

THE ANALYST.

OBITUARY.

RAPHAEL MELDOLA—AN APPRECIATION.

RAPHAEL MELDOLA was born June 19, 1849, in Islington; he died suddenly, of heart failure, at his home in Bloomsbury Square, November 16, 1915. According to the *Jewish Cyclopædia*, he came of an ancient Spanish-Portuguese Jewish family, which long flourished in Toledo, traceable, it is said, down to 1282 through sixteen generations. His grandfather of the same name was a Jewish Rabbi of distinction: born in Leghorn in 1754, he died in London in 1828; he was a noted scholar and a dominant factor of the British Jewry of his generation—indeed, so remarkable were his talents that he was permitted to take his seat in the rabbinical college when only fifteen years old. Meldola's marked literary ability and philosophical tendencies, which are clearly displayed in his numerous addresses, evidently came to him from this grandfather. He was slight in figure and of frail appearance, though a good walker.

The writer first learnt to know him in 1866, when he entered as a student, under Frankland, at the Royal College of Chemistry, Oxford Street. A couple of years later, Meldola became junior assistant, under Mr. C. E. Groves, in the private research laboratory of Dr. Stenhouse; at the time, this was the best school of organic chemistry in the kingdom for a young worker but it was good in other ways, as fervent disputations, sometimes on religious topics, were of frequent occurrence. About 1870 he entered the laboratory of the colour works established at Brentford by Greville Williams (who had been one of Perkin's assistants), Thomas and Dewar. Otto Witt was subsequently chemist in this works and while there brought out the first recognised azo-colour that was put upon the English market.

Why Meldola left this firm I do not know. In 1872 he returned to Frankland's laboratory and was mainly occupied, in succession to Alexander Pedler, on the appointment of the latter to a Professorship in Calcutta, in assisting Mr. Norman Lockyer, then in the first flush of his astronomical career. Lockyer was engaged, in conjunction with Frankland, in studying the effect of pressure, etc., on the spectra of gases. This engagement led to his taking part, in 1875, in the international expedition to the Nicobar Islands, in the Bay of Bengal, to view the total eclipse of the sun; it probably also led him to take an interest in photography.

In 1877 he became chemist to Brooke, Simpson and Spiller, who had taken over Perkin's business a few years previously; he remained there until 1885, when he assumed the Professorship at the Finsbury Technical College, vacant through my appointment to the Central Technical College at South Kensington. He held this office up to the time of his death. Fortunately, Meldola never speculated in ions and knew what was required of the chemist, so—with the aid of my old

assistant Streatfeild, an incomparable lieutenant—his students were trained to be chemists—to use their hands and do things, instead of playing with froth. A large number of young men were turned out from the school who became really useful in works, especially as the course at Finsbury, which my colleagues, Ayrton and Perry and I had instituted, involved some attention being given by would-be chemists to engineering drawing and the rudiments of engineering, as well as to electricity.

He had the advantage of working without being subject to the control of any outside examining body—a condition we had laid down as the *sine qua non* of success, which has been maintained to the present day and has distinguished the Finsbury College from most other institutions of similar grade in London and elsewhere, giving it a deserved supremacy. While saying this, I cannot help expressing the fear that in later years professional examinations have tended, in a measure, to neutralise some of the advantages the Finsbury School had formerly. The time must come when we shall recognise that all such prescribed tests have an arresting effect on mental development, unless taken by students in their stride, without any special preparation. Some day, probably, we shall devise some series of penny-in-the-slot cranial testing machines, such as Midshipman Easy's father worked at, that will be far more effective than any set of present-day, unimaginative, academic examiners; after passing through these, the candidate will be stamped—"A Chemist, well and truly made."

While still a student of chemistry, in 1868, before he published anything chemical, he began to write about insects and early took an interest in the problems of mimicry; he appears to have given special attention to this subject through Darwin's encouragement, as the great naturalist put him in possession of letters written from Brazil by Fritz Müller, the earliest authority on these matters. In fact, although his professional occupation was that of a chemist, at heart he was ever a naturalist—not the mere ordinary variety but a philosophic naturalist; yet he took great interest in field work and occasionally, when the fit was on him, collected vigorously; but to his great credit, be it said, he was only too ready to scrap his collection at any time if he saw an opportunity of encouraging a young worker. His interests, in fact, always lay far above those of the systematists; his scientific training had made it impossible for him merely to collect and split hairs in coining new species. Hence he became the translator of Weismann's "Studies in the Theory of Descent" and Darwin honoured him by writing a prefatory notice to the first volume, published in 1881. Hence also, later on, as President of the Entomological Society, in two addresses delivered in 1900 and 1901, he urged bug-hunters to become experimentalists and theorists and argued strongly in favour of the use of the imagination—a course which, I know, made some of the conservative seniors uneasy. Meldola, I think, though fond of a good story, had no great sense of humour; he failed to realise, apparently, that the naturalist species only occasionally throws aberrant forms with scientific proclivities—"his not to reason why, his but to do and die"; in other words, to collect and record, not to generalise. The truly scientific worker must utilise his material; he cannot save it. Zoology will never be more than a descriptive science in the hands of the zoologists—the biologists alone can make its dead bones live. Meldola certainly played a considerable part in

this country in founding a school of entomological thought, with aspirations towards a science of entomology.

Technically well versed in his subject, he has done much interesting detailed chemical investigation, though in a curiously restricted field. I have always thought that his chemical work lacked enthusiasm and that he failed to display the philosophical grasp apparent in his biological essays. To me this has always been an interesting feature of his psychology. Through lack of means, he was forced in early life to become a professional—at heart, his proclivities were such, I believe, that, had circumstances been favourable, he would have elected to play the part of that particularly English species, the amateur, by preference. On this account, he had the innate faculty of being attracted by and of attracting older men—thus, he knew Darwin well and I believe that Darwin valued his opinion highly; I think I may say that he loved Wallace and that Wallace returned his affection; two other pioneer naturalists, Bates and Trimen, were also his intimates; Poulton and he have long figured as fast friends. But I doubt if, outside these, many really knew him. Though reticent and mute in his early life, in later years he became a confident and fluent speaker. At all times he was more at home and ready to talk shop with naturalists than with chemists: our narrowness bored his catholic taste, I think. I have never known him better company than when out with the Geologists' Association, especially on one occasion in the Bournemouth district, when he brought Wallace, who then lived at Poole, in his train; the occasion is fresh in my mind, as I have a photograph I took of the two men and Starkie Gardiner resting on a bank of Nummulite remains close to the beach. The work he did in founding the Epping Forest and County of Essex Field Club and his subsequent entire devotion to this body are probably the best testimonial of his ability as an organiser on record. He was first President of the Club and again held office when the Association came of age: on this occasion he delivered an address in which he summarised the proceedings of the club; he was in the proud position of showing that it could claim to have done much real work, though he nowhere hinted that this was largely due to his inspiring influence and constant care.

His translation of the two volumes of Weismann's "Theory of Descent" (1882-83) was a remarkable achievement in its way—not the least on account of the happy rendering he gave of the crabbed German of the original; as a literary performance, it touched a high level. He was at all times prepared to break a lance on behalf of Darwin. His Herbert Spencer Lecture, delivered in 1910, on "Evolution: Darwinian and Spencerian," is a scholarly essay in which he traced the impression left by each of the two great founders of the modern school of evolution. It is noteworthy that in this address he declared his belief that the answer evolution has given us is that "the invocation of extraneous powers—of a principle of vitality—to explain processes of which we are ignorant is simply the reintroduction of long-abandoned unscientific methods."

His discussion, in this essay, of the chemical processes which may have been operative at an early stage, and have led to the introduction of "life," is not particularly illuminating; it is strange that he does not appear to have had his attention directed to the importance of enzymic phenomena in this connection. He regards

"vital polygenesis" as conceivable—*i.e.*, the independent origin of life at various centres.

He was a photographer in early days and his book on "The Chemistry of Photography" is full of interest, dealing as it does with the principles underlying the art.

His big book in "The Chemical Synthesis of Vital Products," published in 1904, was a disappointment—just a dull, dry dictionary, the introductory chapter alone being of interest. Instead of dealing with the substances that are met with in animals and plants with reference to their occurrence and function, unfortunately he wasted his energies in giving a complete account of the methods by which such substances could be prepared.

He contributed a readable "Introduction to Chemistry" to the Home University Series; also a semi-popular account of "Coal Tar and its Uses" to the series published by the S.P.C.K.

His technical addresses to the societies of which he was President—the Chemical Society, the Dyers and Colourists and the Society of Chemical Industry*—are all noteworthy literary productions. His first address to the Chemical Society had reference to the "Living Organism as a Chemical Agency" and is a scholarly epitome of the work done in the borderlands of chemistry and biology; but, like the later essay on Evolution, this is marred by repetition of too many of the vague generalities of biological speculation and lacks depth of technical feeling.

His second address dealt with the position and prospects of research, a topic which also figures in several of his other addresses. It is specially noteworthy on account of his outspoken criticism of the modern Polytechnics.

Meldola did his best for the cause of science but I fear he failed to produce much effect upon industry. He preached, as we have all done, too much to the converted—not nearly enough to the uninstructed public. It is clear that we have to go out into the highways and byways if we are to produce any effect. Probably, too, his main outlook was upon Nature and his style too refined. I venture to point out these things, being of opinion that it will advantage the younger chemists to study the writings of such a man and to extract from them the lessons they convey; they will certainly gain encouragement and lessons in grace of style.

Meldola has distinctly won the right to be canonised as an advocate of the need of applying scientific method in all our affairs. In the not distant future, when schools are reformed and made of worth, it will perhaps be enacted that a third lesson, selected from the works of lay saints, be read in school chapel every Sunday. Chapters from Saint Huxley and Saint Meldola will be amongst those declaimed with advantage.

If I should eventually be included among such men of wrath, I can imagine what delectable reading some of my essays on the constant encouragement given to science in schools by our schoolmasters will afford, though perhaps it is more likely that I may be regarded as a sort of scientific Boccaccio and that my pages will be turned over by boys only stealthily. Meldola will ever be regarded as orthodox.

HENRY E. ARMSTRONG.

* In addition to being President of these Societies, Professor Meldola served as President of the Institute of Chemistry from 1912-1915.—EDITOR.

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

ANNUAL ADDRESS OF THE RETIRING PRESIDENT.

(Delivered at the Annual General Meeting, February 2, 1916.)

ONCE again it is my lot to review the activities of our Society during a period of such intense and universal stress and strain as finds no parallel in the world's history. Since my last Annual Address was delivered, the deadly struggle has continued without intermission, and if that struggle has brought untold suffering and misery to millions of our fellow-beings, there is, happily, some good to be placed to the other side of the terrible account.

As a nation we have in the past shown a neglect of Science which has very nearly been our undoing, and although from time to time grave warnings have been uttered and powerful appeals have been made, these have for the most part fallen upon deaf ears. Now, as a result of the inflexible logic of events, the nation is beginning to realise the error of its ways, and never again can Chemistry and the other experimental sciences consent to be relegated to the humble position they have so long occupied in the national esteem.

For the successful prosecution of the war, and still more for the general development and industrial protection of the country during the very difficult period which must follow the cessation of hostilities, all our best scientific brains will be needed, and all the energy and scientific organisation of which we are capable.

Among the many lessons which we are learning as the result of the war, not the least important is the fact that Experimental Science in general, and Chemistry in particular, is not merely an interesting intellectual occupation, but one of the foundation-stones on which national progress rests, and that its continued neglect could only lead to disaster, and end in our complete defeat by more progressive and far-seeing nations.

The ignorance of the value of scientific knowledge shown by our people is very great, and, unfortunately, many of our rulers are little, if at all, better informed. As a consequence, much inertia still remains to be overcome, and a great deal of leeway has to be made up. Happily, signs are not wanting that we are at last directing our footsteps on the right path, and those of us who know, and who have the real interests of their country truly at heart, will earnestly pray that our progress along that path may be certain and rapid.

