exposure to the sun. As a practical method of giving nutrients to cows, free access was allowed to a mixture of 1 part of salt, and 4 parts of bone flour.

E. B. Meigs (177) reported the results of experiments extending over three years; these indicate that rations in which timothy hay constitutes the chief roughage, are deficient for dairy cows, not only in calcium, but also in some other unknown material which is plentifully present in alfalfa hay.

Oscar Erf (178) stated that 45 per cent. of the mineral salts can be washed out of alfalfa hay by heavy rains.

Several readers of papers advocated the use of dried milks for feeding infants, more especially in the tropics where satisfactory fresh milk is difficult to obtain.

The use of milk in bread-making was strongly advocated by R. M. Allen (34). This worker pointed out the greatly enhanced value of bread made with the addition of milk. Where whole milk is used, vitamin A is supplied, and there is an additional practical benefit in "shortening" the product. The new and well balanced bread was recommended made from an extract of the bran and wheat germ with milk and milk solids and additional calcium salts.

In the second paper Allen points out the necessity for legislative control in the sale of milk-breads. The questions of the amount of milk to be required before the loaf may be called milk bread and what descriptive terminology shall be allowed when skim milk solids are used were discussed. A committee considering this subject suggested, as a standard, that at least one-third of the liquid ingredients in the manufacture of milk-bread shall be whole milk.

C. A. Glabau (35) spoke with great enthusiasm of the possibility of finding a market for skim milk solids in the baking industry. He said that the baker consumes 40,000,000 barrels of flour per year, which furnishes a market of about 11 pounds of skim milk solids per barrel of flour, or about  $15\frac{1}{2}$  pounds of whole milk solids per barrel of flour. The vast economical importance of utilising dairy by-products in the baking industry, and by so doing increasing the nutritive

value of the "staff of life," was generally acknowledged as a highly desirable goal by those who took part in the discussion.

Two papers were read on the selection of metals for dairy equipment by O. F. Hunziker and R. Seligman. It was generally concluded that this subject requires more investigation, and the introduction of a variety of new metals in the manufacture of expensive dairy outfit, necessitates a more complete knowledge of the action of milk on these metals and the effects produced by the metals on milk. This subject was also brought out in papers dealing with dried milks.

Much information about chemical and analytical problems was gleaned by visits to laboratories and colleges. With an introduction from Mr. Henry C. Wallace, Secretary of the United States Dept. of Agriculture, I visited the Bureau of Chemistry, Washington, D.C. I had the pleasure of meeting the new Chief, Dr. C. A. Browne. The acting Chief, now Director of the Regulatory Department, Mr. W. G. Campbell; the Director of Research, Dr. Bell; the Assistant Chief of the Bureau, Dr. W. W. Skinner; and Mr. K. J. Keister, in charge of Milk Analysis.

Among the many activities of the Bureau, the investigation and development of processes for the utilisation of agricultural products and by-products were of special interest. Among these were the utilisation of dried milk, dried separated milk, and dried butter milk in bread-making. In this connection the Regulatory Department seemed to be in some difficulty in enforcing and controlling suitable trade designations for the products which are now important articles of food. The practical advantages of milk fat in "shortening" the bread and the better balanced food which resulted are certainly worthy of recognition. The less expensive by-products of the butter industry also add to the nutritive value of the bread, but when I discovered in Canada a soya bean product which was also being proposed for making "milk-bread," the need for suitable designation and analytical control became more apparent.

A list of some of the publications issued under the auspices of the Department is appended :

- U.S. DEPT. AGRICULTURE LIBRARY. No. 6. Bibliographical Contributions. Partial List of Publications on Dairying issued in U.S.A. 1900 to June, 1923.  
 Contents:—Part I., Publications of the State Agricultural Experiment Stations, pp. 4-75; Part II., Publications of the U.S. Dept. of Agriculture, 1900 to June, 1923, pp. 76-97; Part III., Books issued or revised since 1908, pp. 99-103; Part IV., Periodicals, pp. 104 to 107; Subject List, pp. 108-236.
- STANDARD METHODS OF MILK ANALYSIS of the American Public Health Association and the Association of Official Agricultural Chemists. Fourth Edition. 1923.
- REPORT OF THE CHEMIST. U.S. DEPT. OF AGRICULTURE, for the year ending June 30, 1922.
- A HANDBOOK OF DAIRY STATISTICS. By T. R. Pirtle. U.S. Dept. of Agriculture. June, 1922.
- THE DAIRY PRODUCE ACT AND REGULATIONS. Acts, Orders and Regulations, No. 6. Dept. of Agriculture, Canada. 1923.

#### DISCUSSION.

Mr. E. R. BOLTON expressed great satisfaction that Capt. Golding had been able to represent the Society as a delegate at the world's Dairy Congress. He was interested in Miss Kennedy's view that the process of drying milk did not destroy

vitamins. "Dried" Milk was an insufficient description: milk might be dried by three distinct types of processes, and he would like to know whether Miss Kennedy's statement referred to one type only or covered all types.

Dr. J. C. DRUMMOND said that this question of the temperature to which vitamins could be heated was constantly coming up, and was one that it was quite impossible to answer without knowing particulars of the process. No work had, so far, been published in which samples had been examined before and after drying by any particular process. The destruction of vitamins was brought about by oxidation, and the conditions that led to oxidation being rise of temperature, length of exposure to that temperature, and degree to which the product was aerated, it was evident that, by a combination of these factors, one got destruction. There were milk products on the market which had not been satisfactorily prepared, but if dried milk was in a fresh condition it appeared to have as good vitamin value as an average sample of fresh milk.

Mr. A. CHASTON CHAPMAN said that there appeared to be some evidence that the vitamins in milk were not destroyed in the ordinary processes of drying, and if there was any truth in the statement which had recently appeared in the press that one of the vitamins was a crystalline substance melting at 233° C., it would be reasonable to suppose that these substances were tolerably resistant to the destructive effect of heat.

Mr. G. RUDD THOMPSON said that evidently one more terror had been added to life in a fifth accessory food factor. He had carried out experiments, extending over three years, on hay, and from some slight investigations upon alfalfa, he would not be surprised to find the missing ingredient to be fluorine. He considered dried milk would be invaluable in the Tropics, where Europeans often found it almost impossible to get satisfactory milk. He hoped that the suggestion in Mr. Allen's paper of legislative control in the sale of milk-bread for the percentage of milk-solids would not be introduced into this country. As regards the selection of metals for use in dairies, he had, some time ago, conducted experiments on behalf of some dairy farmers, and had been surprised by the corrosive effect that really normal milks had upon certain aluminium-copper alloys. He thought there was a field for investigation in dairy utensils. He enquired if America was more up-to-date in the matter of dairying than we were in this country, and, if so, why it was.

Dr. J. A. VOELCKER said that he was interested in Capt. Golding's remarks on practical matters in connection with dairying in America, and enquired how the position stood with regard to scientific dairying, such, for instance, as research laboratories.

Mr. H. JEPHCOTT said that he had been present at the Congress when Dr. Kennedy's paper was read. The dried milk in which Dr. Kennedy stated vitamin destruction had not occurred had been prepared by the roller process, and not in a vacuum.

Capt. J. GOLDING, referring to Mr. Bolton's question, said that Dr. Kennedy spoke of milk dried or condensed by different processes. She concluded that very little destruction, even of vitamin C, took place when the water was rapidly removed by modern methods.

Rapidity of drying on a roller, low temperature in a spray process, and absence of air in a vacuum process, all tended to prevent the oxidisation which resulted in destruction of the vitamins. The fat-soluble factors were more thermostable than the vitamin C.

Dr. Drummond's remarks summarised the position and were, Captain Golding believed, in agreement with the views of American workers, who fully appreciated the variation in milks due to the feeding of the cows.

G. W. Cavanaugh, R. A. Dutcher and J. S. Hall (*J. Inf. Dis. of Children*, 25, 498, 1923) had recently taken this fact of variation into account in their work on a

spray-dried milk. They concluded that milk powdered by the spray process seemed to possess as great anti-scorbutic properties as the raw milk from which it was made.

Referring to the President's question as to whether American dairy methods were more up-to-date than British, the speaker said that there was no doubt that on seeing American methods, one learnt a great deal of what to follow and of what to avoid. For instance, it was curious to see a brewery bottle-washing machine adapted to dairy-bottle washing, and the difference of opinion evinced in the fundamental principles involved in the apparatus. On the other hand, the Americans understood the use of ice for the carriage of milk in a way which we at present did not. The Americans were fortunate in having access to greater financial resources than were available in this country, with the result that their educational Dairy buildings were large and well equipped.

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## Cream Cheese.

BY T. R. HODGSON, M.A., F.I.C.

*(Read at the Meeting, March 5, 1924.)*

AN attempt was recently made by the Holborn Borough Council to set up a standard for fat in cream cheese (ANALYST, 1923, 48, 383); it was apparently the intention of the Council to insist that cream cheese should contain at least 20 per cent. of fat; the prosecution, according to the report, expected cream cheese to be made from cream, and the defence contended that it could be made from skimmed milk.

This attempt to set up a minimum standard for fat would appear to be very ill-advised for two reasons:—(1) The decision carries no weight outside London, because, although at the police court, the decision was in favour of the prosecution, an appeal from the magistrates' decision, being a question of fact and not of law, is taken to the Quarter Sessions and the decision of the Chairman of the London Quarter Sessions has no effect outside the area of his own Court's jurisdiction; the provincial Analyst is therefore left in this position that, as the appeal was allowed, the case can be quoted against him in similar proceedings, whereas if the appeal had been dismissed it could not have been quoted in his favour. (2) The proposed standard leaves out of account altogether the composition of the original milk from which the cream cheese is made; that this is most important is seen from the United States Standard, under which cream cheese must be made from cream or from milk containing not less than 6 per cent. of fat; this standard obviously does away with the contentions of both the prosecution and the defence, as the minimum requirements are that it should be made from whole milk; as it is quite possible to make cream cheese which contains less than 20 per cent. of fat, from whole milk, and it is also possible to make cream cheese, containing more than 20 per cent. of fat, from partially skimmed milk.

In any similar prosecution, it would be much more reasonable to charge the vendor with selling cream cheese made from milk partially deprived of its fat;

this raises an altogether different question, namely, as to whether it is legitimate to manufacture cream cheese from skimmed or partially skimmed milk, and further, any appeal from a police court decision, being on a point of law, would necessarily have to be taken to the High Court of Justice, with the result that the final decision would be binding on the whole country and not on London alone.

The method of deciding on the results of an analysis, as to whether a sample is made from skimmed or partially skimmed milk, is very simple; Cribb has shown (ANALYST, 1909, 34, 45) that in a genuine cream cheese the percentage of fat should exceed the percentage of protein and, further, Richmond (ANALYST, 1919, 44, 202) has shown that the composition of the original milk can be calculated from the formulæ:

$$\text{Fat in original milk} = \frac{100F}{35.4P \times F} + 0.25.$$

$$\text{Solids-not-fat in original milk} = \frac{333P}{35.4P \times F}.$$

For the purpose of testing the above formulæ, 26 samples of cream cheese were examined, of which 19 were made in the laboratory from milk of known composition, and 7 were purchased from retail shops. Analysis of these samples gave following results:—

	Fat Per Cent.	Proteins Per Cent.	Water Per Cent.	Lactose Per Cent.	Mineral Matter Per Cent.
1	66.03	9.15	23.80	0.33	0.69
2	46.37	12.79	37.63	2.00	1.21
3	45.17	13.84	37.39	0.79	2.81
4	37.22	18.95	42.20	0.91	0.72
5	28.23	27.72	38.73	1.21	4.11
6	28.02	28.90	38.18	0.79	4.11
7	23.71	15.94	55.00	1.84	3.51
8	22.53	16.45	58.09	2.05	0.88
9	21.34	10.42	66.15	0.76	1.33
10	19.13	18.62	57.50	1.32	3.43
11	17.38	17.15	62.61	1.93	0.93
12	16.42	15.31	65.42	1.54	1.31
13	13.60	21.76	61.08	2.07	1.49
14	13.21	18.52	65.17	1.99	1.11
15	12.23	10.92	72.53	1.11	3.21
16	6.43	15.85	74.59	1.41	1.72
17	5.00	23.91	67.13	0.63	3.33
18	1.97	22.13	72.45	1.77	1.68
19	1.06	24.29	71.12	0.72	2.81
20	76.15	3.26	18.85	0.53	1.21
21	26.42	24.71	44.80	1.12	2.95
22	22.53	19.03	54.32	1.33	2.79
23	20.9	28.3	46.4	1.6	2.8
24	15.7	26.4	52.7	1.6	3.6
25	11.8	17.7	66.5	1.5	2.5
26	8.2	24.9	63.2	1.5	2.2

Nos. 1 to 9 were made in the laboratory and Nos. 10 to 26 were purchased in the ordinary course of business.

Comparing the above analyses with the proposed standard, Nos. 1 to 9 and 20 to 23 comply with the standard and Nos. 10 to 19 and 24 to 26 fail to comply and would therefore be reported upon as adulterated; but the actual and calculated compositions of the original milks were as follows:

	ACTUAL.		CALCULATED.	
	Fat Per Cent.	Solids-not-fat Per Cent.	Fat Per Cent.	Solids-not-fat Per Cent.
1	17.19	7.80	17.18	7.81
2	9.63	8.64	9.54	8.53
3	8.75	8.55	8.69	8.63
4	5.56	9.00	5.51	8.91
5	3.09	9.16	3.04	9.14
6	2.89	8.86	2.92	8.88
7	4.33	9.13	4.28	9.03
8	4.00	9.20	3.98	9.06
9	5.77	8.85	5.72	8.89
10	3.09	9.16	3.07	9.14
11	3.12	9.16	3.03	9.30
12	3.22	9.14	3.19	9.13
13	2.00	9.31	1.98	9.24
14	2.00	9.31	2.22	9.22
15	3.41	9.45	3.39	9.33
16	1.36	9.39	1.38	9.30
17	0.85	9.45	0.83	9.34
18	0.48	9.41	0.50	9.38
19	0.40	9.41	0.37	9.39
20	—	—	40.21	5.69
21	—	—	3.26	9.37
22	—	—	3.49	9.10
23	—	—	2.27	9.21
24	—	—	2.10	9.23
25	—	—	2.10	9.23
26	—	—	1.18	9.40

In the above table the calculated fat and solids-not-fat were obtained by the use of Richmond's formulæ.

Now if we consider the above figures, we find that Nos. 1 to 5, 7 to 12 and 15 are made from whole milk and, yet, under the proposed standard, Nos. 10, 11, 12, and 15 would be condemned as adulterated; the unfairness of this standard may be judged from a consideration of Nos. 5 and 10; these two cheeses were made from the same milk and, yet, under the standard, No. 10 would be condemned but No. 5 would be passed as genuine; also No. 6 would be passed as genuine, although made from a milk slightly deficient in fat.

By applying Cribb's formula to the above results, we find that Nos. 1 to 5, 7 to 12, and 15 would be passed as genuine, and Nos. 6, 13, 14 and 16 to 19 classed as adulterated; this actually corresponds with the facts.



Of samples Nos. 20 to 26, the proposed standard would pass Nos. 20, 21, 22, and 23, and would condemn Nos. 24, 25 and 26; Cribb's formula would pass Nos. 20, 21 and 22 and condemn Nos. 23, 24, 25, and 26. It must, therefore, be obvious from the above that it is quite arbitrary and contrary to the obvious facts to attempt to set up any standard for fat which has no reference to the protein content.

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## What is Bondon Cheese?

By G. D. ELSDON, B.Sc., F.I.C.

(Read at the Meeting, March 5, 1924.)

DURING October last a dairyman in the Borough of Salford was fined £5 for selling as "cream cheese" a cheese which contained only 5 per cent. of fat. The cheese was supplied to the vendor under the description of "Bondon," the labels, however, being removed before sale. Although the court upheld the opinion that a cheese such as this should not be sold as "cream cheese," the question as to whether such a cheese may be lawfully described as "Bondon" remains unanswered. A case recently heard in the Appeal Court in regard to a somewhat similar matter affords us no help as, owing to a conflict of evidence, the matter was fought out on a side issue.

In attempting to arrive at a decision the writer has endeavoured to obtain evidence from various sources; a large amount of material has been collected, and an attempt is now made to summarise the information that has been obtained.

Cribb (ANALYST, 1909, 34, 45) makes the following comments:

"It is noteworthy that the produce of the well-known English dairy companies all contained upwards of 69 per cent. of fat, while the worst cases are to be found amongst the varieties labelled as 'Bondon,' one at least of which was made in this country. The true 'Bondon' cheese as made in France, was, and possibly still is, made from whole milk; if it is to be sold here as cream cheese, the least that can be expected is that it should have the composition of a whole-milk cheese. 'If the Bondon cheese is to be accepted as a cream cheese' then the fat should be well over 20 per cent. . . ." If, however, the Bondon is to be excluded from this category, then the standard suggested by Moor (at least 40 per cent. of fat) would be a perfectly reasonable one."