Whilst, fortunately, I have not to refer to any casualties among those of our members who are on active service, it is, unhappily, my duty to have to record the death of four of our members: Professor Raphael Meldola, Sir Arthur Herbert Church, Mr. Joseph Bemrose, and Dr. Edward Cox Seaton.

Of Professor Meldola, who died on November 16, it is scarcely necessary for me to say more than that our Society has lost one of its most valued honorary

members. As a teacher, as an investigator, and as a most earnest and consistent exponent of the importance to the nation of a proper appreciation of the value of Chemical Science, Meldola's name will always be held in the highest honour wherever Science is practised and esteemed. A man of the widest scientific attainments, and with a fund of hard common sense and a practical outlook such as are not always associated with the possession of such talents, Meldola was a man who could very ill be spared by the nation at the present moment. As your representative, I paid to his memory the last tribute of our respect and esteem.

Sir Arthur Church, who passed away on May 31, in the fulness of years, was one of the oldest members of the Society, and an obituary notice dealing with his many-sided scientific activities has been contributed to a recent number of the *ANALYST* by Dr. Bernard Dyer.

Mr. Bemrose died during 1914, but his death was not brought to the notice of the Secretaries until too late to be referred to in my last Presidential Address. Mr. Bemrose, who died in Montreal in his seventieth year, received his chemical education at the School of Pharmacy of the Pharmaceutical Society, and was the senior Bell Scholar in 1867. Since 1878 he has resided in Canada, where he filled several professional positions, finally engaging in independent practice in Montreal as an analytical and consulting chemist.

Dr. Seaton, who died in London on February 13, was well known to many of our older members, and was at one time a tolerably frequent attendant at our meetings. Although his activities were manifested chiefly in the medical direction, he took a keen and intelligent interest in chemical matters, and his loss will be very genuinely felt by many of us.

In addition to the above deaths, we have lost 7 members by resignation. On the other hand, we have elected 26 new members, and our present membership therefore stands at 455 (including 15 honorary members), as compared with 440 at the end of 1914. Having regard to the abnormal conditions of existence during the past year, this may be considered fairly satisfactory; and in view of the remarks which I felt called upon to make in my last address, it is particularly gratifying that a number of our professorial colleagues should have shown their appreciation of our work and their interest in our proceedings by becoming members. I may, perhaps, be permitted to express the hope that others will follow their example.

We are, I think, entitled to congratulate ourselves on the fact that during the past session twenty-three papers have been read at our meetings, and thirty-two original communications have been published in the *ANALYST*. These have maintained the practical character and general high level to which we are accustomed, and I think you will agree that our thanks are specially due to those of our members who, under conditions very unfavourable to the prosecution of scientific investigation, have helped to keep our flag flying.

Our Editor, Mr. Julian L. Baker, has certainly not found his task any easier during the past twelve months than during the preceding period, and it is only fitting that some statement should be made from this Chair in recognition of the success which has attended his efforts. It is due in no small degree to his well-recognised ability and energy that, notwithstanding the dearth of scientific papers suitable for

abstraction, we have published no fewer than 389 abstracts of papers appearing in foreign journals, and that the ANALYST has not fallen far short of its normal dimensions. So far as the abstracts are concerned, this is chiefly due to the great activity manifested by American chemists during the past year, the American chemical journals having constituted our chief source of supply.

In my last address I mentioned that the Council had approved the suggestion of the Editorial Committee to publish from time to time critical reviews of the progress made during recent years in various branches of analytical chemistry, such reviews to be written by members of the Society who had specialised in their respective subjects, and during the past year three of these have appeared in the pages of the ANALYST.

Mr. J. F. Briggs has dealt with recent progress in the Analysis of Cellulose and Cellulose Derivatives; Dr. Schidrowitz with recent advances in the Analysis and Evaluation of Rubber and Rubber Goods; and Messrs. E. R. Bolton and Cecil Revis with recent advances relating to the Composition and Analysis of Edible Fats and Oils.

These reviews, which have been reprinted, and may be purchased separately, are, if I may be permitted to say so, entirely admirable, and are likely to be so valuable to our members that it is to be hoped that the appearance of similar articles will become a permanent feature of our Journal.

Before passing on from questions relating to the Journal of which we are so justly proud, there is one other feature on which I should like to add a few words. I refer to the reviews of current chemical literature by men of acknowledged authority which regularly appear in our pages, and of which we have published twenty-eight during the past year. These reviews, sometimes refreshingly unconventional, always highly critical, and never undeservedly complimentary, have won for themselves a high and almost unique position in the domain of scientific literary criticism.

Notwithstanding the depletion of laboratory staffs, and the very numerous and exceptional claims being made upon the time of the majority of our members, it is a source of considerable gratification to me to be able to announce that the anxiety which some of us may have felt at the commencement of the year has not been justified, and that the investigation scheme is very far from being in a state of suspended animation.

I am informed by our Secretaries that six subjects are now actually in process of investigation, and that there is a probability that others will be allotted in the near future. Members of the Society will recall that during the past year a more than usually interesting communication under this scheme by Mr. A. G. Levy, dealing with the "Estimation of Niobium in the Presence of Tantalum, and some Reactions of Tantalum Compounds," was read at one of our meetings; and it may not be out of place to refer here to the fact that the degree of Doctor of Science has been conferred upon one of our members, Lieutenant Alexander Gemmell, as a result of an original investigation carried out under the provisions of the scheme.

I would again express the hope that our members will do all that they can to

support this scheme, both by making suggestions to our Secretaries in regard to subjects needing investigation, and also, when possible, by offers of actual work.

I think you will agree with me that the statement which has been placed before you by our Hon. Treasurer is, under all the circumstances, a very satisfactory one. Notwithstanding the somewhat gloomy anticipations with which we entered on the past year, our balance-sheet shows a very substantial balance on the right side. This is due largely to a very gratifying increase in the sales of the ANALYST to outside subscribers; but I need scarcely add that it is due in no small measure to the admirable manner in which our Hon. Treasurer, Mr. Hinks, has performed the duties of his important office. Whilst he has very prudently insisted that we should practise all reasonable economies, we have, fortunately, not found it necessary to retrench in connection with our expenditure on the ANALYST. It is true that our Journal has this year cost us less than during the preceding year, but this is due, not to any intentional effort to save, but to the fact that we have been compelled, owing to a dearth of original material, to publish a smaller number of abstracts than usual. Owing to the removal of minimum prices, our investments have depreciated to the extent of about 4 per cent., but we have, fortunately, been able to take a small part in the Government War Loan.

Before passing from the question of the Society's financial position, I would refer to the Decennial Index, which it is expected will be issued in the course of a month or two—a feat of no mean order when it is recalled that this will include the indexing of the ANALYST to the end of 1915. To busy men, the possession of such a collective index is a matter not merely of convenience, but of absolute necessity, and to such it is not necessary for me to address myself. There may, however, be other members who are undecided as to whether the index is likely to be useful to them, and to these I would urgently appeal to purchase a copy, and so help to reduce the net loss to the Society, for I need scarcely remind you that its preparation has necessarily made a considerable draft on our funds.

As might have been expected, the matters which have engaged the attention of the Council during the past year have been chiefly connected, either directly or indirectly, with the war, and the ordinary professional and domestic affairs of peace times have called for but little consideration. To one of these I may, however, refer, as it involved a question of principle on which, as professional men, we have always held very strong views. At the beginning of last year the Board of Agriculture and Fisheries issued a notice (No. 5) containing instructions for taking samples for analysis in cases of the suspected pollution of water. Whilst the circular in question had reference chiefly to samples submitted on behalf of Boards of Conservators or for Local Fisheries Committees under the Sea Fisheries Acts, one paragraph provided that, when samples were sent by persons other than those above mentioned, a fee amounting to approximately two guineas would be charged for the examination.

It appeared to your Council that, in offering to undertake paid work of this kind for private individuals, the Board were taking a step which directly affected the interests of professional chemists. As we were informed that the Institute of Chemistry were about to take some action in this matter, our Secretaries were

instructed to write to the Registrar of the Institute expressing our desire to be associated with the Institute in such action.

After some correspondence of a preliminary character, the Board expressed their willingness to receive representatives of the Institute and of the Society to hear their views and to discuss the question. On April 15 the deputation, consisting of Mr. Edward Bevan, Mr. E. W. Voelcker, Mr. W. J. A. Butterfield, and Mr. Pilcher, representing the Institute of Chemistry, and myself and Mr. Ellis Richards representing the Society, was received by Mr. Henry G. Maurice, Assistant Secretary of the Fisheries Division.

In stating their views, the members of the Deputation pointed out that the offending paragraph appeared to them to constitute an offer on behalf of the Board to undertake professional work for the public, and, as such, was viewed with some concern by chemical practitioners. It was pointed out that the work was already being efficiently performed by practising chemists, and that it was neither necessary nor desirable to attract such work to the Board or elsewhere. Professional competition on the part of a Government Department was unfair, partly because it was subsidised, and partly because the reports would bear the imprimatur of an official Department, and would therefore carry more weight with the general public than those of a private practitioner, however competent and eminent he might be.

Further, it was pointed out that the Board could send out circulars offering their services—a proceeding forbidden to private practitioners—and that the fixing of a fee was tantamount to prescribing a charge for professional work which would be binding on analysts—a matter on which they were obviously entitled to decide for themselves.

Finally, the fear was expressed that this action of the Board might constitute a dangerous precedent, and one which might be followed by other Departments in connection with other branches of chemical work, to the great detriment of members of our profession.

Mr. Maurice, who received the Deputation with the greatest courtesy, assured them that professional chemists had no reason to fear the notice in question, and that the object of the paragraph to which exception had been taken was to dissuade private persons from making frivolous inquiries, and not to attract analytical practice. He promised to lay the views of the Deputation before the Board, and a little later a letter was received from the Board saying that they would consider the question of modifying or deleting the paragraph in question when a reprint of the circular was required.

Quite recently a letter was addressed to your Council by the Local Government Board in reference to the wording of certificates given under the Sale of Food and Drugs Acts in the case of milk samples. This letter was accompanied by copies of several certificates which had, it was stated, been given by certain Public Analysts, and which were clearly not in accordance with the wording of the Milk Regulations of the Board of Agriculture or with the intentions of those who framed those Regulations. The Society was asked to assist the Board in this matter by drawing up for its consideration forms suitable for the various kinds of deficiency or adulteration met with in milk samples. Such forms have been prepared by a Committee

appointed for the purpose, and will in due course be submitted to the Council for their approval.

When addressing you last year, I referred to the fact that it had been decided to hold a joint meeting of this Society and of the Biochemical Society for the purpose of discussing some subject of common interest. That meeting took place in May, and the subject for discussion was "Methods adopted in the Estimation of Nitrogenous Constituents of Extracts derived from Albuminous Substances, such as Meat Extracts and Similar Products, with Special Reference to the Interpretation of the Results." As to the importance of the subject there could not be two views, and, so far as I was able to judge, there was a very general consensus of opinion that the meeting had been very successful and had fully justified itself.

The system of water-tight compartments in which we are compelled to work to-day is perhaps productive of professional efficiency of a kind, but it is undoubtedly conducive to a state of mental polarisation and to a narrowness of outlook which constitute a serious hindrance to scientific progress. An incursion into another scientific domain than that in which one's life-work is cast is like a voyage to a foreign country. It broadens our views, develops tolerance of the right sort, and enables us to see many familiar objects in a new and illuminating aspect. In a word, it is a great help to our education, and I very much hope that further joint meetings with our colleagues in allied branches of science will be arranged as the opportunity occurs.

Turning now for a brief space to matters arising out of the war, it will be recalled that I referred in my last address to the appointment of two special Committees, the one to deal with the supply of pure chemicals suitable for analytical purposes, and the other to take such steps as might be necessary for the production of glassware, porcelain, and filter-paper for laboratory purposes.