Richmond, *Dairy Chemistry*, 3rd edition, gives three analyses of Bondon cheeses by various observers, which vary from 20.8 to 41.9 per cent. of fat, whilst he also reproduces the figures due to Cribb above and describes them as "Bondon?" In a letter to the writer, however, he states that, "Neufchâtel cheese, which is frequently called Bondon, is a product chiefly made in the department of Seine Inférieure in France, the origin probably being in the town of Neufchâtel. It is a soft cheese and is usually made from whole milk, but there are, as a matter of fact, several varieties. First of all there is the Neufchâtel "Double crème dit Bondon" cheese made from whole milk to which a proportion of cream is added, then there

is the whole milk cheese or Neufchâtel cheese "à tout bien," this is the normal Neufchâtel or Bondon cheese and is, I believe, a standard variety. There is, however, a cheese made from skimmed milk or Neufchâtel "maigre" or "à la pic," this is, or has been, also sold as Bondon, and I believe would be distinguished from the standard Bondon cheese, partly by the name, but especially by the price at which it is sold.

"A Bondon cheese containing 5 per cent. of fat would certainly come under the category of the skimmed milk cheese. I have no evidence as to what the sales of the skimmed milk cheese are in Normandy, as, though I have been to several places in the department of Seine Inférieure, I have never bought, nor have noticed, any Bondon skimmed cheese exposed for sale.

"My own impression is that the skimmed milk cheese is not a very largely sold article. So far as England is concerned, I doubt whether there is any understanding of what Bondon cheese should be, and I think that as long as the purchaser gets a soft cheese of the characteristic Neufchâtel type, he would not be prejudiced if the skimmed milk cheese were sold to him so long as it was sold at a low price."

The writer has discussed this matter with several prominent Public Analysts in the North of England, and they were unanimously of opinion that such a cheese ought certainly not to be sold under the name "Bondon" unless the purchaser is distinctly notified that it is a skimmed milk cheese.

The authorities of the municipal laboratory, Paris, on being approached on this matter, replied in the following manner:

"The cheese called 'Bondon' which is used in France should normally contain 20 to 25 per cent. of fat, although standards for fat in cheese have only been fixed in the case of 'Camembert.' I have every reason to believe that a manufacturer who placed on the market a Bondon containing only 5 per cent. of fat would be liable to be prosecuted if not for fraud at least for deceiving the public as to the quality of the goods."

The writer has approached two prominent members of the Dairy Industry in the North Midland area. The first stated that, in his opinion, a Bondon cheese should be a whole milk cheese containing therefore 20-30 per cent. of fat (the percentage of fat in a soft cheese tends to be lower than that in a hard cheese on account of the increased proportion of water), this opinion being supported by the fact that the produce of his firm contained 28 per cent. of fat as determined in this laboratory. The second expressed the opinion that "If I were buying a Bondon cheese I should expect it to be a whole milk cheese and not a skimmed milk one."

Inquiries have been forwarded to the Directors of nine Agricultural Colleges in this country. The general idea which seems to be held at these colleges, as shown by the replies that have been received, is that the original Bondon cheese was made from whole milk sometimes enriched with cream, but that in more recent years the practice has grown up of sending out cheese under this description which has been made from all kinds of milks ranging down almost to separated milks. The opinion is also expressed that the cheese made from separated milk is distinctly inferior, and that the best kinds are still made from whole milk.

An important firm in the Dairy Industry, one of those firms who consider that the preparation of Bondon cheese is a legitimate manner of utilising skimmed milk, write in the following way:

“We cannot, however, agree with you that Bondon cheese made from skim milk should not be sold as such, as for a considerable number of years (over 20 to our knowledge), cheese made in this manner from skim milk with even less than 5 per cent. fat, has been sold under the name ‘Bondon,’ and we think if you refer to any text book you will find confirmation of this. Bondon cheese is made from whole milk, skim milk and partially skim milk both in Normandy (the home of Bondon cheese) and in this country, evidence of this being unlimited, indeed this is the first time we have heard this fact either disputed or queried in any way.”

Reviewing the whole of this evidence as impartially as possible, two main facts would seem to be established: (1) That Bondon cheese was originally a whole milk cheese, and that it is still so regarded by many. (2) That an important section of the dairy industry are now making cheese from skimmed milk which they describe as “Bondon,” and which practice they consider to be legitimate. As in nearly every other case, the last factor which the trade seem to take into consideration is the opinion, knowledge and requirements of the public, and it seems to the writer that it is grossly unfair to that section of the trade which is selling a good class article to allow another section of the trade to produce an inferior article under the same description. It is quite true that, in some cases, the inferior article is sold at a slightly lower price, but this fact is not usually considered to be a legitimate defence in any case of misdescription, and, in the interests of both consumer and trade, it would appear to be most desirable that some definite standard for Bondon cheese should be laid down or, alternatively, that where any soft cheese is not made from whole milk the fact should be plainly declared to the purchaser by a distinctive label

In the opinion of the writer “Bondon” cheese should be a whole milk cheese and should certainly not contain less than 20 per cent. of fat, whilst possibly 25 per cent. might be a better standard, although more definite information would have to be obtained before this point could be finally settled. The fact that skimmed milk cheese has been sold as “Bondon” for the last twenty or even fifty years should surely be no argument at all, if Bondon cheese is really a whole milk cheese, because some firms are still selling a whole milk cheese as Bondon and declare this to be necessary. It should not be possible to allow any firm or firms to plead “Trade custom” merely because they have been selling for years an article alleged to be adulterated without the matter being discovered or brought to light in the courts.

A word or two might be said here in regard to the defence which is so often brought forward by defendants in the case of proceedings under the Food and Drugs Acts that they have been selling similar goods for years, and that no complaint has previously been made—drawing the conclusion that matters have always been satisfactory up to the time in question. The only test that is of any value in such cases is, of course, the percentage of samples, taken under the Acts which have been found to be genuine and adulterated respectively.

## DISCUSSION.

Dr. G. MONIER-WILLIAMS said that in suggesting a standard for cheese it appeared to be an unnecessary complication to take account of the water content. What was really required was to know whether a cheese had been made from cream, whole milk, partially skimmed milk, or separated milk. The ratio of fat to protein in the original milk was the controlling factor as regards the composition of the cheese, and this had been found in Holland to be remarkably constant. Swaving had given a series of figures in which the fat content of the original whole milk varied from 2.55 to 4.01 per cent., the resulting cheeses varying only from 47.9 to 53.3 per cent. of fat. In America the standard for a whole milk cheese was 50 per cent. of fat on the dry solids. In Holland this standard could, apparently, not be reached, and 45 per cent. was laid down as the figure for whole milk cheese. Anything under 20 per cent. of fat on the dry solids had to be labelled as skim milk cheese.

Mr. HINKS said that he agreed with the last speaker. Cream cheese should be made from cream, otherwise the meaning of the term had entirely gone. Apart from the actual fat content of the cheese, the fact that the "creaminess" might be produced by water should also be considered. He was inclined to think that some of the "cream cheeses" referred to by the author must be skim milk churned with water. In a cheese containing 80 per cent. of water the ratio of fat to protein would be very small. Was there a double standard for cream cheeses similar to the condensed milk standard? It was absurd to have a "cream cheese" containing only 5 per cent. of fat. He thought it advisable that a double standard should be set up.

Dr. DYER suggested that the term "cheese" was applied to something you obtained in the form of a slab; the term "cream cheese" was loosely applied to all soft cheeses and, as popularly used, had lost to a large extent, its proper meaning.

Mr. C. L. CLAREMONT said that the term "cream cheese," as used by the author, did not mean made from cream, but merely meant of a creamy consistence. It might be made by warming milk and adding rennet.

Mr. E. M. HAWKINS thought that surely the nutritive value of the cheese should be considered; a buyer did not expect to have to pay for "water standing up" at the price of a cream cheese. If that was the case, the manufacturers of these cheeses must be making a handsome profit. Were these cheeses made, possibly, from whole milk emulsified?

Dr. J. A. VOELCKER said that the authors' definitions of cream and soft cheeses were very different from those which ruled at Agricultural Shows. At the latter there were separate classes for "Soft Cheeses made from whole milk" and for "Cream Cheeses made from cream without the addition of rennet." It was dealing unfairly both with the farmer and the public to call a "soft" cheese a "cream cheese," and he thought that it was time that something was done to secure uniformity of action. From the agriculturist's point of view "cream cheese" was a cheese made from cream and nothing else.

Mr. A. MORE said that when doing experiments with rennet and milk a by-product was obtained, which, if put in a cloth and allowed to drain, was described as cream cheese. The term "cream cheese" resembled some others which were misleading; there was "evaporated cream" which was not derived from cream, "egg powder" which never saw eggs; also several kinds of soft cheese, much advertised, and generally considered to be cream cheese, were probably not made from cream at all.

Mr. T. MCLACHLAN said that the dictionary defined "Bondon" cheese as one made at Neufchatel in the shape of a "bondon" or bung. If the French understood the term "Bondon Cheese" to mean a cheese of a particular shape made in a particular place, surely it was quite irregular to sell "Bondon Cheese," not made in Neufchatel, as such in England.

## The Estimation of the Inorganic Impurities in Gelatin.

BY S. R. TROTMAN, M.A., F.I.C., AND R. W. SUTTON, B.Sc., A.I.C.

THERE is no standard of purity for gelatin sold for food purposes in the United Kingdom, but in the United States of America limits are prescribed by the Food Laws which must not be exceeded. These are, in parts per million:

Arsenious oxide, 1.4; sulphur dioxide, 350; lead, 50; copper, 30; and zinc, 100. Aluminium, iron and calcium, also commonly present, are not subject to regulation.

The estimation of these impurities is not easy. The results obtained by different chemists do not agree so closely as might be expected. They appear to be affected by the method used for analysis. The authors have had a large experience in the analysis of gelatins for export, and have examined some of the published methods very carefully.

The following brief details are given:

1. ARSENIOS OXIDE.—Destruction of organic matter appears to be essential. For this purpose, magnesium nitrate solution, as recommended by Wilkie, *J. Soc. Chem. Ind.*, 1923, 42, 63, is quite satisfactory. The electrolytic apparatus of Monier-Williams (ANALYST, 1923, 48, 112) and that of Wilkie (*loc. cit.*), are used regularly, but the authors prefer standard mirrors to the stains recommended by Wilkie.

2. SULPHUR DIOXIDE.—The only reliable method is to distil, by means of steam, into excess of bromine water, and weigh the sulphuric acid produced, as barium sulphate (*cf.* Chapman, ANALYST, 1922, 47, 204). Distillation into iodine solution and titration is unreliable, since gelatins containing no sulphur dioxide give a distillate which reduces iodine. But a gelatin free from sulphur dioxide gives no sulphuric acid when distilled with steam, even if distillation is continued for two hours, while the whole of the sulphur dioxide comes over in about 20 minutes. It should be noted that discrepancies in results occur sometimes through want of uniformity in determining (a) free sulphur dioxide, (b) total sulphur dioxide after treatment with acid.

3. THE ESTIMATION OF METALS.—This is rendered difficult by the relative amount and nature of the organic matter present. Thirty grms. of gelatin is the smallest quantity which can be used for reliable results. Hertwig (*J. Soc. Chem. Ind.*, 1923, 42, 1034 A) destroys organic matter by incineration. This is very tedious and liable to result in loss of both lead and zinc. The authors prefer the method of Jamieson (ANALYST, 1919, 44, 124). From 30 to 50 grms. of the gelatin are soaked overnight in cold water. About 25 c.c. of strong hydrochloric acid are added, and the mixture is heated on the water bath for two hours to hydrolyse

the gelatin. The liquid is then cooled, made alkaline with ammonia, and subjected to the action of a stream of hydrogen sulphide, or treated with sodium sulphide solution (*cf.* Lander, *ANALYST*, 1908, **33**, 450). The precipitated sulphides are coagulated by heating in boiling water, collected on a Gooch filter, washed with hydrogen sulphide water, and dissolved in nitric acid (1:1). After filtration, the filtrate is concentrated with 10 c.c. of sulphuric acid (1:5) till the nitric acid has been expelled. The residue is diluted to 100 c.c. with water and allowed to stand for some hours, to complete the precipitation of lead sulphate.

*Lead.*—Jamieson recommends weighing the lead sulphate on a Gooch crucible. This, however, is rarely possible. But reliable results are obtained by dissolving the lead sulphate in ammonium or sodium acetate solution and estimating the lead colorimetrically. Under the conditions of the experiment small quantities of lead are precipitated practically quantitatively, as the following experiments prove.

Definite volumes of a standard solution of lead nitrate were treated with sulphuric acid. In one series the nitric acid was removed by concentration, whilst in another it was left in the solution. The precipitated lead sulphate was collected on a Gooch filter and weighed, and any lead in the filtrates was estimated by the colorimetric method. (The presence of alcohol does not interfere with the colorimetric determination of lead.) The results obtained indicate that, even with very small quantities of lead, 99 per cent. is precipitated as lead sulphate when the usual procedure is followed, whilst with incomplete removal of nitric acid, 95 per cent. is obtained as lead sulphate. The figures are given in the following table:

Exp.	Vol. of strong Lead sol. taken. cc.	Lead taken. Grm.	Weight of PbSO <sub>4</sub> Grm.	Lead. Grm.	Lead in filtrate Grm.	Total Lead recovered Grm.	Lead pptd. as PbSO <sub>4</sub> . Per Cent. (by diff.)	Lead pptd. as PbSO <sub>4</sub> . Per Cent. (from Column 4).
<b>I.</b>								
1	20	0.0200	0.0252	0.0178	0.0014	0.0192	93.0	89.0
2	10	0.0100	0.0134	0.0092	0.0006	0.0098	94.0	92.0
3	7.5	0.0075	0.0104	0.0071	0.0004	0.0075	95.3	94.6
4	5	0.0050	0.0070	0.0048	0.0002	0.0050	95.4	96.0
<b>II.</b>								
1	20	0.0200	0.0275	0.0188	0.0002	0.0190	99.3	94.0
2	10	0.0100	0.0138	0.0094	0.0001	0.0095	99.0	94.0
3	5	0.0050	0.0072	0.0049	0.0002	0.0051	96.4	98.0

The lead is prepared for tinting by solution of the sulphate in hot sodium or ammonium acetate (1:3), in which the lead sulphate dissolves unchanged. The asbestos pad containing the lead sulphate is digested with 15 to 20 c.c. of the hot acetate solution, the liquid made up to 50 or 100 c.c., and the lead estimated colorimetrically in an aliquot part. The following results indicate that 2 extractions of the asbestos are necessary.

							Lead.
							Grm.
I.	1st extraction with 15 c.c. ammonium acetate (1:3) gave						0.0005
	2nd in similar way	..	..	..	..	..	0.0002
	3rd " " "	..	..	..	..	..	0.00003
II.	1st " " "	..	..	..	..	..	0.0006
	2nd " " "	..	..	..	..	..	0.0002
	3rd " " "	..	..	..	..	..	0.0000

It is, of course, necessary to ascertain that the acetate solution used is free from lead. One experiment indicated that extraction with sodium acetate was more efficient than with ammonium acetate, but this result was not confirmed.

It is also advisable to add an equivalent amount of ammonium (or sodium) acetate solution to the cylinder containing the standard lead solution, so that the comparison is made with both solutions containing the same amount of acetate. Finally, in the procedure recommended by Jamieson (see above) a small amount of lead will be lost when the metallic sulphides are dissolved in hot nitric acid. It has been found that, even with such small quantities of lead sulphide, solution in nitric acid results in the formation of some lead sulphate. It is therefore necessary to estimate this by extraction of the asbestos pad with ammonium acetate solution. The lead is estimated in this solution colorimetrically, and the amount found is added to the main bulk of the lead estimated as described above.

*Copper.*—Copper is precipitated as sulphide. Jamieson collects the copper sulphide in a Gooch crucible, ignites it and weighs the oxide. This, as with lead, is very unreliable. In a good gelatin the error of experiment would be greater than the copper present. The following method gives accurate results:—The copper sulphide is dissolved in nitric acid, the solution evaporated to dryness, the residue re-dissolved, and the solution electrolysed. The copper is then dissolved in nitric acid, and the solution is evaporated to dryness. The copper nitrate is dissolved in water, the solution made up to 100 c.c. and the copper estimated colorimetrically with potassium ferrocyanide. Winkler, *J. Soc. Chem. Ind.*, 1913, **32**, 157, states that, in the absence of lead, copper in water is best estimated colorimetrically as sulphide, with the addition of ammonium chloride, which increases the intensity of the coloration. This has been tried, but is not so satisfactory as the ferrocyanide method. Wynter Blyth recommended the addition of ammonium nitrate solution to the Nessler cylinders. This overcomes the difficulty that a redder shade is given by the separated copper than by the standard solution. Ammonium acetate acts in the same way, and ensures the absence of traces of mineral acid. It is important to add the ammonium nitrate or acetate solution before the ferrocyanide. If added afterwards, no effect is produced. Excess does not affect the colour. From 2 to 3 c.c. of a 10 per cent. solution is a suitable quantity.