During the past twelve months great progress has been made in connection with both of these important inquiries. In the production of pure chemicals some of our best-known manufacturing firms have been very active, and at the present moment it is possible to purchase the majority, if not all, of the reagents we require of a degree of purity quite as high as that of the imported chemicals on which most of us had, unfortunately, become so dependent.

The symbol "A.R." (signifying analytical reagents) has been adopted to indicate those chemicals which conform to the standards of purity laid down by the Joint Committee of this Society and of the Institute of Chemistry, and I hope that my colleagues will not think me guilty of presumption if I venture most earnestly to impress on them the importance of supporting those manufacturers who had the energy and the patriotism to step into the breach at a time when labour difficulties were very great, and when there were so many other demands being made on their time. Without such support, there will be a tendency to revert to our old condition of dependence on other nations for products which it is well within our power to produce ourselves. So long as chemicals of the required degree of purity can be made in this country, it is, in my view, an essentially unpatriotic action to buy the imported product, even if it should come from a neutral country and have some advantage in the matter of price; and, in any case, it must not be overlooked that

the actual source of origin of an imported product is not always easy to determine.

Thanks largely to the earnest and unremitting labours of the Institute of Chemistry Glass Research Committee, and to the public spirit displayed by some of our leading manufacturers, the problem of a supply of laboratory glassware, porcelain, and filter-paper is within measurable distance of solution. Many of our members will recall the fine exhibitions of glass and porcelain apparatus and of filter-paper which have recently been given in this room, and we must surely agree that a great debt of gratitude is owing to all those who have made such exhibitions possible, and give expression to that gratitude by resolving never again to purchase foreign-made apparatus, no matter whence obtained, if the British article is in any way to be got.

It will be remembered that in March last the President and Council of the Royal Society presented to the Prime Minister a very important memorial dealing with the position of certain chemical industries in this country as a result of the war. The memorialists attributed the unsatisfactory state of affairs to (1) failure to realise that modern industry, to be successful, must be based on scientific research, and (2) the want of more intimate association between the manufacturers and the workers in science.

They urged the creation of some permanent central national organisation, and suggested that the then recently-appointed Advisory Committee of the Board of Trade might form its nucleus. It was arranged that the President of the Board of Trade should receive a joint deputation from the Royal Society and the Chemical Society, with representatives of the Institute of Chemistry, the Society of Chemical Industry, and this Society. This interview, at which I was present as your representative, took place on May 6 at the offices of the Board of Trade, and the results were satisfactory—so far as they went. Mr. Runciman expressed his full appreciation of the extent to which national industrial progress is dependent upon the utilisation of the services of men of science, and agreed with the views expressed as to the need of close co-operation between manufacturers and scientific workers and teachers.

A few days later Mr. Pease, then President of the Board of Education, announced in the House of Commons that the Government would appoint an Advisory Council, and in due course the particulars of the Government scheme for the organisation and development of scientific and industrial research were given to the world.

Into all the details of this scheme, which are easily accessible in the Government publication, it is not necessary for me to enter. Suffice it to say that its success will depend in no small degree upon the attitude taken towards it by the manufacturers of this country. It is, however, based on a sufficiently broad foundation, and all who know the secret of the enormous progress made by German chemical industries during the past few decades will wish it the fullest possible measure of success. It is much to be hoped that the Government will not indulge their inveterate habit of secrecy in connection with this scheme, but may find it possible from time to time to report progress. In that way alone can any real vital interest in it be engendered and sustained.

Before leaving this subject I ought to refer to a certain development of special

interest to this Society. It will be remembered that the Government scheme provides for the establishment of (1) a Committee of the Privy Council responsible for the expenditure of any new moneys provided by Parliament for scientific and industrial research, and (2) a small Advisory Council responsible to the Committee of Council, and composed mainly of eminent scientific men and men actually engaged in industries dependent upon scientific research.

Early in November last, our Secretaries received a communication from the Assistant Secretary of the Advisory Council intimating that the Council would be glad to be supplied with information in regard to the activities of the Society, and particularly in reference to the Society's analytical investigation scheme.

It was also stated that the Chairman of the Advisory Council hoped at a later date to have the opportunity of meeting the President of the Society and other members particularly interested in the question of research. An interview was accordingly arranged, and on November 30 Mr. E. W. Voelcker, our two Secretaries, our Treasurer, and I had an interview with Sir William M'Cormick, the Administrative Chairman of the Council, and Dr. Heath, representing the Board of Education. Full particulars were supplied to Sir William M'Cormick and to Dr. Heath in regard to the work which had been accomplished by the Society in the past, the general scope of its activities, and the general nature of the analytical chemistry investigation scheme. Special stress was laid upon the essentially practical character of the investigations undertaken under this scheme, and on the bearing of such investigations on industrial and commercial problems. At the conclusion of the interview Sir William M'Cormick expressed his appreciation of the work which the Society had done and was doing, and intimated that the institution of Research Scholarships and Fellowships was one of the functions of the Advisory Council, and that though there were evident difficulties in establishing a scheme during the war, he had little doubt that analytical chemistry would figure amongst other branches of scientific and industrial research which the scheme would embrace.

Should the foundation of these Scholarships in analytical chemistry materialise, as seems very probable, I think you will agree with me that it will constitute not only a much needed encouragement to the study of a highly important branch of applied chemistry, but also a most welcome recognition on the part of the Government of the value to the community of the department of science which we represent.

This country has often been referred to as a nation of shopkeepers: at the present moment it might much more truthfully be described as a nation of committees. Whilst the committee as an institution has often been the subject of much adverse criticism and a favourite target for the shafts of the professional humorist, it is obviously a very necessary device for the forwarding of the national business at a time like the present.

To one or two of these numerous committees I wish briefly to refer. On July 1 last a circular letter, bearing the signature of Dr. Alexander Scott as President, was sent to all the members of the Chemical Society, inviting their active co-operation, and asking them to inform the Council in what way they would be prepared individually to assist in chemical service connected with the war.

The Council of the Chemical Society, in pursuance of the assurance given to

the President of the Board of Trade on the occasion of the deputation to which I have already referred, had constituted itself a consultative body with the object of assisting the nation by endeavouring to organise and utilise the chemical talent of the country. In order to accomplish this, the Council decided to form a number of special committees to deal with and advise upon the suggestions and inventions submitted to it. The kindred societies involved in this scheme were the Royal Agricultural Society, the Biochemical Society, the Society of Chemical Industry, the Society of Dyers and Colourists, the Faraday Society, the Institute of Chemistry, the Institute of Metals, the Institute of Mining and Metallurgy, the Pharmaceutical Society, the Physical Society, and the Society of Public Analysts and other Analytical Chemists. In July we received a letter asking us to nominate six representatives to collaborate with the two representatives of the Chemical Society (Dr. T. M. Lowry and Mr. William Macnab) as a special committee formed for the purpose of advising the Council with regard to problems dealing with the examination and analysis of chemical materials. Your Council felt that it was desirable that our representatives should be resident in London, and it was decided to nominate Messrs. E. J. Bevan, Bertram Blount, Bernard Dyer, Otto Hehner, E. W. Voelcker, and myself, Mr. Hehner undertaking to act as secretary.

The Council of the Chemical Society also decided to form a general committee representative of chemical opinion, whose function it would be to deal with matters of general policy, and invited us to nominate two members to serve on this committee. It was suggested to us that the President and a Past President would most probably represent correctly the views of the Society, and Mr. Voelcker and I were accordingly nominated.

To what extent these committees will assist in promoting the great forward movement which, as chemists, we have so much at heart remains to be seen. That they constitute a serious and much needed endeavour in the direction of co-ordination and organisation is clear, and we must all earnestly hope that they will be kept busy with matters of national importance. No one at a time like this wishes to be a member of a body which is not doing active work in one direction or another for the national good.

I must now pass on to a matter which has very closely concerned many of our members during the past year. I refer to the recruiting of chemists for active military service. One of the penalties which a country has to pay for unpreparedness for war—a penalty which is greatly increased by adherence to the voluntary system—is an immense waste both of human material and of treasure. Men who, by their training and experience, are absolutely necessary in their civil occupations for the welfare of the country—both in war and in peace—offer themselves, and are accepted for military work which could in many cases be at least equally well performed by men who could be more readily spared.

At the outbreak of war, the authorities were seemingly unaware of the vast and multifarious services rendered to the State by professional chemists, and of the extent to which the welfare of the nation depended upon the adequate utilisation of their services. As a result, many hundreds of highly-trained chemists were to a great extent wasted by being put to military duties which could easily have been per-

formed by men whose normal activities were of no special value to a nation at war.

This state of affairs lasted until a few months ago, when the authorities apparently began to appreciate the facts of the situation, and the Board of Trade issued a circular of instructions to local tribunals under Lord Derby's Scheme, together with a "list of occupations (reserved occupations) of cardinal importance for the maintenance of some other branches of trade and industry."

In this list the following paragraph appeared: "Analytical Chemists, Chemical Trades, Lubricating Oils and other Lubricants (Manufacture of), Wholesale Manufacturing Druggists." A few weeks later, in response to an inquiry from the Registrar of the Institute of Chemistry, the Local Government Board amplified this somewhat cryptic announcement by the statement that the Board understood that "Analytical Chemists" in that list included Public Analysts and their assistants. Since then the educational ferment, stimulated by the stern events of the war, appears to have been working with increased energy, and the Board of Trade has issued a further schedule of "reserved occupations," in which occurs the following important paragraph: "Chemists: Analytical, Consulting Research Chemists (not to be accepted for immediate enlistment or called up for service with the Colours without the consent of the Royal Society); Chemical Laboratories: Head Laboratory Attendants."

It will have been noticed that chemists are not only not to be enlisted, but are not allowed to enlist without the express permission of a recognised body, the only other persons in the schedule who are treated similarly being "licensed pilots, officers, and crews of vessels belonging to the General Lighthouse Authorities, and lighthouse-keepers"—that is to say, men whose services are absolutely essential for the public safety.

I may be wrong; I may be too optimistic; but I cannot help regarding the above paragraph and all that it implies as constituting a very gratifying, if tardy, recognition by Government authorities of the supreme national importance of chemical science.

This is one of the signs of public recognition to which I referred at the commencement of my remarks, and there are indications that others will be forthcoming. It only remains in this connection to say that the President of the Royal Society has appointed a committee to assist the Royal Society in connection with matters relating to recruiting, and that, as President of this Society, I have been invited to serve on that body.

I would now claim your indulgence to refer quite briefly to a matter cognate with that with which I dealt in my address last year. In that address I pointed out the claims of analytical chemistry—whether regarded as an educational instrument, as a special branch of applied chemistry, or as a subject of practical utility—and advocated as strongly as I could the establishment of chairs of analytical chemistry in our Universities and colleges.

During the past twelve months I have given the matter much thought, and have seen no reason to modify any of the views to which I then gave expression. Of the importance of analytical chemistry as a part of the chemical curriculum I am more

convinced than ever, and I am equally convinced that it cannot be taught to the best advantage under existing conditions.

For the development of the reasoning faculties, for the inculcation of a thorough appreciation of the nature and limitations of chemical reactions, and as affording unexampled opportunities for acquiring dexterity in improvising and manipulating scientific apparatus, I know of no branch of chemistry which can compare with chemical analysis—that is, if taught as a living science by one who is a master of his subject, and not as a series of tedious prescriptions, abbreviated and condensed into wearisome and soul-killing “tables.”

We are sometimes apt to forget that in the early days of our science *chemistry* and *analysis* were almost synonymous terms, and that it is only in comparatively recent times that a somewhat sharp division into professorial and professional chemists has occurred, chemical analysis being regarded as the special province of the latter class. This cleavage was no doubt inevitable, but I cannot help feeling very strongly that much real good would result from the closer intercourse between professorial chemists and their professional colleagues, as well as from the improved teaching of analytical chemistry in our Universities and colleges. Surely it is time that our petty differences and prejudices should disappear, and that the whole chemical profession should attack with an undivided front the innumerable problems which are not only awaiting, but are urgently demanding solution.