Attempts were made to estimate the lead and copper together, colorimetrically, by means of sodium sulphide, first with, and then without, the addition of potassium

cyanide. The method was found to be quite unreliable. Thresh (ANALYST, 1924, 124) has arrived also at the same conclusion in the case of water. But good results were given by the following process which avoids electrolysis of the copper:

The mixed sulphides, obtained as described above, are dissolved in nitric acid, and the solution is evaporated to dryness. The nitrates are dissolved in 100 c.c. of water containing 3 c.c. of hydrochloric acid, and the solution treated with hydrogen sulphide. The amount of acid used is of importance. If the solution is not sufficiently acid, zinc sulphide is precipitated, whilst too much acid involves incomplete precipitation of lead. The sulphides of lead and copper are dissolved in nitric acid, the solution is evaporated to dryness, and the nitrates dissolved in water. Lead is estimated in one portion of the solution in the usual manner, and the copper in another by means of potassium ferrocyanide in the presence of ammonium acetate.

Bogue and Hertwig both recommend the iodimetric estimation of copper in gelatin. The copper nitrate, obtained as described above, is dissolved in water, 2 grms. of potassium iodide are added, and the liberated iodine is titrated with 0.01 N sodium thiosulphate solution (1 c.c. = 0.000636 grm. Cu). The process has been tested, but it was found that the quantity of copper present in good gelatins is rarely sufficient for accurate results. If a gelatin contained 30 parts of copper per million and 30 grms. were taken for analysis, the volume of thiosulphate used would be only 1.4 c.c.

*Zinc.*—The method of Jamieson is adopted. The filtrate from the copper sulphide is boiled to expel hydrogen sulphide, and made alkaline with ammonia. Excess of formic acid is then added and the zinc precipitated with hydrogen sulphide, collected in a Gooch crucible, ignited and weighed as oxide. If iron oxide and alumina are precipitated when ammonia is added, they are removed by filtration. But this is not necessary, since the sulphides of both iron and aluminium are soluble in formic acid.

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## Notes.

*The Editor wishes 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.*

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### THE COMPOSITION OF COCONUT OIL.

In a recent number of the *Journal of the Chemical Society (J. Chem. Soc., 1923, 123, 2837)*, E. V. Walker gives the results of the examination of a sample of coconut oil, and refers particularly to the proportion of octoic and decaoic acids, commonly termed caprylic and capric acids respectively. This author finds about 6 per cent. of caprylic and from 1 to 2 per cent. of capric acid, and compares these figures with those of Paulmyer, who found 0.25 per cent. of caprylic and 19.5 per cent. of capric acid, and with those of the writer (Elsdon, ANALYST, 1913, 38, 8), who



found 9 per cent. of caprylic and 10 per cent. of capric acid. Walker states that "This (his analysis) is entirely at variance with the analyses quoted in the first part of the paper, but is in agreement with Georgey's observations. Whether this disagreement represents real differences in the composition of different samples of oil or whether the analyses were inaccurate cannot be stated definitely."

In regard to the analyses of the writer, Walker entirely overlooks the fact that it was clearly stated in the paper quoted, and also in a later one (ANALYST, 1914, 39, 78), that the method used had little quantitative significance, although a fairly obvious misprint occurs in the last line but one of the second paper, where "qualitative" should read "quantitative." The method adopted, that of alcoholysis, is now well known. The figures given in the papers by the writer were obtained by separating the mixed methyl esters into fractions by distillation, the receiver being changed at a point half way between the boiling points of consecutive esters. In the case of coconut oil the fraction corresponding to methyl laurate was 442 grms., whereas that corresponding to methyl caprate was 92.5 grms., and it is, of course, perfectly obvious that in a fractionation of this type the large quantity of methyl laurate present in the mixed esters will increase considerably the next lower fraction to it, which is methyl caprate. It is thus very probable, and a careful reading of the paper would have indicated this quite clearly, that the amount of capric acid actually present in coconut oil is considerably less than the 10 per cent. apparently indicated by the weight of the methyl caprate fraction.

The writer has more recently separated the fatty acids from about 10 kilos. of coconut oil, and from the amount of capric acid actually isolated from this he is quite in agreement with Walker that there is considerably less than 10 per cent. of capric acid present in coconut oil, and that probably the figure of from 1 to 2 per cent. is not very far from the truth. It is possible that the method of Crowther and Hynd (*Biochem. J.*, 1917, 11, 139) would settle this matter definitely. These workers have obtained apparently excellent results, from an extention of the original method, in their examination of butter fat, and it seems quite likely that their modifications will greatly increase the quantitative accuracy of the process.

G. D. ELSDON.

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### SENSITIVE REACTIONS FOR COPPER.

ON adding to a dilute solution of a copper salt in water three or four drops of a dilute solution of ammonium or potassium thiocyanate, and then a few drops of a one per cent. solution of benzidine in alcohol, a deep blue precipitate, insoluble in all the usual organic solvents, is obtained; this reaction is sensitive for one part of copper in a million and for one part of thiocyanogen in 13000.

If a half per cent. alcoholic solution of guaiacum resin be substituted for the benzidine in the above reaction a blue colour is developed with a concentration of one part of copper in ten millions.

More delicate still is the following test:—If a few drops of a half per cent. solution of guaiacum resin in alcohol be added to a small quantity of a weak aqueous solution of a copper salt and the mixture heated, a deep blue colour develops, the blue compound being soluble in chloroform. This reaction is sensitive for one part of copper in two hundred millions. The above reactions are not given by any of the other metals. It is true that iron gives a blue colour with guaiacum in strong solutions, but this colour disappears on heating.

ROBERT FLEMING.

## CONDENSED MILK CALCULATIONS.

THE Condensed Milk Regulations, 1923, required the label on a tin to declare the equivalent of the contents in pints of milk or skimmed milk. The standard milk must contain at least 12·4 per cent. of milk solids and at least 3·6 per cent. of milk fat, and skimmed milk at least 9 per cent. of milk solids-not-fat.

The following table gives the number of ounces of constituents in the usual quantities of milk given on condensed milk declarations. The third decimal place is ignored. Milk is presumed to have a specific gravity of 1·032; and machine-skimmed milk 1·035, on the basis of 8·9 per cent. of solids-not-fat and 0·1 per cent. of fat.

Pints.	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	2
<i>Milk (full cream).</i>								
Milk solids, ozs.	1·91	2·23	2·55	3·83	4·15	4·47	4·79	5·11
Milk fat, ozs.	0·55	0·64	0·74	1·11	1·20	1·30	1·39	1·48
<i>Machine skimmed milk.</i>								
Milk solids-not-fat, ozs.	1·39	1·63	1·86	2·79	3·02	3·26	3·49	3·73

For example, a condensed milk contained 34·8 per cent. of milk solids and 9·8 per cent. of milk fat and was labelled to be equivalent to  $1\frac{3}{4}$  pints of milk; the weight of the contents was 13·8 ozs. It therefore contained 4·80 ozs. of milk solids and 1·35 ozs. of milk fat, and was in excess of the requirements of 4·47 ozs. and 1·30 ozs., respectively, shown in the above table.

The Regulations make no distinction in the composition of machine-skimmed milk and skimmed milk, though Section 7 suggests that a distinction in the labels should be made.

When the label gives directions for dilution, the fluid produced must be equal to the above standard milk unless a clear statement is made to the contrary; the calculation is as follows:

Percentage in diluted milk =  $\frac{S \times P}{S + V}$ , where S is specific gravity of the condensed milk, P is the percentage composition of a given constituent, and V is the volume of water directed to be added to one volume of milk.

J. F. LIVERSEEGE.

## Legal Notes.

*Under this heading will be published notes on cases in which points of special legal or chemical interest arise. The Editor would be glad to receive particulars of such cases.*

### LABELLING OF MARGARINE.

HAWES v. STEPHENS.

ON May 1st an appeal from a decision of the Clerkenwell magistrate (Mr. Bingley) was heard in the High Court by the Lord Chief Justice and Justices Shearman and Roche.

The appellant, a grocer, had been summoned for selling margarine described by a name other than "margarine," or a name combining the word "margarine" with a fancy or other descriptive name approved by the Board of Agriculture and

Fisheries, contrary to Sec. 8 of the Butter and Margarine Act. He had been convicted and fined 20s.

The respondent (a food inspector) had asked to be supplied with "Kernut" margarine, and had been supplied with an article wrapped in two wrappers, the outside one having on it the word "margarine" in half-inch letters, and the inner one the words "Kernut margarine," printed in capitals, and beneath it in smaller type "churned with fresh milk."

The Public Analyst for Islington had certified that the sample contained 100 per cent. of margarine as defined by Sec. 13 of the Act of 1907.

On behalf of the respondent it had been contended before the magistrate that the appellant was limited to the use of the approved word "Kernut," and that the additional words "churned with fresh milk" formed part of the descriptive name, and were not permitted under Sec. 8 of the Act. The case for the appellant had been that the words "churned with milk" did not form part of the descriptive name, but were only an intimation to purchasers of the method used in the preparation of the article.

Mr. Barrington Ward, on behalf of the appellant, contended that the magistrate had been wrong in holding, on the authority of the Scottish case of *Patterson v. Maypole Dairy Co.*, that the words in question were part of the descriptive name, and that it had not been suggested that the appellant had not complied with the law so far as concerned the outside wrapper.

Mr. Burrows, for the respondent, urged that the added words on the inner wrapper were part of a descriptive name, and that they suggested to the purchaser that he was getting margarine "churned with fresh butter"—not that he was getting Kernut margarine. In his submission this case was indistinguishable from the Scottish case.

In giving the judgment of the Court, the Lord Chief Justice said that the only question was whether upon the facts stated the magistrate had been right in his decision in considering himself bound by the Scottish case of *Patterson v. Maypole Dairy Co.* In that case the words used were "Mayco Margarine mixed with Maypole butter," whereas in the present case quite different words were used. Each case depended upon the particular words used. It was because the magistrate thought that the two cases were indistinguishable that he came to the conclusion he did. If those were the grounds, there could be no doubt that he had made a mistake in a point of law, and that he ought to have dismissed the summons, inasmuch as the added words were not part of the fancy or descriptive name.

The other judges concurred, and the Court allowed the appeal, with costs.

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#### SWEET SPIRIT OF NITRE DEFICIENT IN ETHYL NITRITE.

ON April 24th a pharmacist was summoned at Cheltenham for the sale of sweet spirit of nitre deficient in ethyl nitrite to the extent of at least 45 per cent.

Evidence was given by the inspector who made the purchase that the defendant had explained to him that this sweet nitre was part of the stock which he had taken over with the business two years previously, and that he could not throw it away.

For the defence it was urged that the analyst's certificate was bad on two grounds: (1) Sweet nitre was peculiarly liable to decomposition, and the certificate did not state, as it should, whether or not any change had taken place in the constitution of the article that would interfere with the analysis. (2) The certificate

was too vague, and did not contain sufficient data to enable the magistrates to form an opinion for themselves.

As evidence that the article was prone to decomposition, attention was directed to the wide range in strength permitted by the B.P., viz. from 2.66 to 1.52 per cent. The fact that the spirit was ordered to be kept in closed vessels, as had been done in this case by the defendant, also pointed in the same direction. Extracts from Martindale's Extra Pharmacopœia were quoted to show that the decomposition of sweet spirit of nitre would occur even in closed vessels.

The Chairman of the Bench here observed that they were satisfied as to the decomposition, but considered that two years was too long to keep such a substance.

Mr. Haddock (for the defence) then referred at length to the vinegar of squill case of *Hudson v. Bridge*, in which it was held by the High Court that the form prescribed by the Act must be adhered to in the case of a decomposable article.

Evidence was also given by a retired pharmacist that sweet nitre would undergo decomposition under the most "favourable conditions," and that it had been proved that the decomposition was due to the presence of water. He agreed with "Squire's Companion to the British Pharmacopœia" that, even in closed vessels, a loss of as much as 6 per cent. per month was possible.

The Bench dismissed the summons on technical grounds, but considered that the case was not at all satisfactory.

## Connecticut Agricultural Experiment Station.

### TWENTY-SEVENTH REPORT ON FOOD PRODUCTS (1922).

STATISTICS are given of the 2546 samples of food and drugs examined during the year, together with details of their analysis and composition. Among the points of more than local interest dealt with reference may be made to the following:

**SACCHARIN IN CARBONATED BEVERAGES.**—In 1920 a State law was passed regulating the manufacture and bottling of non-alcoholic beverages, and prohibiting the use of saccharin. In 1920, 40.5 per cent. of the samples examined contained saccharin; in 1921 the percentage had fallen to 18.7 per cent.; and in 1922 to 5.4 per cent.

**DIABETIC AND SPECIAL FOODS.**—A sample of *casein flour* had the following composition:—Moisture, 7.44; ash, 3.49; protein ( $N \times 6.38$ ), 56.72; lactose, 7.52; and fat, 19.76 per cent.

*Washed gluten flour* contained:—Moisture, 7.10; nitrogen, 14.05; protein ( $N \times 5.7$ ), 80.09; soluble carbohydrates (as dextrose), 0.55; and starch, 2.81 per cent.

A *wey mixture* contained:—Total solids, 16.49; ash, 0.76; protein ( $N \times 6.38$ ), 6.25; lactose, 0.55; fat, 8.56; and gelatin, 0.37 per cent.

The question was raised by a manufacturer of diabetic food products as to the possible loss of fat in foods during the baking process. A series of trials gave results showing no significant difference in composition between doughs prepared from the flours and the corresponding baked products.

**COMMERCIAL INULIN.**—The sample contained:—Moisture, 9.53; nitrogen, 0.16; ash, 2.58; insoluble in water, trace; reducing sugar (as lævulose), 0.79 per cent.; monosaccharide, present. Specific rotation at 20° C., corrected for moisture, ash and protein,  $-32.9^\circ$ . The specific rotation of inulin prepared from dahlia tubers in the laboratory was  $-36.5$  (corr.).

EGGS.—Of 48 samples of eggs retained as *fresh* eggs, 3 were classified as fresh, 45 as not fresh, but edible, and 1 was inedible.

The characteristics of fresh eggs and eggs which are not fresh are thus defined:\*

## CHARACTERISTICS OF A FRESH EGG.

Before the candle.

Out of shell.

*Air space:* Not enlarged; less than three-fourths inch in diameter.

*White:* Firm and clear.

*Yolk:* Dimly seen through the white as a shadowy object indistinct in outline.

The chick spot is not visible.

*Distinguishing characteristics:* No shrinkage and general firm conditions of white and yolk. Edible.

*White:* Firm and thick; opalescent; reflects the light.

*Yolk:* Spherical and firm; chick spot small with no sign of hatching. Color is uniform for the entire yolk, but varies in color from light yellow to deep orange, and is occasionally olive green.

*Distinguishing characteristics:* General firm condition of white and yolk. White, opalescent.

## CHARACTERISTICS OF AN EGG WHICH IS NOT FRESH.

Before the candle.

Out of shell.

*Air space:* Enlarged; the lower wall may be movable in outline.

*White:* Thin and clear.

*Yolk:* Definite in outline; sometimes weak, and may occasionally have dark mottled areas.

*Distinguishing characteristics:* Enlarged air cell and increased contrast between white and yolk as compared with a fresh egg. Edible.

*White:* Thin, no opalescence, does not reflect the light as much as does a fresh egg.

*Yolk:* Flattened, and occasionally may have light, mottled areas.

*Distinguishing characteristics:* Thin white and flattened yolk.

Laws regulating the distribution and sale of eggs aim to insure that the consumer obtains good, edible eggs always, and fresh eggs if the extra price of such is paid. If, however, the consumer's understanding of a fresh egg be one that is but two or three days old, then he seldom gets what he expects. If he accepts fresh eggs to be those possessing the characteristics here defined for fresh eggs, he obtains such eggs much more frequently. Whatever his idea of fresh may be, it can be positively stated that the elapsed time since an egg was laid is not the determining factor in establishing its freshness; the conditions of storage are all-important. As to how old an egg may be and still retain the characteristics of a fresh egg, it is pertinent to quote the following:†

"An egg laid in March or April and kept under proper conditions will retain the characteristics which distinguish a fresh egg for from three to four weeks. In warmer weather this time would necessarily have to be reduced, and an egg laid in very hot weather and possibly allowed to remain in the nest for twenty-four hours or more, has lost these characteristics to such an extent that it is not as good as an April egg kept for a month under favourable conditions, and it should not be offered for sale nor be permitted to be sold as and for a fresh egg.

"Nor can an egg which is allowed to remain exposed to ordinary atmospheric conditions in a retail store for several days or a week in warm weather be expected to retain the characteristics which are expected of a fresh egg."

VANILLA EXTRACT.—This is defined‡ as the flavouring extract prepared from the vanilla bean, with or without sugar or glycerin, and containing, in 100 c.c., the soluble matter from not less than 10 grms. of the vanilla bean. Such extracts have

\* U.S. Dept. Agr. Bull., 565, p. 13 (1918).

† Penn. Dept. Agr., Bureau of Foods, 17, p. 44 (1919).

‡ U.S. Dept. Agric. Circ. 136.

been found to contain from 0.11 to 0.31 per cent. of vanillin. In 17 commercial samples examined the proportion of vanillin ranged from 0.09 to 0.26 per cent.

**VANILLA SUBSTITUTES.**—Two samples contained high percentages (0.57 and 0.67) of vanillin, probably synthetic, together with 0.08 and 0.06 per cent., respectively, of coumarin.

**MEAT PRODUCTS.**—Five of eight samples of Hamburg steak were illegally preserved with sulphites, and three were passed. State regulation 7 provides that no exception will be taken to foods which contain ordinary amounts of sulphur dioxide, provided the fact is declared. This is intended to exempt certain products such as molasses, dried fruits and wines which have been subjected directly or indirectly to the process of sulphuring. The use of sulphites to preserve the fresh appearance of, or deodorise meat is not contemplated by this regulation. The five samples condemned contained sulphurous acid in amounts ranging from 260 to 3300 mgrms. per kilo.

**CRYSCOPY OF MILK.**—Results, cited in detail, show that the effect of the increased acidity of milk upon freezing-point depression is an additive factor, and that the magnitude of the increased depression closely approximates  $0.003^{\circ}$  C. for each 0.01 per cent. increase in acidity. Such correction for acidity ought to be made in the observed freezing point depression in the case of milk which is sensibly sour. It would seem that, in general, acidities in excess of 0.20 to 0.25 per cent. result from fermentation, and will represent milk which is sour or near the "turning" point. No correction of freezing point is recommended for acidity within the range normal for fresh milk, *i.e.* milk showing an acidity not exceeding 0.20 per cent.

The freezing points of milk from tubercular cows, or cows otherwise abnormal physically, have again, in general, been found within the limits for normal milk, the few exceptions noted being in the direction of decreased depressions.

The value of the cryoscopic method as an adjunct to other methods of detecting water has been fully demonstrated by data covering a period of more than 2 years. Its use is unnecessary when present methods furnish conclusive evidence, but, in the opinion of the majority of experienced workers, its unique value is shown in those cases where the evidence of present methods is conflicting or inconclusive.

**HUMAN MILK.**—Analyses of 21 samples are given. The fat content ranges from 1.2 to 6.4 per cent., but it is pointed out that the amount of fat varies widely in different portions of the milk, and that unless the entire secretion of the gland is drawn and well mixed before sampling the result obtained may be very misleading.

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## International Union of Pure and Applied Chemistry.

### SUGGESTED STANDARDS FOR HYDROCHLORIC ACID, SODIUM CHLORIDE AND ZINC.

THE British Committee (Messrs. Carr, Fox, Hinks, and Marlow) have sent the following report on Standards for Hydrochloric Acid, Sodium Chloride and Zinc to Mr. Carr, the convener, who will put them before the Union Internationale.

#### ACID HYDROCHLORIC.

**APPEARANCE AND COLOUR.**—The acid shall be clear and colourless.

**DETERMINATION.**—The acid shall contain 35 per cent. by weight of hydrogen chloride. This is to be determined by adding 3 or 4 grms. of the acid to 50 c.c. of water and titrating with 0.1 N sodium hydroxide, methyl red being used as indicator.

**TOLERANCE.**—Acid containing between 34 per cent. and 36 per cent. by weight of hydrogen chloride may be accepted as conforming to this standard.

**RESIDUE ON EVAPORATION AND IGNITION.**—Fifty c.c. of the acid shall be evaporated to dryness in a platinum basin on a water bath and the residue ignited at 600° C., and weighed. The residue shall not exceed 0.0005 grms.

**SULPHURIC ACID.**—Fifty c.c. of the acid shall be evaporated till the bulk is reduced to about 5 c.c. The residue is diluted to 50 c.c., heated to boiling, and 5 c.c. of 0.1 *N* barium chloride solution is then added. No precipitate should be formed after setting aside for 24 hours.

**HEAVY METALS.**—Ten c.c. of the acid shall be diluted with 50 c.c. of water and mixed with 50 c.c. of a freshly prepared solution of hydrogen sulphide. No darkening in colour should result when compared against a mixture of equal parts of distilled water and hydrogen sulphide solution when viewed in a Nessler glass through a depth of 10 cm.

**FREE CHLORINE.**—Five c.c. of acid are diluted with 45 c.c. of water, followed by the addition of half a c.c. of one per cent. solution of zinc iodide and 2 c.c. of starch solution. The liquid is then stirred; no blue coloration shall develop within 5 minutes.

**IRON.**—Five c.c. of the acid shall be diluted with 50 c.c. of water, and 2 c.c. of freshly prepared solution of potassium ferrocyanide shall be added. The colour shown in 30 minutes shall not be greater than that produced by 10 c.c. of a solution of ferric chloride containing 0.0001 gm. of iron per 100 c.c.

**ARSENIC.**—The arsenic shall not exceed 0.04 part per million calculated as arsenious oxide ( $As_2O_3$ ). The test shall be carried out as follows:—To 50 c.c. of the acid add 0.5 c.c. of bromine solution (arsenic-free) and evaporate on a water bath until the volume is reduced to about 15 c.c. Add 50 c.c. of hot water followed by 0.5 c.c. of stannous chloride solution (arsenic-free) and apply the Marsh-Berzelius or Gutzeit test to the liquid for 30 minutes.

**SULPHITES.**—To 50 c.c. of water add 0.05 c.c. of 0.1 *N* iodine solution and 2 c.c. of starch solution. Dilute 5 c.c. of the acid with 50 c.c. of water and add it to the iodine-starch solution. The blue colour shall persist after mixing.

#### SODIUM CHLORIDE.

A white, crystalline salt; a solution of 5 grms. in 50 c.c. of water should be colourless and neutral, and should not show any turbidity when viewed in a Nessler glass through a depth of 10 cm.

**DETERMINATION.**—Five grms. should not lose more than 5 mgrms. on drying at 100° C. to constant weight; 0.2 gm. dissolved in 100 c.c. of water, a few drops of potassium chromate solution added, and the solution titrated with 0.1 *N* silver nitrate solution, should show it to contain at least 99.9 per cent. of sodium chloride.

**SULPHATE.**—Five grms. dissolved in 50 c.c. of water, with addition of 1 c.c. of hydrochloric acid, and heated to boiling; 2 c.c. of barium chloride solution added should not give any turbidity on allowing the mixture to stand for 24 hours.

**BROMIDE.**—Two grms. of the salt shall be dissolved in 10 c.c. of water in a porcelain dish, and 0.1 c.c. of chlorine water, prepared by diluting 1 volume of saturated chlorine water with 4 volumes of water, shall be added. No yellow coloration should be produced.

**IODIDE.**—To a solution of 5 grms. of the salt in 20 c.c. of water, add one drop of ferric chloride solution and 1 c.c. of starch solution. There must not be any blue coloration produced.

**AMMONIA.**—Two grms. dissolved in 20 c.c. of water, 1 c.c. of Nessler's solution added. There should be no greater change than that produced by the addition of 1 c.c. of Nessler's solution to 20 c.c. of the same water with which the solution of the sample was effected.

**POTASSIUM.**—Dissolve 1 gm. in 10 c.c. of water, add 5 c.c. of sodium cobaltinitrite solution, allow the mixture to stand for 24 hours. No precipitate should be formed.

**ALKALINE EARTHS.**—Two grms. dissolved in 20 c.c. of water should not show any turbidity on adding dilute sulphuric acid and standing two hours. Two grms. dissolved in 20 c.c. of water should not show any turbidity on adding a few drops of 5 *N* ammonia, 1 c.c. of 0.1 *N* ammonium oxalate and 1 c.c. of 0.1 *N* ammonium phosphate solution, and allowing it to stand for 24 hours.

**IRON.**—Five grms. shall be dissolved in 50 c.c. of water, and 2 c.c. freshly prepared solution of potassium ferrocyanide shall be added. The colour shown in 30 minutes shall not be greater than that produced by 10 c.c. of a solution of ferric chloride containing 0.0001 gm. of iron per 100 c.c.

**HEAVY METALS.**—Ten grms. shall be diluted with 50 c.c. of water and mixed with 50 c.c. of a freshly prepared solution of hydrogen sulphide. No darkening in colour should result when compared against a mixture of equal parts of distilled water and hydrogen sulphid solution when viewed in a Nessler glass through a depth of 10 cm.

#### ZINC.

1. **ARSENIC.**—When the Gutzeit or Marsh-Berzelius test is applied to 10 grms., using arsenic-free acid, no stain or mirror shall be obtained in 30 minutes.

2. **SENSITIVENESS AND ACTIVITY.**—When tested in the Gutzeit or Marsh-Berzelius apparatus, using arsenic-free acid, with the addition of 0.002 mgrm. of arsenious oxide ( $As_2O_3$ ), a visible stain or mirror of normal intensity should be obtained. A steady stream of hydrogen should be evolved.

3. **IMPURITIES OXIDISABLE BY POTASSIUM PERMANGANATE.**—Ten grms. are dissolved in a mixture of 50 c.c. of water and 15 c.c. of concentrated sulphuric acid in a closed vessel fitted with a valve; the zinc should be entirely dissolved, leaving no black flakes. As soon as solution is complete, 0.1 N potassium permanganate solution is added; 0.1 c.c. of this solution should produce a permanent pink colour.

4. **SULPHUR, PHOSPHORUS, ETC.**—One gm. of zinc and 2 c.c. of concentrated arsenic-free sulphuric acid diluted to 10 c.c. with water are placed in a narrow test tube containing a plug of cotton wool in its upper part. Over the mouth of the tube is placed a disc of filter paper which has been moistened with aqueous silver nitrate solution (1:1) and dried. After the reaction has proceeded for 2 hours in the dark and in an atmosphere free from sulphuretted hydrogen, the paper should show no yellow or black stain.

**NOTE.**—The zinc tests for arsenic testing must comply with tests 1, 2 and 4, and zinc for reducing purposes must comply with tests 3 and 4.

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## ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

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### Food and Drugs Analysis.

**Identification of Wheat and Rye Flours by means of their Aqueous Extract.** R. Strohecker. (*Zeitsch. Unters. Nahr. Genussm.*, 1924, 47, 90–97.)—Aqueous extracts of wheat and rye flours have characteristic and differing refractive indices and electrical conductivities; these factors are available for their recognition and estimation in mixtures. Five grms. of the flour are made into a thin paste with 50 c.c. of distilled water,\* triturated for 15 minutes and then filtered; 10 c.c. of the bright filtrate are evaporated to dryness and weighed. The refractive index of the solution is determined by an immersion refractometer at 17.5° C. and the electrical conductivity at 18° C. Examination of a large number of samples shows that the following are the limits, calculated on the dry sample, for wheat and rye meals:

	Wheat	Rye.
Water extract, per cent.	3.83–8.58	11.80–17.08
Refraction (Zeiss) „	18.75–20.96	22.15–24.27
Conductivity $\times 10^{-4}$ „	5.24–10.24	10.45–14.33

\* Conductivity water not specified.



The conductivity, being mainly due to salts, is closely related to the ash content, but is more readily determined. The quantities of each meal in a mixture of the two can be calculated approximately from the following table:

	Water Extract.	Refraction.	Conductivity.
Wheat flour (85 per cent. extraction)	7·31	20·11	8·52
90 per cent. wheat, 10 per cent. rye	7·54	20·68	8·89
75     "     "     25     "     "	8·94	20·90	9·17
50     "     "     50     "     "	10·87	21·79	9·99
25     "     "     75     "     "	12·94	22·73	10·56
10     "     "     90     "     "	13·64	22·90	11·26
Rye flour (85 per cent. extraction)	14·75	23·33	11·38

H. E. C.

#### Effect of Sodium Trichloroacetate on Sugar Estimations. D. Stiven.

(*Biochem. J.*, 1924, 18, 19–21.)—When trichloroacetic acid was used to precipitate proteins and the glucose in the filtrate was estimated either by the Bertrand method or the micro-method of Schaffer and Hartmann (*J. Biol. Chem.*, 1921, 45, 377) it was observed that the percentage of glucose found was lower than in the case of control tests on a solution not treated with trichloroacetic acid. This fact was traced to the presence of sodium trichloroacetate which, in sufficiently large quantities, can inhibit the reduction of the copper solution. Therefore the use of trichloroacetic acid, as a protein precipitant prior to glucose estimations by any of the copper reduction methods, is to be avoided. Experiments are described on the Schaffer-Hartmann micro-method, which show the extent of the inhibiting effect and also afford evidence of a reaction between the copper of the Schaffer solution and the sodium trichloroacetate by which the copper passes into a non-reducible complex. This organo-copper compound decomposes gradually on heating; but during the heating the glucose is destroyed by the sodium carbonate of the copper solution and no reduction (or very little) results, even after the copper has reverted to its reducible condition. Polarimetric evidence of a reaction between the glucose and trichloroacetic acid is entirely negative. The addition of the trichloroacetate at any stage stops the reduction, and the cuprous oxide already formed is not destroyed.

P. H. P.

#### Glycerides of Palm-kernel Oil. A. Bömer and K. Schneider. (*Zeitsch.*

*Unters. Nahr. Genussm.*, 1924, 47, 61–89.)—The glycerides of oil extracted from Porto Novo palm kernels were separated by more than 100 fractional crystallisations from acetone and divided into five principal fractions having m.p. 13·9° to 51·4° C. After determination of the usual constants, the fatty acids of these fractions were prepared and examined by well-known methods. Contrary to the results of Elsdon (*ANALYST*, 1914, 39, 455) and others, no caproic or stearic acid was present, and the presence of capric acid was doubtful. The fatty acids found were caprylic, lauric, myristic, palmitic and oleic, and the glycerides caprylo-myristo-olein, myristo-dilaurin and lauro-dimyristin, together with small quantities of palmito-dimyristin and myristo-dipalmitin. Comparison with the results

obtained for coconut oil (Bömer and Baumann, *Zeitsch. Unters. Nahr. Genussm.*, 1920, 40, 97) shows these oils to contain the following glycerides, No. 1 predominating in quantity:

Coconut Oil.		Palm-kernel Oil.	
I. Caprylo-lauromyristin m.p.	15° C.	Caprylo-myristo-olein m.p.	13.9° C.
II. Myristo-dilaurin	„ 33°	Myristo-dilaurin	„ 33.4°
III. Lauro-dimyristin	„ 38.1°	Lauro-dimyristin	„ 40.0°
IV. Palmito-dimyristin	„ 45.1°	Palmito-dimyristin	„ 45.2°
V. Stearo-dipalmitin	„ 55°	Myristo-dipalmitin	„ 51.4°

H. E. C.

**Detection of Glycerides in Beeswax. P. Bourcet.** (*Bull. Soc. Chim.*, 1924, 35, 421.)—The author's application of Denigès' test for methyl glyoxal to the detection of glycerides in beeswax is as follows:—Two to 3 grms. of yellow beeswax are saponified with 10 to 15 c.c. of potassium hydroxide solution strength in a large test tube for 1 hour, with frequent shaking; 15 c.c. of water are added, and the solution slightly acidified with 25 per cent. sulphuric acid and filtered. Two c.c. of the filtrate are mixed with 20 c.c. of saturated bromine water, and boiled on a water bath for 20 minutes, when the mixture may be decolorised; but, if not, the boiling and shaking are continued till the colour has disappeared. A tenth of a c.c. of 0.05 per cent. alcoholic solution of codeine and 2 c.c. of the brominated liquid are put into a test tube and 5 c.c. of pure sulphuric acid (sp. gr. 1.84) added, the mixture shaken, and the tube placed in a boiling water bath for 2 minutes, when, if glycerides are present, a bluish-green coloration will be observed. Since an examination of a very large number of authenticated samples of yellow beeswax from various sources failed to give a positive reaction, the coloration can be taken to indicate the presence of added glyceride, and is sufficiently sensitive for all ordinary analytical purposes. The coloration is sometimes obtained with genuine bleached beeswax.

D. G. H.

**Use of Ethylene in the Colouring of Citrus Fruits. E. M. Chace and F. E. Denny.** (*Ind. Eng. Chem.*, 1924, 16, 339-340.)—For a long time it has been the practice to colour citrus fruits by exposing them to the products of combustion of oil. Ethylene has been proved to be the gaseous constituent which changes the colour of the pigment from green to yellow, and pure ethylene is now used for the purpose. It is stated that one part by volume of ethylene in one million parts of air causes the fruit to change colour in about the time required by the older stove method; the colour change is more rapid when the concentration of the ethylene is one part in 5000 to 20,000 parts of air. These mixtures are the more convenient to use and are non-explosive.

W. P. S.

**The Solanine Content of Potatoes. A. Bömer and H. Mattis.** (*Zeitsch. Unters. Nahr. Genussm.*, 1924, 47, 97-127.)—After examination of known methods for the estimation of solanine in potatoes the following, more accurate, process was devised: From 200 to 300 grms. of the finely-divided potatoes are mixed

with 250 c.c. of water, extracted for 30 minutes at room temperature, and the liquor pressed out. The mass is re-extracted three times with 250 to 300 c.c. of water containing 0.5 c.c. of acetic acid. The mixed extract is made alkaline with ammonia, and, after addition of 10 grms. of kieselguhr, evaporated to dryness on the water bath, finely powdered, and extracted with boiling 95 per cent. alcohol for 6 hours. The alcoholic solution is evaporated, the residue dissolved in 50 to 100 c.c. of water acidified with acetic acid, and the solution made alkaline with ammonia and warmed for 30 minutes to coagulate the solanine precipitate, which is then filtered off and washed with a 2.5 per cent. solution of ammonia. The crude solanine so obtained is dissolved in very dilute acetic acid, re-precipitated with ammonia, washed, dried at 100° C. and weighed. The second precipitate should be almost colourless. A correction of 2.75 mgrms. for each 100 c.c. of solution, including wash liquor, is applied, on account of the solubility of the base in dilute ammonia.