In my previous address I ventured to express the opinion that if special chairs of analytical chemistry were founded, their occupants might serve the very useful purpose of forming a much-needed link between the members of the chemical staff and chemical practitioners, one great advantage of this being that the Universities would be able to draw upon the vast accumulation of practical knowledge and experience which practising chemists have acquired in the course of their professional work.

During the past eighteen months the columns of the technical and of the general press have been inundated with letters and with articles bewailing the neglect of chemical science in this country, and deploring the want of appreciation of the services of chemists so often shown by manufacturers.

That we have shamefully neglected the claims of science is a fact of which many of us have been painfully aware for a good many years, and one which through the stern teaching of the war is gradually being brought home to the bulk of the nation. This, however, is a matter which is intimately bound up with our whole system of education, and until that system has been thoroughly reformed it is hopeless to expect that chemistry and the other experimental sciences will take their proper position.

The other subject of complaint—namely, the low esteem in which chemistry is held by some of our manufacturers—is one which touches us more directly, and for which there is, unhappily, a good deal of foundation. If we seek to ascertain the causes of this unfortunate state of affairs, we shall find, I think, that they are connected quite as much with failings and deficiencies on the part of many of our young chemists as with conservatism and want of enterprise on the part of the manufacturers.

The situation, it seems to me, arises from a series of misunderstandings, and constitutes a very good example of the casual and haphazard manner in which in this country we are apt to manage so much of our national business, particularly when scientific matters are in question.

In the first place, academic chemistry has for so long been divorced from the living chemistry of the factory that our chemical teachers are in many cases unacquainted with the nature of the problems with which their students will have to wrestle, and do not appreciate the real requirements of the manufacturers who apply to them for help.

In the next place, the students themselves, brought up in the rarefied atmospheres of some of our modern laboratories, and imperfectly trained in chemical handicraft and in analytical procedure, are often of very little use when introduced into the technical or works laboratory.

In the third place, the manufacturer himself does not always understand what he requires, and is often unintentionally misled by the teacher to whom he applies.

As a result of all these misconceptions, the square peg is inserted into the round hole, with the inevitable result. The young chemist feels that he is not properly understood, and that he is not receiving the treatment to which he considers himself entitled, whilst the manufacturer realises that he is deriving little or no advantage from the chemical assistance from which he had anticipated such great things. As a consequence, there is mutual disappointment, and we are told on the one side that chemistry is no good, and on the other that the British manufacturer is a soulless person, who is unable to appreciate the great advantages of chemical science. It is easier to diagnose the complaint than to prescribe the remedy, particularly as in this case the disease is of a complicated character.

At the present moment, many of our chemical teachers are developing rapidly under war pressure into chemical technologists, and there can be no doubt that their incursions into the realms of chemical industry will be productive later on of the happiest consequences to their students. It is to be hoped that this experience will result in the introduction of a deeper note of reality into chemical teaching, and that it will do something to remove the not undeserved reproach that a good many of the men who leave our colleges may be highly ornamental University graduates, but are certainly not to be described as chemists, using that word in its fullest and best sense.

So far as our colleges are concerned, I feel very strongly that a more thorough training in analytical chemistry is desirable, and I would, in addition, venture to suggest that the present curriculum of those chemical students who intend to become professional chemists should, whenever possible, be amplified so as to include a further year of study.

During this post-graduate year, the student should be trained by thoroughly competent and specially-selected teachers under conditions approximating more to those of the technical than to those of the academic laboratory.

During his academic course of practical work the student is very properly taught that accuracy is the first consideration, and the factor time, which is so important in the works laboratory, scarcely enters into his calculations. Again, he

has been taught to work on a small scale, has little or no knowledge of the disturbing influence of mass, and has never learned to think in terms of large scale operations. He has not, moreover, acquired even the most elementary knowledge of engineering, and does not know how to construct or to interpret even the simplest drawings of plant.

During this additional year of study I am far from suggesting that the student should attempt to familiarise himself with any one special branch of applied chemistry; but I feel convinced that, under the working conditions I have in mind, he would acquire a new mental attitude and a new way of looking at chemical problems which would do much to bridge over the gap which exists at present between his academic studies and his work in the factory. Even with this additional knowledge the young chemist must, if disappointment is to be avoided, realise that he has much to learn, and that a good deal of his further technical training will have to be done at the expense of his employer.

Whilst words fail to express the indignation which one sometimes feels at the miserable wages (the word "salary" would be out of place) offered to men who have devoted several years and a not inconsiderable sum of money to their training, yet, on the other hand, the young chemist seeking a position should remember that his future lies very largely in his own hands. The chemical manufacturer is not a philanthropist, neither is he a fool. Whilst he is obviously disinclined to pay a big salary or to make a binding agreement until he knows something of the capabilities of the man he is engaging, he will be equally anxious not to lose that man's services should he prove himself thoroughly capable and useful.

Again, the manufacturer on his side must understand that in engaging the services of a young chemist from one of our Universities he is getting the partly-manufactured material, and not the finished product. He should be told that his future employee is merely a well-trained apprentice who knows how to use the tools of his craft, but who will have to be given time in which to find his feet and to learn something of the new conditions under which he will have to work. It is here that our University Professors can do much to prevent misunderstanding and disappointment by pointing out to manufacturers the limitations of the men whom they may be recommending.

A good many manufacturers (I am not, of course, referring to the heads of large concerns where many chemists are employed, and where their functions are thoroughly well understood and appreciated) do not always know very clearly what they want. They have a vague idea that some sort of chemical assistance is necessary in a modern factory, and they consequently go to one of our colleges and state that they want "a chemist." As one of the objects of our colleges is very properly to find employment for the men they have trained, he is offered the services of a man who has perhaps just finished his chemical course, but who knows little or nothing of the nature of industrial chemistry or the requirements of the factory. He has done his work industriously and well, and perhaps with distinction, and his Professor is obviously justified on general grounds in recommending him highly.

It is at this point, however, that the trouble to which I have alluded commences for the young man in question is offered to the manufacturer labelled "chemist"

without any qualification at all. As a very general rule no intimation is given to the manufacturer that his prospective employee is little more than a senior student, and, in the absence of any statement to the contrary, there is some justification for regarding him as thoroughly competent not only to carry out the routine work of the factory, but also to undertake industrial research, to cheapen production, and to effect improvements in the manufacturing processes concerned. At the end of the year, in many cases, nothing very definite had resulted, no additional profit had been made, and there is no obvious improvement in the factory working, and the manufacturer is very apt to give emphatic expression to his disappointment, and to inveigh against science in general and chemistry in particular.

I need scarcely say that I do not overlook the very numerous cases in which young chemists fresh from our college laboratories have entered factories, and have most thoroughly justified themselves in every possible way, nor do I desire to exaggerate in the slightest degree the extent of the difficulty to which I have referred. I have merely called attention to a state of affairs which does, unhappily, exist, and which, owing to its unfortunate consequences, is one for which the chemical profession should urgently seek a remedy.

I wish it to be understood, moreover, that my remarks apply especially to the general works chemists, to whom is entrusted the testing of the raw materials and finished products, and the exercise of a general scientific supervision. With the more important question of industrial chemical research it is quite impossible to deal within the limits—which, I fear, have already been overstepped—of an Annual Address. I would only say that chemists competent to initiate and to carry through to a successful issue the kind of investigations which are of importance to manufacturers are, comparatively speaking, few in number, and that the chemical investigator, like the poet, must be born. He may be shaped, but he certainly cannot be made, and it would save not a little disappointment if it were recognised more generally on the industrial side that men possessing all the special qualities of intellect and of character which go to make a successful chemical investigator are not very frequently combined in any one man, and that the chances of obtaining the services of such a man in a more or less haphazard way, and at a salary which would be rejected with scorn by many an artisan, are not very great.

Summarising the points on which I have briefly touched in this address, I would appeal for—

1. Greater sympathy, freer intercourse, and closer co-operation between the two great branches of the chemical profession—the teachers and the practitioners.
2. The establishment of Chairs of Analytical Chemistry in our Universities and Colleges as a practical step towards securing the more adequate treatment of that important branch of our science.
3. The more general provision in our Universities and Colleges of post-graduate facilities for acquiring a good general knowledge of certain subjects which form an indispensable part of the professional equipment of every technical chemist.

I have now to turn for a few moments to a personal matter. It is with the deepest regret that I close this evening my official connection with this Society, a Society for which I have always entertained a feeling akin to affection, and to which I have at all times given the best I had to give. I may perhaps remind you that that connection has lasted over seventeen years—fifteen years as one of your Secretaries and two years as your President—and I can truthfully say that during the whole of that time I have experienced nothing but kindness and consideration from every member of the Society with whom I have come into contact.

No one can realise more fully than I do myself the extent to which my achievements have fallen short of my hopes and my anticipations, but you have always been generous in your appreciation of my endeavours, and for all this, as well as for numerous personal acts of kindness, I desire to express to you my warmest gratitude. During my occupancy of this chair I have always had the loyal support of all my colleagues on the Council, and I am particularly grateful for the ready assistance rendered to me at all times by our Secretaries and Treasurer. On their shoulders the bulk of the hard work necessarily falls, and to their unfailing energy and ability are due in no small degree the smoothness and success which have happily characterised the working of the Society.

In handing over the reins of office to my friend Mr. Embrey—an old and very distinguished member of the Society—I have the great satisfaction of feeling thoroughly assured that under his guidance the affairs of the Society will continue to flourish, that its valuable work will be carried on with undiminished vigour, and that its prestige will be fully maintained. I can express for him no better wish than that he may find his term of office a source of as great happiness and satisfaction as mine has been to me.



ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

FOOD AND DRUGS ANALYSIS.

Sensitive Colour Reaction for Atropine, Hyoscyamine, and Scopolamine.
R. Wasicky. (*Zeitsch. anal. Chem.*, 1915, **54**, 393-395.)—The reagent used is prepared by dissolving 2 grms. of *p*-dimethylaminobenzaldehyde in 8 grms. of concentrated sulphuric acid, and then adding 0.4 grm. of water. When a trace of either atropine, hyoscyamine, or scopolamine, is heated with a drop of the reagent, an intense red coloration develops. On removing the source of heat the colour changes to a more intense cherry-red, and then to violet-red. The reaction is obtained with as little as 0.0002 mgrm. of the alkaloids. Whilst these three alkaloids do not give a coloration with the reagent in the cold, others—morphine and codeine—at once give a red colour; other alkaloids, again, give reactions when warmed with

the reagent, but the colorations obtained are quite distinct from that yielded by atropine, hyoseyamine, and scopolamine.

W. P. S.

Estimation of the Amino-Acids of Feeding-Stuffs by the Van Slyke Method. H. S. Grindley and M. E. Slater. (*J. Amer. Chem. Soc.*, 1915, **37**, 2762-2769.)—Results of estimations of the amino-acids of certain feeding-stuffs (cotton-seed meal, tankage, and alfalfa hay) have been recorded previously (*ANALYST*, 1915, **40**, 399) by the authors. Additional results are now given as follows, the figures being expressed as percentages of the feeding-stuff:

	Blood Meal.	Wheat.	Rolled Wheat.	Barley.	Oats.	White Soya Beans.
Ammonia nitrogen	0.818	0.380	0.276	0.359	0.289	0.578
Humin nitrogen	0.539	0.199	0.147	0.208	0.218	0.378
Arginine nitrogen	1.281	0.173	0.133	0.224	0.251	0.726
Cystine nitrogen	0.096	0.029	0.027	0.030	0.026	0.038
Histidine nitrogen	1.179	0.036	0.052	0.086	0.095	0.329
Lysine nitrogen	1.360	0.055	0.041	0.052	0.077	0.351
Amino-nitrogen in filtrate from bases... ..	7.871	1.029	0.772	1.085	1.136	2.839
Non-amino-nitrogen in filtrate from bases	0.618	0.294	0.227	0.328	0.174	0.488
Total nitrogen	13.772	2.195	1.675	2.372	2.264	5.727

The high results for humin nitrogen are probably due, in part, to the presence of soluble carbohydrates during the hydrolysis of the proteins, and also to the presence of cellulose which mechanically prevents the complete hydrolysis of the proteins. There is thus a source of error in the results obtained by the direct application of the Van Slyke method to the estimation of the free and combined amino-acids and amides of feeding-stuffs.