The normal solanine content of potatoes depends upon the variety; usually it is from 2 to 10 mgrms. per 100 grms.; those kinds in which the amount exceeds 25 mgrms. are injurious, and are more harmful when cooked in their skins than when previously peeled. Unripe potatoes contain more solanine than the same variety when ripe and smaller ones more than large ones. Prolonged exposure to daylight causes an increase in the solanine content, but no connection is apparent between the quantity of this base and the fertiliser applied to the soil. H. E. C.

**True Nature of the Methyl Salicylate Glucoside in the Bark of the Sweet Birch.** M. Bridel. (*Comptes rend.*, 1924, 178, 1310–1312.)—The glucoside gaultherin extracted from the bark of *Betula lenta*, and up to the present regarded as yielding only methyl salicylate and glucose on hydrolysis (*cf.* Schneegans and Gerock, *Arch. Pharm.*, 1894, 82, 437), is shown to be identical with the monotropitin isolated in 1923 by the author from *Monotropa hypopitys*, this giving methyl salicylate, glucose and xylose on hydrolysis. T. H. P.

**Histological and Chemical Examination of the Seeds of *Ipomoea hederacea* and other species of *Ipomoea*.** H. L. Kassner. (*Pharm. J.*, 1924, 112, 328–331.)—An examination was made of the seeds of *Ipomoea hederacea*, Jacq., *I. pes-tigridis*, L.; *I. muricata*, Jacq., *I. coccinea*, L.; *I. pilosa*, Sw.; *I. eriocarpa*, R. Br., specially collected at Dehra Dun, India, and also of the commercial seeds of *I. muricata*, Jacq. and *I. hederacea*, Jacq., as sold for medicinal use in London. It was found that the oil content on the dried seeds varied from 14.94 per cent. in the case of *I. coccinea* to 9.23 per cent. with *I. eriocarpa*, and that in the collected and commercial samples of *I. muricata* and *hederacea* the variation was only from 13.08 to 12.21 per cent. The content of crude resin, however, was considerably higher in the case of the official *I. hederacea* (15.98 per cent. for the commercial and 15.59 per cent. for the collected seeds) than for *I. muricata*, which contained only 10.84 per cent. in the case of the commercial sample and 10.41 per cent. in the collected seeds. *I. pes-tigridis* contained the least proportion of

crude resin (9·20 per cent.). The constants of the extracted resins and oils were as follows:

	Saponification value.	Acid value.	Refractive index. ( $n_D^{25}$ )
<i>I. hederacea</i> , collected.			
Oil	191·0	3·8	1·4714
Resin	144·7	30·5	—
<i>I. muricata</i> , collected.			
Oil	185·4	3·5	1·4748
Resin	116·7	31·6	—
Commercial.			
Oil	184·5	—	1·4745
Resin	116·8	—	—
<i>I. pes-tigridis</i> , L.			
Oil	187·8	3·3	1·4715
Resin	143·5	35·0	—
<i>I. coccinea</i> , L.			
Oil	193·4	3·7	1·4714
Resin	145·7	32·7	—
<i>I. pilosa</i> , Sw.			
Oil	196·7	4·1	1·4714
Resin	145·8	34·0	—
<i>I. eriocarpa</i> , R. Br.			
Oil	192·3	3·2	1·4728
Resin	144·6	25·0	—

The saponification values of the resins were determined by dissolving 0·5 gm. of the crude resin in 50 c.c. of cold neutralised 50 per cent. alcohol, diluting the solution with 750 c.c. of cold water (free from carbon dioxide), adding 0·5 c.c. of 1 per cent. phenolphthalein solution, and titrating the whole with 0·2 N alcoholic potassium hydroxide solution. The crude resins were found to give positive reactions in Kobert's tests for saponins, and the presence of saponin-like bodies in the resins is therefore inferred.

D. G. H.

**Analysis of Lysol.** A. H. Dodd. (*J. Soc. Chem. Ind.*, 1924, 43, 93–96 T.)—

The author has examined the various methods adopted to effect the separation and measurement of the tar acids, including the separation of phenols by steam distillation, as recommended by the German Pharmacopœia and the method of Jordan and Southerden (*Pharm. J.*, 1921, 47a), and Chapin's method of extracting the tar acids with benzene, forming the phenates by adding 1:2 sodium hydroxide solution to the benzol solution, evaporating the bulk of the benzene and decomposing the phenates with acid. Although the distillation method of separating tar from fatty acids, etc., is not generally recommended, such divergent results were obtained by other methods that the author carried out lengthy trials, and after applying corrections obtained results accurate to within 0·5 per cent. One

hundred grms. (if possible) of lysol are measured into a separator, shaken with sufficient 2 per cent. sulphuric acid to destroy the emulsion and separate the fatty acids, 50 c.c. of ether added, the supernatant layer separated, and the dilute acids again washed with 20 c.c. of ether. The ethereal solution of fatty acids and phenols is dried over fused sodium sulphate (otherwise a sharp separation on distillation will not be obtained), filtered into a 250 c.c. distillation flask, and washed in with ether. The ether is distilled, and the fraction passing over between 100° and 160° C. tested for ether. The phenols are then slowly distilled at the rate of 1 to 2 drops per second, the flask and burner being completely enclosed in a metal cylinder, and the thermometer projecting from a sheet of asbestos used as a covering. The temperature gradually rises to a maximum at about 215° C., the rate of distillation falls and the temperature drops, phenols distilling slowly all the time. The flame is then gently raised till the temperature exceeds the former maximum by about 5°. After more drops have come over the temperature will again fall, and, on the third time of heating, 230° C. can be reached, and impure cresylic acid comes over. After this, an increase in the size of the flame will send the temperature rapidly up to 300° C. The necessary corrections were obtained by finding the percentage of cresylic acid distilling with mixtures of the usual quantities of oleic and cresylic acids (1) temperatures to 225° C. and percentages obtained on first heating; (2) to 220° C. after the temperature falls and the flame is raised; (3) on slowly distilling to 230° C. The results are given in a table. A comparison of the ordinary direct distillation method, Jordan-Southerden's, and Chapin's methods was made on 10 different brands of lysol, and the results (given in a table) show the need for an official method, since they differ from about 2 to 12 per cent. according to the method used.

D. G. H.

**Reactions of Dial-Ciba. Isnard.** (*J. Pharm. Chim.*, 1924, 29, 272-278.)—Dial-Ciba (diallylbarbituric acid) consists of small white anhydrous crystals melting at 170° to 171° C. It is very soluble in acetone, ethyl acetate and hot alcohol, and one part dissolves in 30 of cold 95 per cent. alcohol and in 20 of cold ether. Ten per cent. sodium hydroxide solution dissolves it readily; it is precipitated from the solution by acetic acid, but redissolves on addition of excess of acid. A 1 per cent. solution does not reduce Fehling solution; on melting the solid with potassium hydroxide ammonia gas is evolved; when heated for an hour with *N* alcoholic potassium hydroxide solution under a reflux condenser a solution is formed liberating gas on the addition of sodium hypobromite. On driving off the alcohol a precipitate is formed on the addition of hot water. Apparently, saponification begins and urea and malonic acid are formed. In common with other hypnotic derivatives of barbituric acid, the dixanthylated derivative (m. pt. 242-243° C.) is formed by condensation with xanthidol in acetic acid. Large tabular crystals are formed on adding the necessary amount of hydrochloric acid to a solution of dial-ciba in 10 per cent. sodium hydroxide solution; one drop of a solution in dilute ammonium hydroxide solution mixed with one drop of ammoniacal silver nitrate solution results in the formation of prismatic crystals, isolated and

grouped incrosses, squares and rosettes. Gardenal, the melting point of which is very close to that of dial-ciba, gives, under similar conditions, a granular precipitate composed of small isolated globular crystals, quite different from those from dial-ciba. Fuming nitric acid produces a violent reaction with dial-ciba, giving a clear yellow solution, but has no effect on gardenal. Dial-ciba, when treated with Laffon's reagent (ammonium sulphoselenite), gives a salmon-pink colour in the cold and a reddish-brown colour on warming; and with Mandelin's reagent (ammonium sulphovanadate) it gives a slight pink coloration in the cold and a brown colour on warming, whilst with gardenal no colour is produced in either case in the cold, and only a slight brown or yellow green coloration on heating. Since the sodium salt of dial-ciba is alkaline to methyl orange, litmus and rosolic acid, these substances cannot be used for its estimation. The samples of dial-ciba examined had an iodine value of about 235, corresponding to a product of a purity of 96.2 per cent. The iodine value is estimated by dissolving 0.2 grm. of the substance in 20 c.c. of ethyl ether, and continuing the operation as in the case of fats.

D. G. H.

**Isolation and Constitution of the Active Constituent of Dalmatian Insect Powder.** H. Staudinger and L. Ruzicka. (*Helv. Chim. Acta*, 1924, 7, 177-259.)—The substance pyrethron isolated as the active constituent of the flowers of *Chrysanthemum cinerariifolium* by Fujitani is not a pure substance, and the physiological properties ascribed to it are incorrect, on account of the impurities present. By extraction of the insect powder with petroleum spirit and shaking out the solution with aqueous methyl alcohol, carefully neutralising any acidity with potassium hydroxide, about 0.5 per cent. of an oily ester was obtained, which was separated into two parts by distillation *in vacuo*. The active part, which was strongly insecticidal, was a thick yellow oil having b.pt. 120-150° C. *in vacuo*. This fraction contains the pyrethrol of Fujitani, is readily saponified by alkali, and thereby rendered inactive. It is shown to contain two active constituents, namely, pyrethrin I and II, which are the methyl esters of chrysanthemum mono- and di-carboxylic acids, respectively, and are present to the extent of about 50 and 40 per cent. in the active oil, partly combined as semi-carbazones. These esters are exceedingly toxic to insects, mites being killed in about 20 minutes at a dilution in an inert powder of 1:10000. The synthesis, constitution, and reactions of the pyrethrins are described in detail. The proportion of pyrethrins present in insect powder is about 0.2 to 0.3 per cent., which figure is confirmed by comparing the toxicity of the powder with that of an artificial mixture containing 2 grms. of pyrethrin per kilo. of inert powder. No insecticidal compound was found in the flowers of *Tanacetum vulgare*, *Matricaria chamomillae*, or *Achillea millefolium*.

H. E. C.

## Biochemical, Bacteriological, etc.

**Precipitation of Lacto-Proteins by Copper Salts.** A. J. J. Vandevelde. (*Bull. Soc. Chim. Belge*, 1923, 32, 376-386.)—A survey of the literature relating to the composition of the precipitate formed on adding copper salts to protein solutions shows divergent results, the proportion of copper in the precipitate being given as from 0.7 to 20 per cent. The differences are mainly due to adsorption. According to Ritthausen lacto-protein gives a precipitate containing 16 to 17 per cent. of CuO, but, by using chloride, sulphate, acetate, and nitrate of copper as precipitant and varying the concentrations and the amount of water used for washing the precipitate, the copper percentage varies from 1.6 to 4.1. Examination of the solid and liquid phases shows that the equilibrium is influenced by the initial concentration; no definite compound is formed. When copper sulphate is the precipitant the cation is the active part, the anion being only adsorbed in traces by the precipitate. Harnack's results, which apparently showed that compounds were formed containing 1 or 2 atoms of copper to the molecule, according to the concentration, are found to be erroneous. H. E. C.

**Tryptophan Content of Caseinogen.** H. Onslow. (*Biochem. J.*, 1924, 18, 63-84.)—None of the previous attempts to estimate tryptophan has been successful. In an earlier paper (*Biochem. J.*, 1921, 15, 392) the author describes the compound precipitated by mercuric sulphate from a caseinogen solution which had been digested by enzymes. Since it was found that the total nitrogen of the precipitate was no criterion of the tryptophan content, owing to the other amino acids present, an attempt was made to obtain a value for the tryptophan from the difference between the amino nitrogen and the more resistant nitrogen of the pyrrole ring. The following equations were used:

Total  $N$  = tryptophan  $N$  + histidine  $N$  + monamino  $N$  + peptide  $N$ .

Amino  $N$  = tryptophan  $N/2$  + histidine  $N/3$  + peptide amino  $N$  + monamino  $N$ .

Non-amino  $N$  = tryptophan  $N/2$  + histidine  $2N/3$  + peptide non-amino  $N$ .

Or Tryptophan  $N = 2$  (non-amino  $N$  - (histidine  $2N/3$  + peptide non-amino  $N$ )).

The non-amino nitrogen can be calculated from the difference between the total nitrogen (obtained by Kjeldahl's method) and the amino-nitrogen (obtained by Van Slyke's method); the histidine nitrogen by the methods of Koessler and Hanke (*J. Biol. Chem.*, 1919, 39, 497); the peptide non-amino nitrogen from the difference between the amino nitrogen before and after complete hydrolysis; then the tryptophan content may be calculated from these. Difficulties encountered during the course of the work were overcome and 6 of the last 8 estimations out of 20 altogether were considered satisfactory. Four of these, carried out on one sample of caseinogen (English "casein") gave concordant values. The remaining two, carried out on another sample (Merck's "casein"), gave concordant, but rather higher, values. Full details of experimental procedure are given with a table of the results. The possible sources of error are discussed.

P. H. P.

**Action of Rennet and of Heat on Milk.** N. C. Wright. (*Biochem. J.*, 1924, 18, 245-251.)—The previous work done on this subject is summarised and experimental details are given of the author's work, with tables of his results. The action of rennet and of heat on caseinogen solutions has been investigated by means of a study of the racemisation curves of the raw and treated protein. Caseinogen and casein have identical racemisation curves. This supports the view that rennet does not cause any proteolytic cleavage of the caseinogen molecule, but that coagulation is due to an alteration in the colloid state of the caseinogen, by which precipitation in the presence of bivalent metal ions is facilitated. Heat does not affect the constitution of the caseinogen molecule within the limits of the temperature studied (up to 120° C. for half an hour). Any difference in digestibility must be due to alteration in the physical (colloid) condition of the protein. The coloration of autoclaved milk is due to the caramelisation of the lactose, a reaction which appears to be catalysed by the presence of a colloid substrate of calcium caseinogenate. The colour of caseinogen precipitated from autoclaved milk is due to adsorption of this pigment and not to alteration in the caseinogen molecule itself.

P. H. P.

**Separation of a Fat Pigment from Fat.** A. N. Currie. (*Biochem. J.*, 1924, 18, 231-234.)—Several unsatisfactory methods of separation are discussed, but more efficient methods depend on hydrolytic treatment of the fat. The authors use calcium oxide and barium hydroxide as hydrolytic agents, and the calcium oxide gives the better results, since with barium hydroxide there is difficulty in separating the barium salts of the fatty acids present from the pigment. If the autoclave is used, at 12 atmospheres 1 per cent. by weight of lime is sufficient to effect complete hydrolysis. Full details of the method are given, and a scheme of the separation. Fat (from the abdominal wall of stall-fed cattle) was hydrolysed with lime, and the aqueous extract obtained then contained glycerol, pigment salt and small quantities of a fatty acid and the calcium salt of fatty acid. The fatty acid was removed by extraction with ether, leaving an aqueous layer containing pigment salt and glycerol. This was acidified with 20 per cent. hydrochloric acid and extracted with ether. The glycerol and calcium chloride were left in the new aqueous layer and the adipochrome (adipose tissue pigment) migrated immediately to the ether layer, showing that adipochrome freed from combination with calcium is soluble in ether.

P. H. P.

**The Antiscorbutic Fraction of Lemon Juice.** S. S. Zilva. (*Biochem. J.*, 1924, 18, 182-185.)—This work was carried out in continuation of the results already published by Zilva (*Biochem. J.*, 1923, 17, 410). A great part of the solids of decitrated lemon juice consists of invert sugar. Details are given of a biochemical method devised for removing the sugar without appreciably altering the antiscorbutic activity of the solution, namely, by fermenting the sugar with yeast in an atmosphere of carbon dioxide. The preparations were tested for their antiscorbutic content on guinea-pigs and a table shows the results. It was further found that the antiscorbutic factor in the fermented decitrated lemon juice behaves



in alkaline solution in the presence of air similarly to that in unfermented decitrated solutions. The alkali and air have an inactivating influence. The remaining active fraction, after removal of the sugar, contains less than half of the dry matter of the decitrated juice and is a complex mixture of substances, mostly of a nitrogenous character. Fermented decitrated juices give negative biuret, sulphur and tryptophan tests, but usually a faint murexide reaction masked by a brown coloration. Precipitates are obtained with mercuric sulphate, basic lead acetate and, occasionally, phosphotungstic acid; also Millon's reagent gives a precipitate which is soluble in excess of the reagent. The solution reduces ammoniacal silver nitrate and gives a Pauli reaction. No amide nitrogen can be detected. Very little extraneous matter is introduced by solution from the yeast, and most of the above reactions are also obtained in unfermented decitrated lemon juice. P. H. P.