W. P. S.

Estimation of Shell in Ground Cocoa. R. Wasicky and C. Wimmer. (*Zeitsch. Untersuch. Nahr. Genussm.*, 1915, **30**, 25-27; through *Bull. Agric. Intelligence and Plant Diseases*, 1915, **6**, 1528-1529.)—When examined in ultra-violet light, the powder of the cocoa bean appears violet-blue, while powdered shells have a brownish appearance. In particular the mucilaginous tissue of the shell varies from dull white to yellowish-green, and the author's experiments have shown that the presence of one fragment of such tissues in three prepared samples of the cocoa indicates the addition of 1 per cent. of shell. The samples are prepared by treating 0.01 gm. of the cocoa with 5 c.c. of a mixture of alcohol and glycerol for an hour; then centrifuging the mixture, and replacing the liquid by 1 c.c. of a solution of borax and glycerol. One drop of the thoroughly stirred mixture is then examined under a cover-slip in ultra-violet light by means of a special microscope, and compared with standard samples prepared from decorticated cocoa beans mixed with definite pro-

portions of shell from 1 per cent. upwards. The method is also suitable for estimating minute quantities of ergot in flours. C. A. M.

Molecular Weights of Certain Vegetable Oils. H. J. Backer. (*Chem. Weekblad*, 1915, 12, 1034-1040.)—The molecular weights of typical vegetable oils were calculated from the lowering of the freezing-point observed on dissolving 0.5 gm. of the oil in 15 c.c. of benzene: $M = \frac{185.6}{\text{Depression (0.5)}}$. The following mean results were obtained: Coconut oil, 613; cohune nut oil, 625; arachis oil, 803; castor seed oil, 803; castor seed oil (hydrogenated), 884; linseed oil, 796; maize oil, 796; mustard seed oil, 928; olive oil, 803; palm kernel oil, 644; rape oil, 892; castor oils, 844 and 1031; sesame oil, 800; and soya bean oil, 783. A commercial sample of blown rape oil had the following characters: Sp. gr. at 15° C., 0.958; $[n]_D^{25^\circ \text{C.}}$, 1.4769; iodine value, 65.7; acid value, 3.82; saponification value, 195; and molecular weight, 1355. C. A. M.

Oil of the Wild-Grape Seed (*Vitis Riparia*). G. D. Beal and C. K. Beebe. (*J. Ind. and Eng. Chem.*, 1915, 7, 1054.)—The crushed seeds of the wild-grape, on extraction with light petroleum spirit, yielded 19.38 per cent. of a greenish amber-coloured oil with a peculiar acrid odour and taste like castor oil. The examination showed: Sp. gr. at 15° C., 0.9425; $[n]_D^{15^\circ \text{C.}}$, 1.4781; saponification value, 187.8; iodine value, 76.47; acetyl value, 61.29; insoluble, 90.0 per cent.; neutralisation value of fatty acids, 173.4. Total fatty acids: liquid, 95 per cent.; solid, 5.0 per cent.; iodine value of the acids: liquid, 91.8; solid, 3.12; mean molecular weight, 268.6. The chemical characters of this oil all tend to place it in the group with the other oils of the grape family, and with castor oil, by which the group is headed. J. F. B.

Resins in Hops from Various Geographic Localities. G. A. Russell. (*J. Ind. and Eng. Chem.*, 1915, 7, 1033-1035.)—The soft resins were extracted by maceration and percolation with light petroleum spirit. Drying the extract *in vacuo* did not yield good results, as it showed a continuous loss of weight; concordant results were obtained by allowing the last trace of solvent to evaporate spontaneously, and weighing as soon as this solvent was removed. In a portion of the product the co-extracted wax was estimated by redissolving in light petroleum and precipitating the wax by methyl alcohol. The hard resin was estimated by extracting the previously treated residue from the soft resins with ether in a Soxhlet apparatus for about six hours and drying the evaporated extract in an electrically heated oven for thirty minutes. Results showed that a single sample weighing 10 grms., whether selected at random or selected from perfect cones, does not give a correct indication of the amount of soft resins in a quantity of hops. The average of a number of estimations in samples weighing 10 grms. picked at random gives a true indication, as likewise does one large representative sample of about 1,500 grms. taken for extraction. The methods outlined above give accurate comparable results. The yield of soft resins varies from season to season in the same and different localities, making

necessary the determination of the percentages of soft resins in every bale of hops at the time it is used. The time of storage plays a large part in the variations of percentage of soft resins. The percentage of ash in hops varies in samples from different localities, but remains approximately the same in samples from the same locality from year to year.

J. F. B.

BACTERIOLOGICAL, PHYSIOLOGICAL, ETC.

Amino-Acid Nitrogen of Soil. R. S. Potter and R. S. Snyder. (*J. Ind. and Eng. Chem.*, 1915, 7, 1049-1053.)—By Sørensen's formaldehyde titration method the authors could detect no appreciable amount of amino-acid nitrogen in soils, but the copper method of Kober (*ANALYST*, 1913, 38, 567) is capable of detecting with considerable accuracy 1 part of amino-acid nitrogen in 500,000 of solution, and has been found very suitable for soil work. Even with this method, no amino-acid nitrogen could be found in the dilute acid extract of soils, and on adding small quantities of amino-acid to a soil before extracting with dilute acids, none could be found in the solution. On the other hand, on extracting with dilute alkali practically the whole amount added was recovered. No difference was found in the amount of amino-acid nitrogen extracted by dilute alkali in one, two, four, and six hours. A few soils were analysed for free amino-acid nitrogen, total amino-acid nitrogen, and total peptide nitrogen. The soils contained 0.151 to 0.21 per cent. of total nitrogen; the total amino-acid nitrogen ranged from 7.95 to 23.1 parts per million, the free from 5.45 to 14.7, and the total peptide from 30.9 to 31.5. Pot experiments showed that there is no tendency for the amino-acid to accumulate under the conditions of the experiment—viz., in a limed and unlimed acid soil, in a heavily manured and limed and a heavily manured, unlimed acid soil. Further, the soils with the larger amounts of manure showed a decided decrease in the amount of nitrate nitrogen at first, but a decided increase after four to six weeks.

J. F. B.

Rapid Method of Counting Bacteria in Milk. W. D. Frost. (*Science*, 1915, 42, No. 1077.; through *Bull. Agric. Intelligence and Plant Diseases*, 1915, 6, 1529.)—About 0.1 c.c. of the milk is mixed with standard agar and spread over a definite area on a sterile glass slide, which (as soon as the agar is set) is incubated for six hours under conditions which prevent evaporation. It is then dried, stained, decolorised, and cleared, and the colonies counted under the microscope. The results thus obtained do not show greater variations than those given by standard methods. In the case of recently pasteurised milks a longer incubating period (*e.g.*, eight hours) may be necessary.

C. A. M.

Simple Test for *B. Sporogenes* in Milk and Water. J. Weinziel. (*Science*, 1915, 42, No. 1080; through *Bull. Agric. Intelligence and Plant Diseases*, 1915, 6, 1530.)—The milk is placed in a sterile test-tube with sufficient paraffin wax to form, when melted, a layer of an eighth of an inch. The tube is heated for ten minutes in an oven at 80° C., and then rapidly cooled, so that the paraffin wax solidifies and forms a cover which excludes atmospheric oxygen. It is next incubated for twenty-

four hours at 37° C., and if *B. sporogenes* is present it attacks the lactose and produces a gas which raises the plug of paraffin wax. Commercial samples of milk thus tested gave the following results: In the case of 90 samples of 5 c.c. each there were 28 per cent. positive results; 112 samples of 10 c.c. each gave 37.5 per cent. positive results; while 34 samples of 15 c.c. each gave 50 per cent. positive results. C. A. M.

Improved Respiration Calorimeter for Use in Experiments with Man. C. F. Langworthy and R. D. Milner. (*J. Agric. Research*, 1915, 5, 299-347.)—The apparatus described in this paper is a modification of that originally employed by Atwater and Rosa in 1892; the name "respiration calorimeter" indicates that it performs simultaneously the functions of both a respiration apparatus and a calorimeter. For the determination of gaseous exchange the principle employed is that of a respiration chamber and a system of air-purifying devices connected in series in a closed circuit. The air confined in the circuit is kept in circulation, the respiratory products imparted to it by the subject in the chamber being constantly removed and oxygen constantly supplied to replace that used. For the determination of heat produced in the chamber the device is a constant-temperature, continuous-flow water calorimeter, with walls impermeable to heat and air. The difference between the temperature of the water as it enters and that as it leaves the heat absorber may be easily read at any moment to 0.01°. Some ninety-five thermo-elements of special construction are arranged round the walls of the chamber, which, if equally spaced out, would be one for every 4.5 dm. square of surface; but since the temperature tends to vary more at the top, more elements are placed in the ceiling than lower down. The respiration chamber is 1.96 metres long, 1.96 metres high, and 1.19 metres wide; the total capacity of the empty chamber is 4,570 litres. Specially constructed openings for supply of food are made in the walls, and suitable furniture for the convenience of the subject, who may be occupying it for as long as two or three days at a time. As a check on the whole apparatus, alcohol is burnt in the respiration chamber, and from its known weight is calculated the calories theoretically obtainable. Another check device provides for the conversion of a known amount of electric energy into heat within the chamber by means of a coil of resistance wire. Very full details and descriptions of the numerous special devices employed to secure the very highest degree of accuracy obtainable are given, for which the original paper must be consulted. H. F. E. H.

Modification of Rose's Method for the Estimation of Pepsin. M. H. Givens. (*Amer. J. Pharm.*, 1915, 87, 541.)—Rose's method requires the digestion of 0.25 per cent. solution of pea globulin in 10 per cent. sodium chloride at 37° C. for one hour, or at 50° to 52° C. for fifteen minutes with varying amounts of a previously neutralised gastric juice, usually diluted five times. Although the gastric juice is thus first neutralised, the digestion is made to take place in dilute hydrochloric acid of standard strength, so that, as Rose claims, the conditions are constant in every trial in respect to acidity, volume, protein content, and temperature. The author objects to this preliminary neutralisation of pepsin, since very dilute alkalies will inhibit, if not destroy, the action of pepsin. In order to avoid neutralisation and

consequent destruction of gastric juice, the following procedure is recommended: The gastric contents are strained through cheese cloth, the filtrate is diluted twelve and a half times, and into each of seven small test-tubes is measured 1 c.c. of a 0.25 per cent. solution of filtered pea globulin in 10 per cent. sodium chloride solution. To each tube is added 1 c.c. of 0.6 per cent. hydrochloric acid. The tubes are then allowed to stand about five minutes until the maximum turbidity develops. To the first five tubes distilled water is added as follows: To the first, 0.9 c.c.; to the second, 0.8 c.c.; to the third, 0.7 c.c.; to the fourth, 0.6 c.c.; and to the fifth, 0.2 c.c. To the sixth and seventh, none. The following amounts of the diluted gastric juice are then added: To the first, 0.1 c.c.; to the second, 0.2 c.c.; to the third, 0.3 c.c.; to the fourth, 0.5 c.c.; to the fifth, 0.8 c.c.; to the sixth, 1.0 c.c.; and to the seventh, 1.0 c.c., of the diluted boiled juice. All tubes are then immersed for fifteen minutes in a water-bath at 50° to 52° C. At the end of this time the tube is selected which is clear and contains the least amount of diluted gastric juice. Upon this basis the peptic activity is calculated as the number of c.c. of 0.25 per cent. globulin digested by 1 c.c. of undiluted gastric juice. If the original free acidity of the gastric juice be high, a dilution of twenty-five times in place of twelve and a half may be used. The gastric contents are never filtered, but strained through cheese cloth, as it is believed that in this way less enzyme is adsorbed.

H. F. E. H.

ORGANIC ANALYSIS.

Estimation of Alcohol in Ether. P. Szeberényi. (*Zeitsch. anal. Chem.*, 1915, 54, 409-411.)—A method proposed for the estimation of small quantities of alcohol (not more than 4 per cent.) in ether depends on the fact that alcohol is readily oxidised by moderately acid bichromate solution, whilst ether is scarcely affected. Five c.c. of the sample are diluted with water to 100 c.c., and 30 c.c. of this solution are transferred to a flask already containing 10 c.c. of $\frac{N}{2}$ bichromate solution, 20 c.c. of dilute sulphuric acid (1:1), and 40 c.c. of water. The mixture is boiled under a reflux condenser for fifteen minutes, then cooled, diluted to 250 c.c., and the excess of bichromate estimated iodimetrically. Under these conditions, the ether reduces 0.6 to 0.9 c.c. of the bichromate solution; the variation depends on such factors as the size of the flame used for boiling the mixture, the size of the reflux condenser, etc., and the exact correction should be ascertained by a control estimation with pure ether. After allowing for the quantity of bichromate used by the ether, the remaining number of c.c. of $\frac{N}{2}$ bichromate solution is multiplied by 0.64 to obtain the amount of alcohol present. Larger quantities than 4 per cent. of alcohol in ether may also be estimated by boiling 5 c.c. of the aqueous solution of the sample with 20 c.c. of $\frac{N}{2}$ bichromate solution, 55 c.c. of water, and 20 c.c. of dilute sulphuric acid; in this concentration, the ether is not affected, and a correction need not be applied. To estimate ether as well as alcohol, a 2 per cent. aqueous solution of the sample is prepared. Ten c.c. of this solution are treated as described for alcohol. Another 10 c.c. of the solution are placed in a flask, 40 c.c. of $\frac{N}{2}$ bichromate solution and a cooled mixture of 40 c.c. of concentrated sulphuric acid and 10 c.c. of water, are added; the flask is closed with a stopper and set aside for thirteen

hours. The mixture is then diluted to 500 c.c., and the excess of bichromate is titrated. The quantity of bichromate solution used by the alcohol is multiplied by 1.1 and deducted from the total quantity of bichromate reduced. The result (in c.c. of $\frac{N}{2}$ solution) multiplied by 4.6 gives the amount of ether. W. P. S.

Action of Cupric Solutions on Cane Sugar. Estimation of Invert Sugar in Presence of Cane Sugar. E. Saillard. (*Comptes rend.*, 1915, 161, 591-593.)

—Estimation of reducing sugars by means of alkaline copper solutions gives too high results when cane sugar is present, owing to the latter being attacked during the reduction. The action of the copper solutions is more pronounced with the more alkaline solutions, and varies with the proportion of invert sugar. The following table gives the results obtained by heating 50 c.c. of the sugar solution for twenty-two minutes with 20 c.c. of Fehling's solution at 62° to 64° C., and filtering without cooling:

Invert Sugar in 50 c.c. of Solution.		Cane Sugar in 50 c.c. of the Solution.					
	Grm. 0	Grm. 0.815	Grms. 1.63	Grms. 2.44	Grms. 4.07	Grms. 6.52	Grms. 8.15
Mgrms.	Mgrms.	Mgrms.	Copper. Mgrms.	Mgrms.	Mgrms.	Mgrms.	Mgrms.
8	14	15.2	16.1	16.8	18.1	19.4	20.1
16	28	29.6	30.4	31.2	32.5	34.2	35.2
24	42	44.0	44.8	45.6	46.9	49.0	50.4
40	70	72.8	73.6	74.4	75.9	78.8	80.8
56	98	101.6	102.4	103.2	105.0	108.7	111.2
64	112	115.9	116.8	117.6	119.7	123.7	126.5
72	126	130.3	131.1	132.0	134.4	138.8	141.8

In estimating reducing sugars in beetroot, molasses, etc., the solution is clarified with lead acetate and polarised, the excess of lead removed by means of sodium carbonate, the liquid filtered, 50 c.c. of the filtrate heated with Fehling's solution, and the above table applied to the results. A sugar may be tested for reducing substances by heating the filtrate from the first treatment with Fehling's solution for a further twenty-two minutes. If less copper is precipitated in the second heating than in the first, reducing substances are present. C. A. M.

Graphitic Acid. L. Balbiano. (*Annali Chim. Applic.*, 1915, 4, 231-245.)—The so-called graphitic acid and graphitic oxide prepared from graphite of various origin had compositions corresponding to formulæ ranging from $C_{13}H_4O_7$ to $C_{14}H_4O_7$. When heated *in vacuo* they yielded carbon monoxide, carbon dioxide, and water, and when treated with a solution of hydroxylamine they left a residue of graphite containing adsorbed water. The results indicated that these supposed chemical compounds are only adsorption compounds of graphite with water, carbon monoxide, and carbon dioxide, and it is suggested that in future they should be termed yellow, green, or black hydrocarboxy-graphite. C. A. M.

Estimation of Tannin. D. B. Dott. (*J. Soc. Chem. Ind.*, 1915, **34**, 1124-1125.)

—The hide-powder method is considered to be untrustworthy. Precipitation of the tannin by cupric acetate yields more concordant results. In this method a hot solution of cupric acetate is added in excess to the warm tannin infusion, the mixture is boiled, the precipitate collected, washed with hot water, dried, ignited, the ash treated with nitric acid, again ignited, and the residue of cupric oxide weighed. The weight of the cupric oxide is multiplied by 1.45 to obtain the amount of tannin. This is the factor to be used when dealing with sumach, but it is possible that further experience would show that it would have to be varied when dealing with tannins from other substances.

W. P. S.

Estimation of Tannin in Tanning Materials. A. Gawalowski. (*Zeitsch. anal. Chem.*, 1915, **54**, 403-405.)

—The copper acetate precipitation method is carried out as follows: Fifty grms. of oak bark are digested at ordinary temperature for twenty-four hours in a closed flask with 260 c.c. of a mixture of alcohol, 1 part, and ether, 2 parts. Ten c.c. of the solution are then evaporated at a low temperature, the residue is dissolved in 50 c.c. of cold water, the solution filtered, and 25 c.c. of the filtrate (equal to 1 gm. of substance) are precipitated with cupric acetate solution. The precipitate is collected on a weighed asbestos filter, washed, dried first at a low temperature in the air, then in the water-oven, and weighed. The precipitate is now ignited in air or oxygen, then in hydrogen, and again weighed; the difference in the two weights gives the amount of the tannins. The proportion of copper in the precipitate varies with each tannin, and is not always the same for one and the same tannin; consequently, the amount of the copper must be estimated, and not calculated by means of a factor. In the case of materials other than oak bark, 15 grms. are treated with 150 c.c. of the alcohol-ether mixture; with tannin extracts, 10 grms. are digested with 200 c.c. of the solvent.

W. P. S.

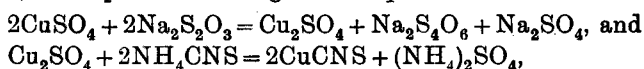
INORGANIC ANALYSIS.**Borax and Metallic Borates. L. Vanino.** (*Zeitsch. anal. Chem.*, 1915,

54, 408-409.)—The conflicting statements that the reactions between borax and soluble metallic salts are due to the formation of borates, pyroborates, metaborates, and tetraborates, cause confusion. The reactions may be explained by the hydrolysis of the compounds produced. When concentrated borax solution is mixed with concentrated barium chloride or calcium chloride solution, a white precipitate of BaB_4O_7 or CaB_4O_7 is obtained; these compounds react with three more molecules of water, giving $\text{Ba}(\text{BO}_2)_2$ or $\text{Ca}(\text{BO}_2)_2$ and two molecules of free boric acid; with four further molecules of water, the precipitate dissolves, the solution now containing barium hydroxide or calcium hydroxide and free boric acid. These reactions are shown by the following equations: $\text{BaCl}_2 + \text{Na}_2\text{B}_4\text{O}_7 = \text{BaB}_4\text{O}_7 + 2\text{NaCl}$; $\text{BaB}_4\text{O}_7 + 3\text{H}_2\text{O} = \text{Ba}(\text{BO}_2)_2 + 2\text{H}_3\text{BO}_3$; and $\text{Ba}(\text{BO}_2)_2 + 4\text{H}_2\text{O} = \text{Ba}(\text{OH})_2 + 2\text{H}_3\text{BO}_3$. A similar reaction takes place between borax and silver nitrate, but in this case, and when the solution is warmed, the resulting silver oxide remains insoluble. The final reaction with silver takes place according to the equation:



W. P. S.

Estimation of Copper in Commercial Copper Sulphate. G. Inze. (*Zeitsch. anal. Chem.*, 1915, 54, 412-413.)—In the method described previously (ANALYST, 1915, 40, 362), the reaction between the thiosulphate, thiocyanate, and copper sulphate, takes place according to the equations :



and not according to the equations given previously (*loc. cit.*).

W. P. S.

Colorimetric Method for the Determination of Copper and Iron in Pig Lead, Lead Oxides, and Lead Carbonate. B. S. White. (*J. Ind. and Eng. Chem.*, 1915, 7, 1035-1036.)—Owing to the great delicacy of the colour reactions employed, a sample of 30 grms. is sufficient in the case of refined products, and 10 grms. in the case of unrefined materials. The finely divided sample is weighed into a beaker of 400 c.c., and small portions of hot nitric acid (1:1) are added until solution is effected. The lead is precipitated by the addition of 32 c.c. of (1:1) sulphuric acid, with constant stirring. The liquid is decanted through a filter, and the precipitate washed several times with warm water by decantation, and finally drained on the filter. The filtrate is neutralised with ammonium hydroxide and 4 c.c. excess added; it is boiled for a short time and filtered. The precipitate is collected, washed, and reserved for the estimation of the iron. The filtrate is acidified with pure hydrochloric acid, adding not more than 2 drops excess of acid; litmus paper only should be used as an indicator. Six drops of 10 per cent. potassium ferrocyanide solution are added, the precipitate is collected on double filter papers, and the filtrate carefully examined for copper ferrocyanide. The precipitate is drained well without washing, and then dissolved on the filter with alternate washings of small portions of ammonium hydroxide and hot water. With the washings, the total bulk should be kept down to 30-40 c.c. The liquid is acidified with hydrochloric acid, adding not more than 2 drops excess, made up to 100 c.c. in a Nessler tube and the copper estimated colorimetrically by Carnelly's method. For comparison, 10 c.c. of dilute ammonium chloride solution, 2 drops of hydrochloric acid, and 90 c.c. of water, are mixed with standard copper sulphate solution (1 c.c. = 0.0001 gm. Cu) added from a burette until the colour is matched. In the case of red lead, 30 grms. of the sample are treated carefully with 40 c.c. of nitric acid (1:1), then with 30-40 c.c. of 3 per cent. hydrogen peroxide, and the liquid boiled until solution is complete. If the sample contains zinc, the filtrate from the iron precipitate, before precipitating the copper ferrocyanide, is made slightly acid with acetic acid, treated with 5 c.c. of an 8 per cent. solution of sodium ammonium phosphate, boiled, filtered and treated as described. For the estimation of the iron, the precipitate containing the iron oxide is dissolved on the filter with hydrochloric acid (1:1), and the filtrate with washings made up to 300 c.c. Ten c.c. are mixed in a Nessler tube with 3 drops of nitric acid and 10 c.c. of ammonium thiocyanate solution (1:15), made up to 100 c.c. and compared colorimetrically with standard iron solution (1 c.c. = 0.0001 gm. Fe), prepared by oxidising 0.7022 gm. of ferrous ammonium sulphate by permanganate in acid solution. The entire analysis may be completed within forty minutes, and the results attain the same degree of accuracy as those established by the more complicated methods.