**The Vitamin A Potency of Hake Liver Oil.** A. D. Holmes. (*Ind. Eng. Chem.*, 1924, 16, 379-380.)—A daily dose of 0.8 mgrm. of crude hake liver oil is sufficient to meet the body requirements of growing albino rats fed on a diet lacking in vitamin A; hake liver oil is therefore equivalent to cod liver oil as regards vitamin A content. W. P. S.

**Vitamin A Content of S. African Oils.** E. M. Delf. (*Biochem. J.*, 1924, 18, 93-100.)—The distribution of vitamin A has been studied in products belonging to the northern hemisphere, but very little is known of the vitamin content of the local produce of other countries. This work was carried out from a dietary point of view. Experiments on young rats are described and graphs of the results are given. The three vegetable oils, sesame, mafura and castor oils, were deficient in vitamin A. Two samples of seal oil had considerable growth-promoting properties. A difference in value was found in three different samples of crude whale oil. Sample No. 1, extracted at 100° C., was most active. The lower activity of the other two samples was correlated with their extraction at considerably higher temperatures. The sperm whale gave oils of differing activity with regard to vitamin A, that from the head being least and that from the blubber being most active in this respect. With more careful extraction, the blubber and meat oil would serve as a valuable source of this vitamin. The rat has little need of vitamin C in the diet, but a greater need of vitamin A. When the latter is limited the addition of vitamin C to the diet appears to have a really beneficial effect on growing rats. This suggests that the two vitamins are to some extent interchangeable in the diet of the rat. P. H. P.

**Estimation of Sugar in the Blood.** R. V. Stanford and A. H. M. Wheatley. (*Biochem. J.*, 1924, 18, 22-28.)—The chief object of this note is to point out a source of error in this estimation as commonly practised. The method generally used is the modified one of Folin and Wu (*J. Biol. Chem.*, 1920, 41, 367). The blue coloration obtained by the action of phosphomolybdic acid on cuprous oxide in acid solution gradually fades, and it is found that the colorimetric measurement must be made within an hour of the production of the blue colour, although

short intervals make no perceptible difference. The reason why duplicate standards, made at the same time, often differ considerably in tint, however, is the temperature of the liquid when the blue colour is formed. The colour is darker the lower the temperature. Therefore the temperature at which the blue coloration is produced must be the same for the standard and for the unknown solution to be compared with it, and this is obtained by immersing the tubes in a cold bath. The authors give their own process and results obtained with the use of solutions described by Folin and Wu. A fallacy is pointed out in the results of Calvert (*Biochem. J.*, 1923, 17, 117) due to his using an insufficient concentration of the alkaline copper tartrate. Therefore the reacting substances (especially the tartrate) must not fall below the concentrations given by Folin. The authors have carried out tests in which added dextrose was quantitatively recovered from a blood filtrate, and in which the content in reducing sugar of a blood filtrate was shown to remain sensibly unchanged after 2 days. The comparisons must be made in a dilution colorimeter.

P. H. P.

**Detection of Incipient Putrefaction in Fish. J. Tillmans and R. Otto.**

(*Zeitsch. Unters. Nahr. Genussm.*, 1924, 47, 25-37.)—The decomposition of fish differs from that of mammalian flesh; the criteria of soundness or otherwise therefore require modification. The commencement of putrefaction may be recognised by the estimation of ammonia and amino-acid nitrogen, and is indicated when these are more than 100 and 30 mgrms. per cent. respectively. The double titration method of Willstatter and Waldschmidt-Leitz (*ANALYST*, 1922, 47, 308) also gives good results; when the difference between the acidity of a 10 per cent. extract in water and in 50 per cent. alcohol exceeds 3 c.c. of *N* alkali, decomposition has commenced. Another satisfactory test is oxygen absorption; 5 grms. of the minced fish are incubated in a closed bottle of water at 22° C. for 1 to 2 hours, the complete disappearance of dissolved oxygen indicating putrefaction. The reduction of methylene blue or of nitrates is a less delicate test, but their complete reduction in an hour or 2 to 4 hours, respectively, is a positive sign. Methods dependent on the detection or estimation of peptones, carbon dioxide, indol or soluble nitrogen, or on the iodine absorption yield indefinite or negative results.

H. E. C.

**Bacterial Decay of Textile Fibres. A. C. Thaysen and H. J. Bunker.**

(*Biochem. J.*, 1924, 18, 140-146.)—Results are given of problems put forward by Fleming and Thaysen (*Biochem. J.*, 1921, 15, 407) when they described a swelling test for the quantitative determination of the destruction of cotton fibres caused by micro-organisms. With the use of this test it is shown that raw cottons of different origin vary in their resistance to this destruction. The resistance is probably due to difference in the physical or chemical nature of the respective fibres; sometimes the absence of food substances, such as phosphates, increases it. Since the rate of destruction of each type is practically constant, it has been possible, on several occasions, to identify raw cottons by means of this rate of

destruction by micro-organisms. It is concluded that the resistance is adversely affected by climatic or soil conditions, since it disappears when resistant strains are cultivated in a country producing non-resistant types. Flax fibres appear to show differences in their behaviour to bacterial destruction similar to those exhibited by cotton. The rate of deterioration of jute and hemp fibres cannot be determined by the swelling test owing to the individual fibres being too interwoven. Little information is available as to the nitrogen content of raw cottons; some estimations by the authors are given.

P. H. P.

## Toxicological and Forensic

### **Poisoning by Barium Sulphate administered for X-Ray Examination.**

**E. Dinslage and Fr. Bartschat.** (*Zeitsch. Unters. Nahr. Genussm.*, 1924, 47, 7-9.)—The administration of 50 grms. of barium sulphate for an X-ray examination caused death in 12 hours; the barium sulphate was subsequently found to contain 90 per cent. of barium carbonate. For the estimation of the barium in the tissues the moist method of Fresenius was used, but as the oxidation of the organic sulphur leads to the formation of insoluble barium sulphate, the undissolved residue should be ignited and fused with fusion mixture, then extracted with water to remove sulphate, after which the residue soluble in hydrochloric acid is added to the main solution, and the barium identified and estimated in the usual way. In the case referred to the soluble barium was recovered mainly from the intestines, but small amounts were separated from the liver and kidneys. Tests on a number of samples of barium sulphate supplied for internal administration showed most of them to contain considerable quantities of soluble barium salts. The risk attending the use of barium sulphate for X-ray purposes is emphasised, and it is recommended that it be prohibited.

H. E. C.

### **Failure of the Toxicological Tests for Phosphorus. Fr. Bartschat.**

(*Zeitsch. Unters. Nahr. Genussm.*, 1924, 47, 10.)—Although yellow phosphorus in the free state or as phosphide can usually be detected many days after death, it sometimes happens that it is completely oxidised to phosphoric acid, in which case it is not revealed by the ordinary test. A case is reported in which 0.1 gm. of phosphorus was criminally administered in foods in small doses extending over two or three days; death ensued one week after the first dose, but phosphorus was not detectable in the post-mortem examination two days later, nor by chemical tests four days after the death. All the phosphorus had been oxidised in the tissues to phosphoric acid.

H. E. C.

**Forensic Importance of Blood-Groups. G. Roche Lynch and F. C. Martley.** (*Lancet*, 1924, 206, 913.)—The relative numbers of blood-groups (first discovered in 1900) in the ordinary population are now fairly well known,

as well as the broad differences found between Europeans and Asiatics. According to L. and H. Hirschfeld (*Lancet*, 1919, ii., 675) these were as follows:

Cases.		GROUPS. Per Cent.			
		I.	II.	III.	IV.
Europeans.	Average of 4000	4.70	41.23	12.14	41.93
Asiatics.	Average of 2500	6.74	21.84	32.74	38.68

The most convincing theory advanced in explanation of the facts is that of Dungern and Hirschfeld, which postulates the presence of two agglutinogens and two agglutinins. The application of the test lies in two directions—(1) blood stains, (2) paternity cases. In the case of a man charged with murder it might be claimed by the prosecution that blood stains found on him were from the victim, and by the defence that they were from himself; the group of the stain would, in many instances, enable one or other of these suggestions to be negatived.

Tables by Dyke and others give the blood-groups of the offspring that might be produced by any combination of parents:

Parents.	Offspring may be—	Cannot be—
I. and I.	I., II., III., or IV.	—
I. and II.		
I. and III.		
I. and IV.		
II. and III.	II. or IV.	I. or III.
II. and IV.		
III. and III.	III. or IV.	I. or II.
III. and IV.		
IV. and IV.	IV.	I., II. or III.

It would seem to be possible to demonstrate from the blood-groups that a given child could not have been produced by some particular parents—*e.g.* a Group II. child could not have sprung from two Group IV. parents. In applying the test to ascertain to which group a particular person's blood belongs a drop of II. serum and a drop of III. serum are placed at either end of a microscope slide, and a little of the blood under examination is taken up on a platinum needle and mixed with each. Agglutination can be readily seen with the naked eye in a few minutes; when it occurs in both drops the blood is of No. I. group; when it is in neither it is of IV. group; and when it is in only one it belongs to the group of the serum in which there is no agglutination. To ascertain the "titre" of a blood serum, drops of whole serum, half serum, quarter serum, one-eighth serum, and so on, up to about 1/250 serum, are treated with an equal volume of a 1 per cent. dilution of appropriate corpuscles, and the agglutinations noted under a low power of the microscope. They may extend nearly to the end of the series, or may only go down three or four places, the range varying greatly in different cases.

In applying the test to blood stains two methods may be used:—(1) An extract of the stain can be used to agglutinate known corpuscles, or (2) the agglutinating power of a known serum may be varied by treating it with unknown stain. The first is often difficult to demonstrate, but when a blood-stain on a garment is cut up into fine fragments and incubated in a sealed glass tube with a minimum quantity of water the resulting fluid, when filtered free from undissolved matter, generally agglutinates appropriate corpuscles when the preparation is kept overnight in a moist chamber. The second depends on the agglutinating power of a serum being finite. For instance, when a IV. serum which agglutinates II. and III. corpuscles is treated with II. corpuscles, it can still agglutinate III. corpuscles, as before, but its action on II. corpuscles is lessened, as shown by the agglutination "titre," or entirely abolished. In practice the blood stain is cut up and incubated as described above, except that in this case it is mixed with a known No. IV. serum instead of with water; after incubation the serum is drawn off and filtered, and its agglutinating power tested on known corpuscles. In the case of a IV. blood-stain no impairment of agglutinating power should be observed, but in the case of the other groups it can generally be detected. For instance, if the "titre" of the treated IV. serum was unchanged for III. serum, but very markedly diminished for II. corpuscles, it would be shown that the stain in question was No. II. blood. It should be noted that negative evidence alone may be fallacious, owing to the blood-stain having become inert from age or otherwise, or from its having been too small. In no case, however, has a definite positive result been found to lead to a wrong conclusion.

## Organic Analysis.

**Volumetric Estimation of Carbon.** J. F. Durand. (*Comptes rend.*, 1924, 178, 1193-1195.)—The following method for estimating carbon in organic compounds is applicable to a large number of substances, including probably all the hydrocarbons and ternary compounds containing carbon, hydrogen and oxygen. It lends itself to a method of micro-estimation to be described later. Use is made, as oxidising agent, of a sulphuric acid solution of permanganic anhydride, this being prepared by grinding in a mortar excess of potassium permanganate with about 20 c.c. of pure sulphuric acid of 66° Bé. The resultant green liquid, surmounted by oily droplets of the permanganic anhydride, is decanted and poured into one of the compartments of a calcimeter for measuring gases; about 2 per cent. of water is added to it. Into the other compartment of the vessel is introduced a solution of the substance to be examined (about 5 grms.) in 5 c.c. of sulphuric acid or carbon tetrachloride. The two liquids are then mixed, and the volume of carbon dioxide liberated is read over mercury at ordinary temperature. The liquid remains green if sufficient of the oxidising agent has been used. If the reaction is too violent, the oxidising liquid may be suitably diluted, since the anhydride must be prevented from liberating free oxygen and

from assuming an appreciable vapour pressure owing to the thermal effect of the reaction. Of nitrogen compounds, phthalimide, azobenzene, dimethylaminoazobenzene, and picric acid yield virtually theoretical results, but urea, propionamide, and nitromethane yield no gas, and with some other compounds the carbon dioxide formed corresponds with only certain of the carbon groupings of the molecule.

T. H. P.

**Identity of Phocœnic and Valeric Acids.** E. André. (*Comptes rend.*, 1924, 178, 1188–1191.)—The supposed identity of Chevreul's phocœnic acid, prepared in 1817 from the oils of the dolphin and porpoise, with isovaleric (isopropylacetic) acid is confirmed.

T. H. P.

**Action of Bromine on Methyl Esters of Phenolsulphonic Acids. Estimation of Sulphur in Phenolsulphonic Esters and Salts.** L. J. Simon and M. Frèrejacque. (*Comptes rend.*, 1924, 178, 1282–1284.)—The authors have applied Desvergnès' method for analysing sulphonic acids (ANALYST, 1920, 45, 386) to the methyl esters of various phenolsulphonic acids. The ester was first boiled with water until dissolved and hence hydrolysed, and the solution was then heated with a saturated solution of bromine in hydrochloric acid (20 c.c. for 2 to 3 grms. of the substance) until evolution of bromine ceased. The liquid was next diluted and filtered, and the sulphuric acid in the filtrate estimated. The method yields satisfactory results with the esters examined, and with the water-soluble additive products of the sulphonic esters with tertiary bases. The acyclic methanesulphonic and sulpho-acetic acids, or rather their barium salts, give no trace of sulphuric acid under the above conditions.

T. H. P.

**Some Colour Reactions of Wool.** Meunier and Rey. (*J. Soc. Leather Trades Chem.*, 1924, 8, 149.)—To obtain the violet-red colour produced by the action of quinone on wool it is essential that moisture be present. If the wool has previously been exposed to the sun or ultra-violet light, the colour produced is dark brown, which may explain certain anomalies observed in dyeing fabrics which have been dried in full sunlight. Wools of acid reaction fix quinone more slowly, but, if previously exposed to ultra-violet light, are immediately coloured a bright yellow by quinone. Wools bleached by sulphurous acid are directly coloured bright yellow by quinone without exposure to sunlight, thus providing a ready method of testing whether a wool has been bleached with sulphurous acid. It is suggested that the sulphur in wool is partially oxidised by ultra-violet light. Wool bleached with sulphurous acid and then treated with a solution of sodium bicarbonate is again coloured violet-red. This colour reaction of quinone on wool is much quicker than in the case of silk, and thus affords a rapid test for the composition of a mixed fabric. Wool, whether bleached or not, if dipped in a neutral or alkaline solution of sodium nitrite, takes no colour at all, even if allowed to dry in the air; but, if dried at 100° C. for some hours, it is coloured an orange-yellow. If treated with sodium nitrite, exposed to ultra-violet light, and dried

at the ordinary temperature, it is rapidly coloured orange-yellow, and this is more rapid if the sodium nitrite had been alkaline than if it had been neutral. (An identical reaction takes place with tyrosin.)

In the absence of nitrous acid Millon's reagent colours neither wool, silk, nor hair. In presence of small quantities of nitrous acid, wool, silk and hair are coloured red by this reagent, but the quantity of acid necessary is greater for hair than for wool, and greater for silk than for hair. If the acid is in great excess, no red colour appears, and there is immediate formation of a yellow colour. A very stable red colour can be obtained on wool or silk as follows:—*Silk*: From 0.1 to 0.2 gm. is dipped in a 7 per cent. solution of mercuric chloride. The solution is now warmed for 10 minutes and then five drops of a 25 per cent. solution of sodium nitrite are added. *Wool*: The same procedure is used as for silk, except that the solution is kept warm for 25 to 30 minutes before adding the nitrite.

To estimate the acidity of a wool 5 grms. are treated with 200 c.c. of 0.05 *N* sodium bicarbonate solution for 24 hours, with occasional shaking, and then rinsed four times with 50 c.c. of water. The mixed solution and washings are boiled with excess of 0.2 *N* sulphuric acid and back-titrated with 0.2 *N* sodium hydroxide solution.

R. F. I.

## Inorganic Analysis.

**Rapid Electro-analytical Separation of Silver, Copper, and Bismuth by Graduated Potentials.** A. Lassieur. (*Comptes rend.*, 1924, 178, 847-849.)—The experiments here described were made with a fixed, cylindrical, platinum foil cathode, 43 mm. in diameter and 50 mm. in height, and a rotating anode, 30 mm. in diameter and 50 mm. high.