J. F. B.

Reduction of Ferric Salt Solutions, and Titration of the Reduced Solutions with Permanganate. A. Hoenig. (*Zeitsch. anal. Chem.*, 1915, 54, 441-457.)—The following modification of the stannous chloride method is recommended; the excess of stannous chloride is eliminated by boiling the reduced solution with sulphur instead of removing it by the addition of mercuric chloride, since the mercurous chloride produced tends to act on the permanganate during the titration. Fifty c.c. of the ferric salt solution, containing at least 10 c.c. of concentrated hydrochloric acid, are heated in a graduated flask, stannous chloride solution is added drop by drop until the solution is decolorised, the mixture is cooled, 2 grms. of flowers of sulphur are then added, and the whole is boiled for one to two hours, while a current of carbon dioxide is passed into the flask; water is added from time to time to replace that which is lost by evaporation. After cooling, the mixture is diluted to a definite volume, mixed, an aliquot portion of the solution is transferred to a flask containing 25 c.c. of manganese sulphate-phosphoric acid solution and 100 c.c. of water and tinted with a few drops of permanganate solution, and the liquid is then titrated with standardised permanganate solution. The manganese sulphate-phosphoric acid solution is prepared by dissolving 170 grms. of crystallised manganese sulphate in water, adding 400 c.c. of phosphoric acid (sp. gr. 1.7) and 340 c.c. of sulphuric acid (sp. gr. 1.8), and diluting the mixture with water to 2.5 litres. W. P. S.

Ignition of Ferric Oxide in the Gravimetric Estimation of Iron. E. Selch. (*Zeitsch. anal. Chem.*, 1915, 54, 457-462.)—Experiments carried out by the author show that ferric oxide is not reduced even when ignited over a blowpipe, provided that the flame is not allowed to play over the top of the crucible, and that the latter is not completely covered by its lid (so that air may be admitted). It is therefore possible to heat alumina to the requisite high temperature before being weighed without risk of reducing any ferric oxide which may be present. W. P. S.

New Reaction of Hydrogen Peroxide. K. Spiro. (*Zeitsch. anal. Chem.*, 1915, 54, 345.)—When a dilute solution of phenol is mixed with a few drops of hydrogen peroxide solution, and a small quantity of $\frac{N}{100}$ ferrous sulphate solution is added, an intense green coloration at once appears. The addition of dilute alkali solution (ammonia, ammonium carbonate, or sodium carbonate) changes the green colour to red-violet; the green colour reappears when the mixture is acidified. The reaction (green coloration) may be obtained with 1 c.c. of $\frac{N}{100}$ hydrogen peroxide solution—that is, with 0.000017 gm. of the peroxide. Other monohydroxyl derivatives of benzene, such as cresol, *p*-hydroxybenzoic acid, tyrosine, picric acid, etc., may be used in place of the phenol, but salicylic acid cannot be employed, on account of the coloration which it itself gives with iron salts. The reaction does not take place in the presence of salts such as tartrates and cyanides, which form complex compounds with iron salts. W. P. S.

Note on the Identification of Trivalent Manganese in Glass. S. R. Scholes. (*J. Ind. and Eng. Chem.*, 1915, 7, 1037.)—Manganese dioxide is added

o glass to impart a violet tint, generally for the purpose of masking the colour due to the presence of iron. The author has prepared mixtures of easily decomposable glasses containing manganese dioxide in order to ascertain the state of oxidation of the manganese present in the coloured silicate. The solutions obtained from these glasses, either by treatment with hydrofluoric acid or by prolonged heating with 30 per cent. sulphuric acid, had a pink colour, readily decolorised by oxalic acid and other reducing agents. This colour was not due to permanganate, being less violet in shade, but was recognised as characteristic of manganic sulphate. An identical solution was prepared by heating manganese dioxide until it was partially reduced to brown Mn_3O_4 , and extracting with sulphuric acid. On diluting these pink solutions with a large volume of water, a light brown flocculent precipitate appeared in both cases.

J. F. B.

Estimation of Phosphorus Hydride. H. Reckleben. (*Zeitsch. anal. Chem.*, 1915, **54**, 308-321.)—Only when the phosphorus hydride is absorbed in an excess of chlorine or bromine water or potassium permanganate solution does complete oxidation of the hydride to phosphoric acid take place; the phosphoric acid thus formed may be estimated by the usual methods. Processes which depend on the absorption of the gas in an excess of the oxidising solution, and subsequent titration of this excess, are unsatisfactory and inaccurate. Approximate results may be obtained by calculation from the weights of the precipitates formed when the gas is led into ammoniacal silver nitrate solution or alkaline copper tartrate solution. (See also ANALYST, 1915, **40**, 367.)

W. P. S.

Separation of Potassium and Sodium by the Use of Aniline Perchlorate and the Subsequent Estimation of the Sodium. D. V. Hill. (*Chem. News*, 1915, **112**, 277.)—The method employed is based upon the precipitation of sodium chloride from solution in alcohol by means of gaseous hydrogen chloride after the removal of potassium as perchlorate. Kreider and Breckenridge (*Amer. J. Sci.*, 1896, **4**, 263) have shown that 0.0002 gm. of sodium oxide in 40 c.c. can be seen distinctly when thus precipitated, and conclude that this method can be applied to the quantitative estimation of sodium. The advantage of substituting aniline perchlorate for perchloric acid depends on the fact that the aniline salt forms crystals of definite composition without water of crystallisation, so that the amount to be used can be determined by weighing. The easiest way to prepare aniline perchlorate is to make the acid first by the method of Willard (*J. Amer. Chem. Soc.*, 1912, **34**, 1480), which involves the oxidation of ammonium chlorate to perchloric acid by dilute *aqua regia*, and then to add aniline to an aqueous solution of the acid until some of the oil remains after shaking, the excess being expelled by vigorous boiling. In solutions containing sodium chloride only, it was found that the precipitation with gaseous hydrogen chloride gave accurate results with an error not exceeding -0.04 per cent. of the weight taken (0.1 gm.). The method was as follows: 0.1 gm. of sodium chloride was dissolved in $1\frac{1}{2}$ c.c. of water, the volume made up to 50 c.c. with absolute alcohol, and gaseous hydrogen chloride was passed into the cooled solution; when saturated the precipitate was collected on asbestos, dried at about 110° C., and

weighed. Test mixtures of sodium and potassium chloride were then made, and an excess of aniline perchlorate dissolved in absolute alcohol added, the precipitate of potassium perchlorate being filtered off, washed with 97 per cent. alcohol, dried, and weighed. The filtrate was then saturated with gaseous hydrogen chloride and treated as described. Working as before with about 0.1 gm. of the mixed salts, the error in the potassium amounted to about -0.1 per cent. of the weight taken, and in the sodium the error was about -0.06 per cent. In the case of sodium, experimental results indicate the presence of a small constant negative error, due, apparently, to some solubility of sodium chloride in the saturated solution of hydrogen chloride in alcohol.

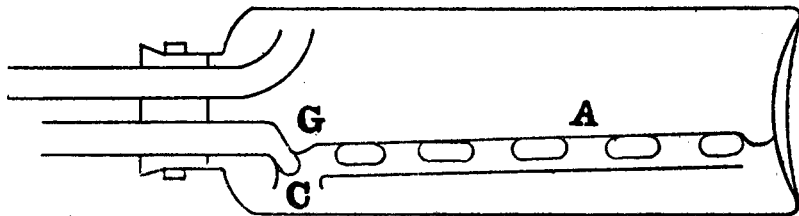
H. F. E. H.

Methods for the Determination of Radium. II. The Emanation Method.
S. C. Lind. (*J. Ind. and Eng. Chem.*, 1915, 7, 1024-1029.)—The principle on which the method is based consists in separating the emanation (as gas) from its parent radium in order to measure its quantity in a gas-tight electroscop, previously standardised with a known quantity of emanation—*e.g.*, from analysed pitchblende or standard radium solutions. Equilibrium between radium and emanation is not attained until the substance has been enclosed in a gas-tight vessel for at least a month. For practical purposes it is preferable to employ a more rapid method with a time correction. The emanation is removed completely from the substance, and the de-emanated substance is sealed up in a gas-tight vessel to allow the emanation to accumulate for a convenient period (one to four days). This emanation is collected and measured, and the correction applied to ascertain the maximum amount that would be obtained after the attainment of equilibrium with the radium content. The emanation may be removed either by fusion or by boiling a solution of the substance; in both cases the removal is assisted by the passage or generation of gas. Some substances, like carnotite, yield up their emanation by simple ignition without fusion, but are so changed that a second ignition does not liberate the newly accumulated emanation completely. Such conditions can only be employed in the equilibrium method. In dealing with solutions containing radium, precautions must be taken against losses due to precipitation or adsorption of radium, and the presence of a considerable excess of barium salt and nitric acid is a necessary condition. If the solution contain a sulphate or carbonate, this should be precipitated by barium, and filtered off after standing all night. The filtrate is strongly acidified with nitric acid, and treated as an ordinary radium solution; the precipitate, which also contains part of the radium, is fused (as sulphate) with four to five times its weight of an equimolecular mixture of sodium and potassium carbonates, and subsequently treated as a fusion. Both the solution and the melt are manipulated simultaneously, and their emanations collected in the same electroscop. For the treatment of a solution containing excess of barium and nitric acid, a quantity representing about 1×10^{-8} gm. of radium is boiled in a small flask containing a few glass beads for five or ten minutes to remove all emanation, cooled slightly, and then closed tightly with a rubber cork through which passes a tube drawn out and sealed as a capillary at its upper end. The liquid is maintained under a slightly reduced pressure for the period assigned for

the accumulation of the emanation. For the treatment of a fusion (*e.g.*, barium sulphate) the substance, freshly fused in a small platinum or porcelain boat, is enclosed in a glass tube, both ends of which are drawn out to suit rubber tubes, and sealed off as capillaries. The emanation having been allowed to accumulate for one or more days, one end of the tube is connected with a stopcock, and the other to the evacuated emanation chamber of the interchangeable electroscopes. The capillaries are broken off inside the rubber tubes, and the transference of the emanation is effected by repeated displacement by air. Sufficient vacuum must be left to accommodate the gas resulting from the further treatment of the fusion as follows: The boat is removed, wrapped in filter-paper, and supported in the neck of a flask containing nitric acid (1 : 1). The flask is connected with a gas-burette containing sodium hydroxide, and the boat containing the carbonate fusion allowed to fall into the acid. The carbon dioxide is expelled together with the emanation, and is absorbed in the gas-burette, while the emanation gas is passed on to the electroscopes. The method of boiling off the emanation in this case is identical with that followed in the case of solutions of radium salts; the apparatus and details of manipulation are described. If preferred, instead of dissolving the fusion in acid, it may be re-fused for the complete expulsion of the emanation. The presence of a high proportion of silica is objectionable, both for the fusion and the solution methods, and such substances—*e.g.*, carnotite—require special treatment. Recommendations for the most suitable means of dealing with various radio-active preparations met with in practice are given (*cf.* ANALYST, 1915, 40, 335).
J. F. B.

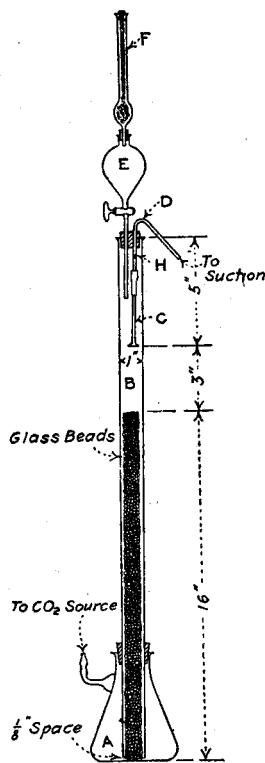
APPARATUS, ETC.

Improved Form of Gas-Washing Bottle. F. R. v. Bichowsky and H. Storch. (*J. Amer. Chem. Soc.*, 1915, 37, 2695-2696.)—The form of bottle described is similar in principle to that suggested by Cumming (ANALYST, 1910, 35, 144). As shown in the figure, the apparatus consists of a bottle, preferably a square medicine bottle, provided with a cork through which pass the inlet and outlet tubes. The gas enters through the lower tube, and forms bubbles at the bend *G*, these bubbles pass



along the tube *A*, and the gas leaves by the upper tube. The tube *A* should be of such diameter that the bubbles sweep the liquid through it, thus causing efficient circulation of the liquid in the bottle. The opening *C* should be about twice the diameter of the tube *A*. A similar wash-bottle is described which is constructed entirely of glass, and may be used with liquids which attack corks. W. P. S.

Methods for the Estimation of Carbon Dioxide. New Form of Absorption Tower adapted to the Titrimetric Method. E. Torug. (*J. Ind. and Eng. Chem.*, 1915, 7, 1045-1049.)—The gravimetric estimation of carbon dioxide by weighing of absorption apparatus gives accurate results for small quantities slowly aspirated; it is important, however, that the drying apparatus before and after the absorption bulbs should have exactly the same drying efficiency. With large amounts of carbon dioxide and rapid aspiration of the gas, the gravimetric method is less accurate and convenient. The method depending on absorption in alkali hydroxide and estimation of the carbonate by differential titration to phenolphthalein and methyl orange has many disadvantages in accurate work. The



influence of the amounts of indicator used and the uncertain end-points make the method extremely inconvenient, even under the best conditions. On the other hand, perfectly sharp and accurate titrations can be made with standard barium hydroxide solutions in presence of phenolphthalein. A form of absorption tower for use with barium hydroxide, and suitable for both slow and rapid aspirations, is illustrated (see figure). The apparatus consists of a suction flask (*A*) of 500 c.c. capacity, a glass tube (*B*) 24 inches long by 1 inch diameter, a dropping funnel (*E*), and a soda-lime tube (*F*) in the orifice of the funnel. The bent outlet-tube *D* has a hole at *H*, and to the end of it is attached a glass rod (*C*) flattened out at the bottom to break up any bubbles which may tend to rise up to the outlet at *H*. The funnel is charged with 40 c.c. of 0.4 *N*-barium hydroxide solution from a guarded burette, and the soda-lime tube immediately replaced. After connecting the funnel to the tower, the apparatus is scrubbed out with air free from carbon dioxide. The baryta solution is then transferred to the tower, and the funnel washed out with 40 to 45 c.c. of water free from carbon dioxide, which is also discharged into the tower. The suction draws the liquid up the tower, keeping the glass beads always moist. Perforated beads should be used, in a column 16 inches high. After the absorption of the gas, the suction tube is

closed and air allowed to pass into the apparatus through the soda-lime tube and stopcock of the funnel. The stopper at the top of the tower is raised, and the extending tubes washed down. The tower is raised a little and tapped until the beads fall into the flask. It is then washed inside, and at the lower end outside. Titration is made immediately; the presence of the beads and the barium carbonate does not interfere with the accuracy of the results, but the liquid should be shaken continuously to prevent the local action of the acid on the barium carbonate.

J. F. B.

Simple Method of Determining the Melting-Points of Fats, etc. A. W. Knapp. (*J. Soc. Chem. Ind.*, 1915, 34, 1121-1122.)—The substance is placed on the

pressure acting on the mercury in *B* forces this mercury into *A*, the air in *A* being forced through the capillary *U*. At the same time the mercury rises in tube *E*, quickly at first, and then more slowly until it rises at the same rate that the mercury rises in *A*. Finally, when the mercury in *A* reaches the capillary, the mercury in *E* rushes up to the level *b*, to which level the mercury in *B* has fallen. In passing the level *e* mercury flows into bulb *D*, preventing further access of air to the water-pump. The pressure in *B* immediately decreases, so that the mercury is drawn back from *A*, which latter is now cut off from *R* by mercury in the capillary *U*. Simultaneously, the mercury level in *E* is lowered below level *e*, and mercury rising in tube *L* is finally forced into *B*, so that the atmospheric pressure again presses on the mercury in *B*. The volume of *R* is larger than that of *A*, and the air forced out of *A* does not increase the pressure in the latter to any great extent. In each cycle, when the pressure over *C* is decreased sufficiently, air is drawn out of *R*, so that the pressure in the latter always falls short of the column of mercury in the capillary *U*. Each time the mercury is driven through the capillary it rises in *V*, out of which it is forced back into *A* when the mercury is leaving the latter, the difference in level of the mercury in *U* and *V* becoming equal to the pressure in *R*. It is essential that tube *G* be connected to tube *F* at the same level that *E* is joined to *F*. The ends of tubes *M* and *E* may be joined to a common glass tap; this is closed at the start, the air is exhausted by the water-pump, and, on then opening the tap, air enters *M* and *E*, and the pump begins to work. A tube and tap may also be attached near the top of tube *T*, so that air can be admitted at the end of an experiment. W. P. S.



REVIEW.

THE EXAMINATION OF HYDROCARBON OILS AND OF SAPONIFIABLE FATS AND WAXES.
By Professor Dr. D. HOLDE, Sub-Director of the Royal Bureau for Testing Materials of Berlin-Lichterfelde. Authorised translation from the fourth German edition by EDWARD MUELLER, Ph. D., Assistant Professor of Inorganic Chemistry, Massachusetts Institute of Technology. First English edition. New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd. 1915. Price 21s. net.

Professor Holde's textbook on Hydrocarbon Oils and Saponifiable Fats and Waxes is quite properly accepted in Central Europe as the standard treatise on its subject, but for cogent reasons it is less highly appreciated by the English and American chemist than most German technical works of equal standing. A valuable feature of the book is that it is substantially a compendium of first-hand knowledge, yet therein lies its great deficiency to English readers, viz., that the geographical and fiscal conditions which determine the source and variety of the hydrocarbon products which must form the staple supplies of Germany consequently determine also the materials to which Professor Holde extends full and authoritative treatment. Thus, the petroleum of Wietze in Hanover, and the brown-coal oils of Thuringia, neither of which ever enters an English or American laboratory unless

as a curiosity, are accorded almost as much consideration as Pennsylvanian and Caucasian oils, and very much more than the Californian, Oklahoma and Kansas, Mexican and East Indian oils, which together make up a preponderating proportion of the world's output of petroleum products. Publishers are apt to forget that a technical work which has successfully met the requirements of German-speaking countries commonly needs, not merely translation, but extensive editing and revision, to render it even approximately of the same utility to the more cosmopolitan circle to which it appeals when presented in the English language. This translation of Professor Holde's treatise would have had a greatly enhanced value had it been edited and revised by an English or American technical chemist who has specialised in oils.

Apart from the faults due to the restricted cosmos of the author, the book is admirable, and, for the ground covered in its compass of 483 pages, is unequalled by any other work. The first chapter, which occupies nearly half the volume, treats of Petroleum and Petroleum Products, and is followed by short second and third chapters dealing respectively with Natural Asphalt and Ozokerite and Montan Wax. The fourth chapter, of 35 pages, is on the Tars obtained by the Distillation of Coal, Lignite, Shale, and Peat. This chapter presents a good illustration of the author's Central European outlook—*i.e.*, he devotes to lignite or brown-coal tar, which is purely a local product of comparatively small importance, as much space (15 pages) as to coal tar, which confronts the technical chemist and analyst in every quarter of the globe.

The fifth and sixth chapters relate to Saponifiable Fats and Technical Products prepared from them, including stearine candles, hardened oils, soaps, soap powder, glycerol, wool oils, Turkey-red oils, boiled oils, paints, varnishes, etc. It may appear at first glance a too presumptuous effort to attempt adequate treatment of fats and so wide a range of their products in two chapters of rather more than 150 pages, but by the free use of tabular statements of properties, reactions, and data, the author has succeeded in collecting in so small a space an immense amount of material in a very handy form for reference. The seventh and last chapter is a short one on Waxes. The book concludes with some useful physico-chemical tables and good indexes of authors and subjects.

Dr. Edward Mueller has furnished a translation which, on the whole, is very good, and not so devoid of literary merit as the efforts of many writers of technical handbooks. He has, however, made some slips which should be expunged when his translation is reprinted. On p. 43 he makes the author say that "gasoline gas" is a mixture of air and gasoline, and "is used as a substitute for illuminating gas." This nonsense doubtless arises from the translator having forgotten that *leuchtgas* almost invariably means one type of illuminating gas—*viz.*, coal gas. Again, on p. 80, he refers to tar oils which have been freed from tar acids as "indifferent," whereas, of course, the English technical equivalent is "dead." Further, the term "motor spirit" is applied primarily to a highly volatile fraction of petroleum which has a calorific value exceeding 11,000 calories per gram., yet on p. 49 Dr. Mueller gives 5,940 calories for "motor spirit." Clearly, the author was speaking of an alcohol motor fuel, which has been wrongly rendered in the translation.

There are other blemishes for which Dr. Mueller may be only responsible in the second degree. "American" is constantly used with reference to petroleum when, in fact, only the Pennsylvanian product is meant. This is, however, not the only recent textbook the writers of which have forgotten that the Pennsylvanian or Appalachian oil-fields are now responsible for scarcely one-tenth of the total output of petroleum in the United States, and that the products of different districts in that country are at least as divergent in character and constitution as are Pennsylvanian and Caucasian oils. Yet there are other "professors" of technology who constantly emulate Dr. Mueller in dilating still on the differences between "American" and "Russian" petroleum, and how the analyst may distinguish one from the other, while in California alone there is sufficient variety of oil to confound all their distinctions and tests.

Perhaps the printer may be made the scapegoat for two other errors. On p. 45 we read that corrections are to be applied to the thermometer readings in the fractional distillation of petroleum naphtha "if the barometric pressure varies more than 5° from the normal." On p. 80 an oil gas is said to give a certain illuminating power with "a burner No. 60 (that is, with a consumption of 35 litres per hour)." If the words in brackets had been omitted, the reader could not have discerned that it was a No. "00" burner which was really referred to.

Slips such as those cited do not occur very frequently—perhaps less frequently than in the first editions of most technical works of this magnitude. It is to be hoped, however, that when a new English edition is put in hand, the opportunity will be taken, not merely to correct these and similar errors, but also to edit and revise the work from the broader standpoint of British and American technical chemists.

W. J. A. BUTTERFIELD.



INSTITUTE OF CHEMISTRY.

PASS LIST: JANUARY (1916) EXAMINATIONS.

THREE candidates passed the Intermediate Examination—viz., H. E. Cox, B.Sc. (Lond.), A. J. Somer, and E. E. Wells, B.Sc. (Lond.). Nine candidates passed the Final (A.I.C.) Examination—viz., in the Branch of Mineral Chemistry: R. G. Browning, B.Sc. (Lond.); in the Branch of Organic Chemistry: R. Brightman, R. L. Brown, A.R.C.S.I., H. S. Foster, and A. Hancock; in the Branch of the Chemistry (and Microscopy) of Food and Drugs, Fertilisers and Feeding-Staffs, Soils, and Water: C. E. Corfield, J. J. Geake, F. A. Pickworth, B.Sc. (Lond.), and Fred Smith.