Silver and copper may be readily separated by electrolysing an almost boiling solution of the nitrates containing 1.3 c.c. of free nitric acid of 36° Bé. in a total volume of 85 c.c. and containing also a weight of mercury equal to about 10 per cent. of that of the silver. The latter is deposited first with a current of 2 ampères, the anode-cathode p.d. being 1.2 volt for the apparatus used; the time required is 20 minutes for each metal. The deposit of silver formed in the presence of the mercury is perfectly adherent and the cathode may be dried at 100° C. without loss of mercury. With silver and bismuth the operation is quite similar; during the deposition of the bismuth the auxiliary potential is maintained exactly at 240 millivolts, particularly at the end of the electrolysis; a good deposit of bismuth should be iron grey, matte and compact.

For the separation of bismuth and copper, an ammoniacal solution gives good results, the copper remaining dissolved and the bismuth being precipitated as hydroxide. The solution containing the two metals is treated with ammonia until it turns blue, an excess of 1 c.c. of ammonia (22° Bé.) and 10 c.c. of 95 per cent. alcohol being then added and the volume made up to 100 c.c. The solution is electrolysed in the cold with an auxiliary potential of 320 millivolts, which may be allowed to increase at the end of the electrolysis to 400 millivolts, the copper being

weighed; for quantities of copper not exceeding 0.5 gm. this deposition occupies 20 minutes. The liquid is then neutralised by means of nitric acid of 36° Bé., 10 c.c. of which are then added in excess. The bismuth is then separated from the nearly boiling solution, the auxiliary potential being fixed at 240 millivolts.

T. H. P.

**New Reagent for Carbon Monoxide.** A. Damiens. (*Comptes rend.*, 1924, 178, 849-852.)—When cuprous oxide (5 grms.) is slightly moistened with water and concentrated sulphuric acid (100 grms.) is gradually added, a reagent is obtained which readily absorbs carbon monoxide in considerable volumes, and may be used for the estimation of this gas in a gaseous mixture. Ethylenic and acetylenic hydrocarbons and oxygen are also absorbed to a slight extent and must, therefore, be removed before the carbon monoxide can be estimated in this way. The compound formed appears to have the formula,  $\text{Cu}_2\text{SO}_4 \cdot 2\text{CO}$ . When large proportions of carbon monoxide are absorbed by the reagent, the latter assumes an appreciable vapour pressure; hence it is necessary that treatment of the gaseous mixture with a second portion of the reagent should result in no further diminution in the volume.

T. H. P.

**Solution of Tin and Antimony Oxides.** E. Stelling. (*Ind. Eng. Chem.*, 1924, 16, 346.)—Tin and antimony oxides, even after they have been ignited, may be dissolved readily in hydrochloric acid if they are digested previously with water containing sulphur dioxide. The oxides are not reduced by the treatment, and the sulphur dioxide is not oxidised to sulphuric acid; a portion of the sulphur dioxide, however, combines with the oxides and is expelled by the hydrochloric acid. The following procedure is recommended for the treatment of an alloy containing tin or antimony, or both. One gm. of the sample is treated with 20 c.c. of nitric acid and 10 c.c. of water, the mixture evaporated to dryness, 10 c.c. of dilute nitric acid are added to the residue, and the tin and antimony oxides are collected on a filter and washed with dilute nitric acid. The oxides are then transferred to a beaker, digested for five minutes at 60° C. with 50 c.c. of concentrated sulphur dioxide solution, and the mixture then boiled, with the addition of 10 c.c. of concentrated hydrochloric acid, until all sulphur dioxide has been expelled. The tin and antimony oxides will now be in solution. W. P. S.

**Estimation of Tungsten in Low-grade Ores.** E. Jünger. (*Zeitsch. anal. Chem.*, 1923, 63, 438-439.)—Two grms. of ore are fused with 4 parts of sodium peroxide in a nickel crucible. The fused mass is leached with 100 c.c. of water, the liquid filtered, and the precipitate well washed. The filtrate is heated, acidified with nitric acid, and made alkaline with ammonia; the precipitate is left to settle and filtered off. The hot filtrate, faintly acidified with nitric acid, is treated with excess of mercurous nitrate solution followed by ammonia until the precipitate gets black; the liquid, however, should remain faintly acid and contain mercurous nitrate. The precipitate is filtered off, washed with boiling



water and dried, and the paper ashed separately. The precipitate is ignited to constant weight in a platinum crucible and fused with potassium bisulphate, and the cold mass is treated with hot water and a fragment of ammonium carbonate; if the resulting solution is not perfectly clear, the flocculent precipitate (silica or alumina) is filtered off, ignited and weighed, and the weight subtracted from the first, tungstic acid being obtained by difference.

W. R. S.

**Estimation of Iodine in Iodides. Weichherz and Klinger.** (*Chem. Zeit.*, 1924, 52, 269.)—This method can be used in presence of chlorides and bromides. It depends on the fact that iodides in acid solution are oxidised by potassium permanganate, the excess of which is then destroyed by means of oxalic acid, and the liberated iodine is titrated with sodium thiosulphate solution. In the reaction between the hydriodic acid and the permanganate hydrated oxide of manganese separates, in spite of the acid solution, but the presence of manganese sulphate facilitates its solution, accelerates the reduction of the permanganate and prevents small amounts of chlorine or bromine from interfering. If the amount of iodine is small and that of the chlorine or bromine is large, these, even though liberated, can be eliminated by adding formic acid, which reduces chlorine and bromine but not iodine.

R. F. I.

## Physical Methods, Apparatus, etc.

**Analysis of Binary Mixtures. Volumetric Turbidity Method. C. D. Bogin.** (*Ind. Eng. Chem.*, 1924, 16, 380-386.)—Binary mixtures of two liquids, one of which has a much greater solubility in water than the other, may be analysed by titrating with water until a turbidity appears. The volume of water that can be added to a unit volume of a binary mixture of any certain composition before turbidity appears is definite and invariable, independent of the time of contact, amount of shaking or rate of addition, and only slightly dependent on the temperature. Applications of the method to mixtures of ethyl and butyl alcohols, propyl and butyl alcohols, ethyl alcohol and petroleum, benzene and ethyl alcohol, etc., are described and the curves for the various mixtures are given. For the analysis of a mixture of ethyl and butyl alcohols, 20 c.c. of the sample, dried previously over potassium carbonate, are placed in a flask and water is added from a burette until a turbidity appears; the end-point is quite sharp (within 0.05 c.c.), and reference to a curve gives the composition of the mixture. The method may be applied to ternary mixtures if an independent method is available for estimating the proportion of the third constituent, and mixtures of organic liquids and water, salt solutions, and pure organic liquids may be used as titrating media in the same way. Mixtures of two liquids, both of which are miscible with water, may be analysed by adding a definite volume of a third insoluble liquid and then titrating with water; mixtures of solids may be analysed by dissolving them in a liquid and then titrating with another liquid. The percentage of water in organic liquids

(e.g. acetone, butyl alcohol) may be estimated by titration with benzene, and moisture in solids may be estimated by extracting the sample with an organic liquid and then titrating the latter with benzene. W. P. S.

### Estimation of Silicon in Iron-Silicon Alloys by their Physical Properties.

**T. D. Yensen.** (*Ind. Eng. Chem.*, 1924, 16, 366-367.)—The electrical resistance and hardness of iron-silicon alloys are functions of their silicon content. The relationship between silicon and electrical resistance is shown by a curve consisting of two straight lines with a bend at Si 0.35 per cent., and may be expressed by the equations:

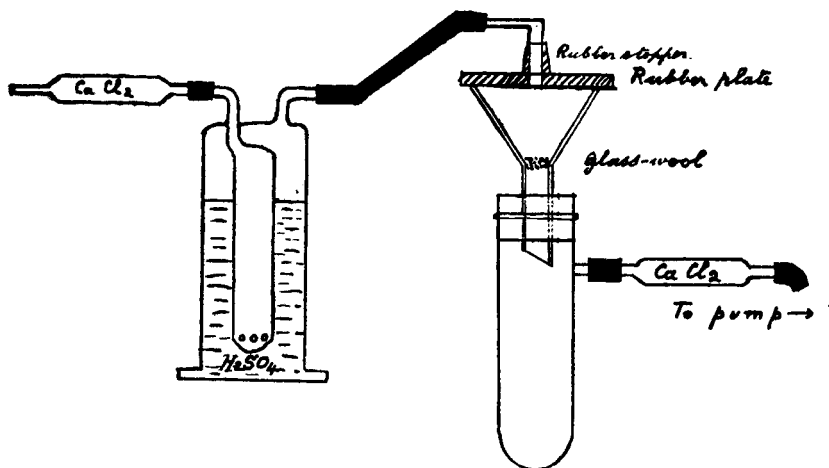
$$\begin{array}{ll} \text{For Si} \leq 0.35 & \phi = 9.6 + 18.4 \times \text{Si.} \\ \text{For } 0.35 \leq \text{Si} \leq 6.5 & \phi = 16.05 + 11.1 (\text{Si} - 0.35). \end{array}$$

The curve showing the relation between silicon and hardness may be expressed by the equation:

$$\text{Si} = 0.092 \times (N - 86)^{0.777}$$

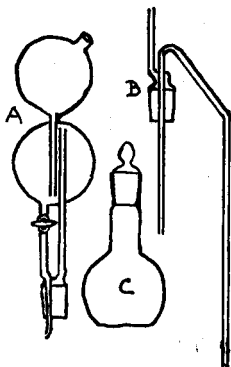
where  $N$  = the Brinnell hardness number (or  $P/A$ ),  $P$  = load, in kilos., on a 10 mm. diam. steel ball, and  $A$  = the area, in sq. mm., of the impression made by the 10 mm. ball on the sample. Either method will give the silicon content within 0.1 per cent. W. P. S.

**Apparatus for Filtering Hygroscopic Substances.** Ban. (*Chem. Zeit.*, 1924, 52, 271.)—The rubber plate with stopper shown in the diagram is pressed by means of a stand and clamp on to the rim of the funnel, the ring of contact being



smearred with desiccator-grease. In the case of oxidisable substances an inert gas, or air freed from oxygen by means of alkaline pyrogallate solution, can be drawn through the apparatus. R. F. I.

**Apparatus for the Analysis of Oleum and other Fuming Liquids. E. Bosshard.** (*Helv. Chim. Acta*, 1924, 7, 330-332.)—The stoppered flask C, made of resistant glass and of about 150 c.c. capacity, is weighed; then the stopper replaced by the tube B, the end of which dips into the liquid to be analysed and of which about 5 grms. are introduced by suction. B is removed without wetting the neck of the flask, the stopper replaced and the weight noted. The bulb head A is now attached; the upper bulb contains glass beads, and the lower one about 100 c.c. of water. The flask C is cooled in ice, and the apparatus inclined so that drops of water introduced from A run down the side of C; water is then very slowly added from A to dilute the oleum; any sulphur trioxide evolved is trapped and absorbed in the head A. When sufficiently diluted, the liquid is made up to a definite volume and an aliquot part titrated in the usual way. When chloro-sulphuric acid is being analysed it is a good plan to put about 5 times its weight of ignited sand (previously washed with hydrochloric acid) into C before weighing the acid. The apparatus is recommended for use with a number of other fuming acids and phosphorus compounds.



H. E. C.

## Reviews.

GENERAL CHEMISTRY. By H. G. DEMING. Pp. 605. New York: John Wiley & Sons; London: Chapman & Hall, Ltd. 1923. Price 17s. 6d. net.

When a further addition is made to the already too large number of text books of general chemistry one may reasonably search for the distinctive feature or merit which alone can warrant a new publication. Prof. Deming sets out to treat of separate principles in each chapter and to illustrate them from industrial applications, thus avoiding the cataloguing of the ever-increasing number of compounds, many of which are of purely academic interest. As the volume touches on organic, physical and biological chemistry, as well as its principal subject of inorganic chemistry, it will be realised that it has been necessary to omit the detailed description of a number of substances usually included in a book of this type.

The result has been to produce a very readable treatise in which the general principles and applications of chemical science are clearly presented. The more important recent developments, such as X-ray analysis and the Lewis-Langmuir theory of atomic structure, are described in an explicit, though elementary, manner, and in such a way as to stimulate clear thinking and further investigation.

A book with such a wide scope is sure to contain blemishes. The description of some of the industrial processes is meagre and too scrappy to be of much value;

for instance, the hydrogenation of oils is dismissed in about five lines, and the preparation of hydrogen is discussed in the ordinary text-book manner, after which it is hardly fair to ask the student at the end of the chapter (p. 320) "if you were to establish a small plant for the hardening of vegetable oils what sources of hydrogen would you consider?"

There is an American style about the book, but the general presentation is one which will be acceptable to English readers, though it may be regretted that English spelling is not adhered to in words such as "sulfur" and "tires." The printing, paper and binding are good, but some of the illustrations are not all that they might be.

H. E. Cox.

CANNED FOODS IN RELATION TO HEALTH (MILROY LECTURES, 1923). By WILLIAM G. SAVAGE, B.Sc., M.D. (Lond.), D.P.H. Cambridge Public Health Series. Pp. vii. +146. Cambridge: University Press. 1923. 8s. 6d. net.

Those who are acquainted with Dr. Savage's work on the bacteriology of canned foods will welcome the appearance of this book, which is based on the Milroy Lectures for 1923 delivered by the author before the Royal College of Physicians. Four or five years ago Dr. Savage set himself the task of undertaking a thorough investigation into the bacteriology of canned foods, a subject about which there had been much misconception and difference of opinion. As recently as the year 1920 we find definite statements by various authors that the keeping qualities of canned foods, with the exception of sweetened condensed milk, depend on their absolute sterility. As a consequence of Savage's work this view is no longer tenable. Of the foods examined by him a large proportion were by no means sterile. Over 60 per cent. of canned meat samples and of marine products contained living spores, and no class of product was absolutely free from organisms.

The author points out that the keeping qualities of canned foods depend, not on sterility or non-sterility, but on whether the conditions within the tin are such as to prevent the multiplication of any organisms which may be present. What these conditions are, and how they affect the growth respectively of aerobes and anaerobes is fully discussed, and Dr. Savage's arguments, supported as they are by a wealth of experimental data, seem to be conclusive.

Food poisoning due to specific bacteria and their toxins naturally receives extended treatment, and it is worthy of note that only a month before the outbreak of botulism at Loch Maree in 1922, Dr. Savage had referred at the Plymouth Congress to the possibility of this deadly form of food poisoning being introduced into this country. Savage's work enables us to draw the broad conclusion that bacterial food poisoning from canned foods is due almost entirely to certain specific bacteria which have gained access to the food prior to canning, owing to lack of care and cleanliness in the preparation of the food, and that the occurrence of these specific bacteria is comparatively rare. The ordinary decomposition of food, *e.g.* by organisms of the *B. proteus* group, has never been shown to be associated with food poisoning, nor is there any evidence that the so-called "ptomaines" are injurious to health. At the same time the author makes it clear that tins

which are "blown," or which show obvious decomposition of their contents, are evidence of faulty methods of preparation or storage, and are on that account to be rejected as being the more likely to have been exposed to infection by specific bacteria.

While the bacteriologist can hardly fail to agree with the author's conclusions, the chemist will feel that the factors influencing the action of foodstuffs upon tin, and the possibilities of tin-poisoning occurring through the consumption of canned foods, have been dismissed in somewhat too arbitrary a manner. A number of recorded cases of alleged tin-poisoning were discussed by Buchanan and Schryver in a Report to the Local Government Board in 1908, but Savage is of opinion that the evidence pointing to tin as being the active agent is by no means conclusive in many of these cases. This may be so, and, further, it is true that neither Lehmann nor Schryver could find any evidence of chronic tin-poisoning resulting from the ingestion of canned foods over a considerable period. We are familiar with negative evidence of this character, not only in the matter of tin, but in the case of almost every impurity or chemical preservative commonly found in foodstuffs. Injury to health does not necessarily begin only with definite symptoms of poisoning, and it is clearly in the interest of the consumer that the amount of tin in canned foods be kept down to the lowest possible limit. Much yet remains to be done on the purely chemical side in investigating the mechanism of the action of different foodstuffs on tin-plate.

The book concludes with two appendices giving an account of some of the principles involved in the processing of canned foods and of the methods of examination in the laboratory. There is a full bibliography and a short index. Dr. Savage's work can be thoroughly recommended as an admirably concise and lucid exposition of modern views on the subject of canned foods.

G. W. MONIER-WILLIAMS.

OILS, FATS, WAXES AND RESINS. By E. R. BOLTON and R. G. PELLY. Pp. 275. (The "Resources of the Empire" Series.) London: Ernest Benn, Ltd. 1924. Price 21s. net.

This is one of a series of twelve volumes which have been prepared by the Federation of British Industries for the purpose of bringing before business men and others the Empire's resources. As is the case with each book in the series, it opens with a Foreword by H.R.H. the Prince of Wales, and a general Introduction by the Right Hon. Sir E. Geddes. In addition, there is an introductory review by Mr. J. H. Batty. The introductory matter, with the Author's Preface and Table of Contents, occupies 20 pages, and contains much of interest.

This book is partly statistical in nature, and probably for the first time authentic and official statistics on the subjects dealt with in this volume are available in a well-classified form under one cover. It must not be supposed, however, that, as the volume is largely statistical in form, it lacks interest or information of any other kind. On the contrary, it is replete with material concerning methods of collection, descriptions of varieties of commercial products,

outlines of manufacturing processes, methods of valuation and chemical data that make the volume of all-round value to the business man with Empire-wide interests, as well as to the chemist, the student and the technical expert.

The book comprises, as its title indicates, commercial, technical and statistical information on oils, fats, waxes and resins; it defines and classifies these terms, discusses the sources of supply, and describes the commercial methods of manufacture of oils, fats and oil-cakes, etc. The refining of oils, production of fatty acids by splitting, and hydrogenation are described lucidly and concisely. Analytical data are supplied, the composition of the various products is given, and the methods of commercial valuation briefly set out. All the important varieties of these substances are adequately dealt with, for the most part in consecutive chapters, the whole constituting Part I. of the book, comprising 135 pages.

Part II. (100 pages) is concerned with the Production and Trade of the British Empire in these commercial products. Part III. deals with the development of Imperial resources of oilseeds and oils, and contains some valuable suggestions as to the way in which the less-known products may be exploited in the future. The difficulties which must be overcome before trade in certain directions can increase are duly emphasised. In a short special section Mr. H. Moore reviews the mineral lubricating oils in a manner similar to that done for the fatty oils in Part I. Part IV. contains an important list of officials and official institutions from which information is obtainable, and the work concludes with a bibliography containing references to some of the more useful publications on the various products described, and with an index of subjects and of botanical and zoological names.

The reviewer is impressed with the very considerable scope of the statistical information, and with its great value. This information is not only noteworthy for what it comprises, but also because it draws attention to respects in which our knowledge is scanty or non-existent, and so suggests the desirability of getting further facts relating to many important products. In this way the volume has done real service to the Empire, and the Federation of British Industries is to be congratulated on its scheme of inaugurating this well-conceived series. No such complete statistics of the kind have hitherto been available, and although the Bulletins of the Imperial Institute have for years given information of this character (and the authors acknowledge their debt to these bulletins), there is no other publication which combines the subject-matter in a digested form, suggestive and interesting, and provocative of ideas for the extension of the Empire's trade. The work will be invaluable to the business man whose interests lie within the subjects dealt with here; the technical chemist is provided with a mass of material which he must long have desired to have in a handy form. The authors also are to be congratulated on the way in which they have presented this material. The publishers have done their part to make the book presentable in form, while the printing is excellent. The proofs have evidently been carefully read, and very few errors meet the eye. The volume makes a timely appearance during the early days of the British Empire Exhibition.

ARNOLD R. TANKARD.

FATS: NATURAL AND SYNTHETIC. By W. W. MYDDLETON and T. HEDLEY BARRY.  
Pp. xi. +182. London: E. Benn, Ltd. 1924. Price 25s. net.

The authors of this book have made a useful addition to the literature of chemical industry by gathering, into the compass of one volume, much information, hitherto only available in scattered papers, on the preparation and commercial uses of the hydrogenated oils. The descriptions of large scale processes are clearly written, and the diagrams illustrating the text are good. The handling of the theoretical side of the subject is less satisfactory. The authors do not seem to have clearly in view whether they are writing for the manufacturer seeking a knowledge of chemistry, or for the chemist wishing to acquire a knowledge of manufacture. This results in an unfortunate confusion of style; for instance, while "saturated" and "unsaturated" acids are referred to in inverted commas on p. 7 and defined on p. 15 as compounds which take up bromine, in the former case with, and in the latter case without, displacement of hydrogen, yet the theory of the tetravalent carbon atom and of the single, double, and treble bond, is taken for granted throughout the book. Both the deductive method and the empirical method of teaching have their uses, but a mixture of the two is confusing.

A statement that cannot be allowed to pass uncriticised occurs in the preface, namely, that "the methods of oil analysis are not of the same order of accuracy as the standard methods of inorganic chemistry." This is more than misleading. The methods of oil analysis have perforce to be of a much higher order of accuracy than those used in ordinary inorganic analysis, since, owing to the much greater mass of the fatty acid molecule, the interpretation of the analytical results is so much less sharply defined.

In the later and less theoretical chapters, Chapter V. and onwards, the presentation of the matter greatly improves, and the authors are to be particularly complimented on Chapters VI., VIII. and XI. The setting out of the physical properties of fats in the form of graphs is a valuable innovation. The curves given in figure 26, however, appear to be unsatisfactory, since the iodine value for arachis oil, calculated from the percentage composition, is in two cases some twenty units higher than the value given at the head of the column on p. 107.

A few statements in the text seem to require qualification; *e.g.* on p. 32, cottonseed meal is referred to as used for human consumption; on p. 39, the fish liver oils are referred to as "valued almost entirely for medicinal properties"—dietetic would have been a better word than medicinal, and it has been overlooked that several thousand tons yearly are absorbed by the tanning industry. In the account of the preparation of edible oil from seeds, it should have been mentioned that the neutralised oil is deodorised by means of superheated steam.

In dealing with the commercial uses of the oils and fats the author discusses the function of these as human food. A brief account is given of the vitamin theory which, though correct enough in what is present, is vitiated by an absence of allusion to the subject of rickets. The rickets problem is admittedly one of the most pressing social problems of the day in this country, and is closely connected with an inadequate fatty diet. The conclusion that it does not "seem necessary

to insist that they (the vitamins) should be present in it (a synthetic fatty food) at all, since a sufficiency apparently can be obtained from the other substances in the diet of the average person" is a piece of false argument, since it is amongst that very class of the population which suffers from a generally inadequate diet that there is also the tendency to substitute cheap margarines for butter. It is of the greatest importance therefore that these should be made as complete in dietetic value as possible.

In general, "Fats, Natural and Synthetic" may be commended for containing "the truth and nothing but the truth," but, unfortunately, not for containing the whole truth. As a work of reference the information which it gives is generally sound, but there are blanks the existence of which is not even indicated. The references given to original papers, while all useful, are too haphazard to be regarded as forming a bibliography.

The book, unfortunately, is not free from those defects of literary style which are so constantly attributed to scientific authors; for instance, on p. 10 "unique" is used where "single" is meant (it would have been exciting to meet a "unique" hydrogen atom!); on p. 31 "above" is used as a noun; on p. 103 "smallest" is assumed to be synonymous with "least possible"; and on p. 87 hydrogen is added "to the double bond." There are also difficulties with that subtle mood, the gerundive, and on p. 30, paragraph 6, a full stop appears somewhat surprisingly in the middle of a sentence. The paragraphing also needs revising, being without any obvious system. On p. 140 every sentence except one has a paragraph to itself.

Two other defects are the mixture of type founts used for chapter sub-headings, and confusion in the use of the sign " $=$ ". This is used both for "equals" and for a double bond. At first sight it is not always clear which is meant; for instance, on pp. 10 and 11, " $=C$ " is in the middle of an equation, and on p. 14, of a molecular formula. The consistent use of spacing round the "equals" sign, such as indeed is found in three out of the four equations on p. 11, would make the meaning clear at the first glance. All these minor defects could have been removed by a more careful attention to detail in the proof stage, and it is to be hoped that they will have disappeared in the second edition that is certain to be demanded.

The publishers, Messrs. Ernest Benn, Ltd., are to be congratulated on the general appearance of the volume.

DOROTHY JORDAN LLOYD.

THE CHEMISTS' YEAR BOOK, 1924. Edited by F. W. ATACK, M.Sc., D.Sc., B.Sc., F.I.C. Ninth Edition. Pp. 1147 and Index. Manchester: Sherratt & Hughes. 1924. Price 21s.

Although the present edition of this work is larger by 40 pages than that of 1923, it is issued in the form of one volume, and in that respect is decidedly more convenient for frequent reference than its two-volume predecessors.

The abundant tabular matter has been supplemented with some new data, chiefly from American sources. One new table, giving the years and corresponding



volume numbers of the more important scientific periodicals, should appreciably facilitate the often wearisome task of tracing references.

Other new features of the book include a section on "Essential Oils" by T. H. Durrans and one on "Spirits" by F. Robinson. The former is clearly written, and as full as could be expected in a work of this kind, and includes a short bibliography of the subject. The section on "Spirits" too, is well written, though it does not give sufficient information as to where fuller details can be found; there is a slip on p. 905, line 1, where "ammonium acetate" should read "aniline acetate." The section on "Water Analysis" has been re-written by S. E. Melling; it is considerably longer than in earlier editions, and is fairly adequate for laboratory reference. This section also contains a short bibliography.

An unfortunate error on p. 628, where mannitol and dulcitol are referred to as "sugars," might leave an inexperienced reader in doubt as to whether the alcohols named or the corresponding sugars should be used. The section on "Agricultural Chemistry" has been revised and slightly enlarged. It could hardly be further improved within the limits of space assigned to it, and is indeed a model of what special articles in works of this kind should be. Brief accounts of American methods of analysis constitute a new feature of this and several other sections. The section on "Dairy Products" also deserves high commendation.

In reviews of previous editions (ANALYST, 1921, 46, 431; 1923, 48, 354) it was pointed out that some of the sections dealing with special branches of analysis were too short to be of value in themselves, and that they gave few or no references to authorities. It is satisfactory to note that these defects have been remedied to a large extent, and that, although some sections are still open to complaint on these grounds, the book as a whole should prove a most useful laboratory aid.

LEWIS EYNON.

PHOTOGRAPHY AS A SCIENTIFIC IMPLEMENT. By Various Contributors. First Edition. Applied Physics Series. Pp. viii. +549. London: Blackie & Co. 1923. Price 30s.

This treatise, as stated in the preface, is an endeavour to include in one volume the "whole of the results achieved" in the development of methods of technique in various branches of science, and thus to make available to scientific workers methods with which they may be more or less unfamiliar, but which may be of service in their own particular branch. That this aim has not been attained will be obvious from the size of the volume, but the attempt has led to the production of a textbook which will prove not only of great value to scientists, but also of interest to the general reader. The title of the volume is perhaps not sufficiently comprehensive, since much is included that cannot be classed under the above heading, especially in optics and photographic research.

Chapter I., by Mr. C. R. Gibson, consists of a brief history of photography down to about the year 1850, with, in addition, short paragraphs on the wet collodion process and the gelatine dry plate. No reference is made to the evolution

of the isochromatic or panchromatic plate, since this is dealt with elsewhere in the volume. Chapter II., by Mr. S. E. Sheppard, is devoted to the elementary optics of photography, and, although more or less a bald statement of facts, and therefore tedious reading, is none the less accurate and reliable. In Chapter III. the more advanced optics of the photographic lens is dealt with by Professor A. E. Conrady from the point of view of the practical photographer; it treats of the formation of images and the various aberrations and other factors limiting the formation of the ideal representation of an object photographed, in addition to experimental methods for determining the constants of any lens system. Chapter IV. provides the theory of photographic processes and methods and is also written by Mr. S. E. Sheppard. In this chapter the production and manipulation of photographic plates and papers are treated in a thorough manner including much recent work.

The preceding four chapters may be said to constitute Section I. of the volume, for the remainder of the book is devoted to the application of photography to various branches of science. In Chapter V., by Mr. C. R. Davidson, an admirable account is given of the use of photography in astronomical work, including descriptions of the apparatus used and the methods employed for the production of spectra and determination of luminosity of the heavenly bodies. Chapter VI. is contributed by Mr. H. Moss, and illustrates in a striking manner the great utility of photography in the study of physics. Both the methods adopted and the results achieved in Worthington's work on splashes, Boys' researches on bullets in flight, and many other branches of physical investigation are described and illustrated. Chapters VII. and VIII., the former by Mr. J. H. G. Monypenny, and the latter by Dr. G. H. Rodman, may be mentioned together, since both consist principally of admirable descriptions of practical manipulation in photomicrography, the first in its application to metallurgy and the second in its more general bearings. "Photographic Surveying," by Col. H. S. L. Winterbotham, is the subject of Chapter IX., and the methods adopted in topographical work, both from the ground and from aeroplanes, are described in a lucid and agreeable manner.

An interesting account of the development of the aeroplane camera is given in Chapter X. on "Aeronautical Photography," by Mr. F. C. V. Laws, in which the essentials required to achieve the greatest efficiency, together with methods of manipulation adopted for the production of single and stereoscopic photographs, are recorded.

Mr. W. L. F. Wastell, in Chapter XI., deals with the development of photography in colours and the various methods adopted at the present time for the production of photographs in the natural tints of the subject, a few pages at the end of the chapter being devoted to brief descriptions of the methods employed in colour kinematography. The extensive use made of photography in the production of illustrations of all kinds is made apparent by perusal of Chapter XII. by Mr. W. B. Hislop, in which the principles and technique of the different branches of relief, surface, intaglio and three-colour printing are described. This chapter

is unique in that it is provided with an appendix giving formulæ and notes on the various solutions employed for development, intensifying, sensitising, etc.

Chapter XIII., entitled "The Technics of Kinematography," by A. S. Newman, is an able exposition of the development and present-day practice in the highly popular field of "the pictures." This subject is an excellent example of a lengthy and intricate process in which careful attention to detail throughout is essential to success.

The volume is brought to a close by Chapter XIV., "The Camera as Witness and Detective," by Mr. W. M. Webb, which, on the whole, is somewhat disappointing. Considering the enormous amount of material available, and the extensive variety of subjects included under this head, it is curious that much of the chapter deals only with the detection of erased writing on foreign passports. Although the matter included is of much interest, it is to be regretted that no examples are given of the use of photography in the study of watermarks, finger prints, forged paintings, the identification of ink and pencil markings, the deciphering of charred documents, and other applications frequently employed at the present time.

The index is perhaps the least satisfactory portion of the volume. The small "nonpareil" type employed is not conducive to a rapid search, this being in striking contrast to the subject matter which is printed in the much more legible "small pica." Further, several errors in the page references may be found, thus: "Astronomical photography" is not to be met with on page 398 as given, nor is "Autograph, stereo-" on pages 200 and 209-60, whilst, in addition, various subjects found in the text are not mentioned in the index, among these being "Backing of plates," "Compensation eyepieces," "Astrophysics," "Portrait lenses," and others. For these and other reasons it is to be hoped that the index will undergo a careful revision before the second edition is produced, when the opportunity might also be taken to introduce more complete cross-indexing than is at present provided in this volume.

In addition to numerous figures and diagrams interspersed throughout the text the volume contains over forty plates, many of which are excellent examples of the results obtained in various branches of photography. Unfortunately no index to these is provided, and, since both text illustrations and plates are arranged somewhat erratically, the omission is particularly noticeable.

One admirable feature of this production is the series of bibliographical references appended to each chapter, or in some cases to each section—an excellent example which might well be copied in other scientific manuals.

A perusal of the text shows that very few serious errors are present, but two have been noted. On page 203 the curves illustrating Purkinje's Phenomenon are wrongly lettered, thus suggesting that the converse of this is true, and, on pages 140 and 167, various expressions intended to represent chemical equations are decidedly unbalanced. Misprints are also few in number.

The information, both theoretical and practical, throughout the volume is of a high degree of accuracy, but the reviewer is unable to agree with the statement on

page 322 referring to the photomicrography of opaque objects that "the photograph is better taken without such procedure" (bilateral illumination of the object), for undoubtedly the best results are achieved by a secondary diffused illumination on the side remote from the principal illuminant. The method given for the detection of changes in a complicated group of objects is not so recent as is indicated on page 312, for it was first described by Hodgson and Wilsey in 1917. Other and simpler methods for detecting such changes, which are not mentioned, are the stereoscopic observation of the two negatives and application of the method for the comparison of stellar photographs described on page 219.

The authors and publishers are to be congratulated upon the results of their efforts in breaking new ground and compiling a manual which is lucid, accurately expressed and not overburdened with the higher mathematics. It is to be hoped that we may look forward to a similar production dealing with the applications of photography in other branches of science not included in the present volume.

T. J. WARD.

## The Institute of Chemistry of Great Britain and Ireland.

### PASS LIST.

#### APRIL EXAMINATIONS, 1924.

The following candidates have passed the Examination for the Associateship:—  
*In General Chemistry*: R. P. Balfour, C. W. Gibby, F. J. Green, G. W. Harrison, A. G. Laing, G. L. McCarter, L. B. Milne, C. F. Myers, J. L. Philp, and W. E. Wright.

*Under Regulations prior to March, 1920—In the Chemistry, including Microscopy, of Food and Drugs and of Water*:—C. W. Maplethorpe.

The following candidates have passed the Examination for the Fellowship:—  
*In Branch D, Agricultural Chemistry*: B. Viswanath.

*In Branch E, The Chemistry, including Microscopy, of Food and Drugs, and of Water*:—G. M. Norman and R. G. Thin.

*In Branch H, General and Analytical Chemistry*:—C. Hollingsworth.

## Publications Received.

THORPE'S DICTIONARY OF APPLIED CHEMISTRY. Vol. V. (Oxygen to Rye).  
Pp. 722. London: Longmans, Green & Co. Price 60s. net.

CLOUDS AND SMOKES. By W. E. GIBBS. London: J. & A. Churchill. 1924.  
Price 10s. 6d. net.

TECHNICAL METHODS OF CHEMICAL ANALYSIS. 2nd Edition. Vol. I. Edited  
by G. Lunge and C. A. Keane. London: Gurney & Jackson. 1924.  
Price 63s.