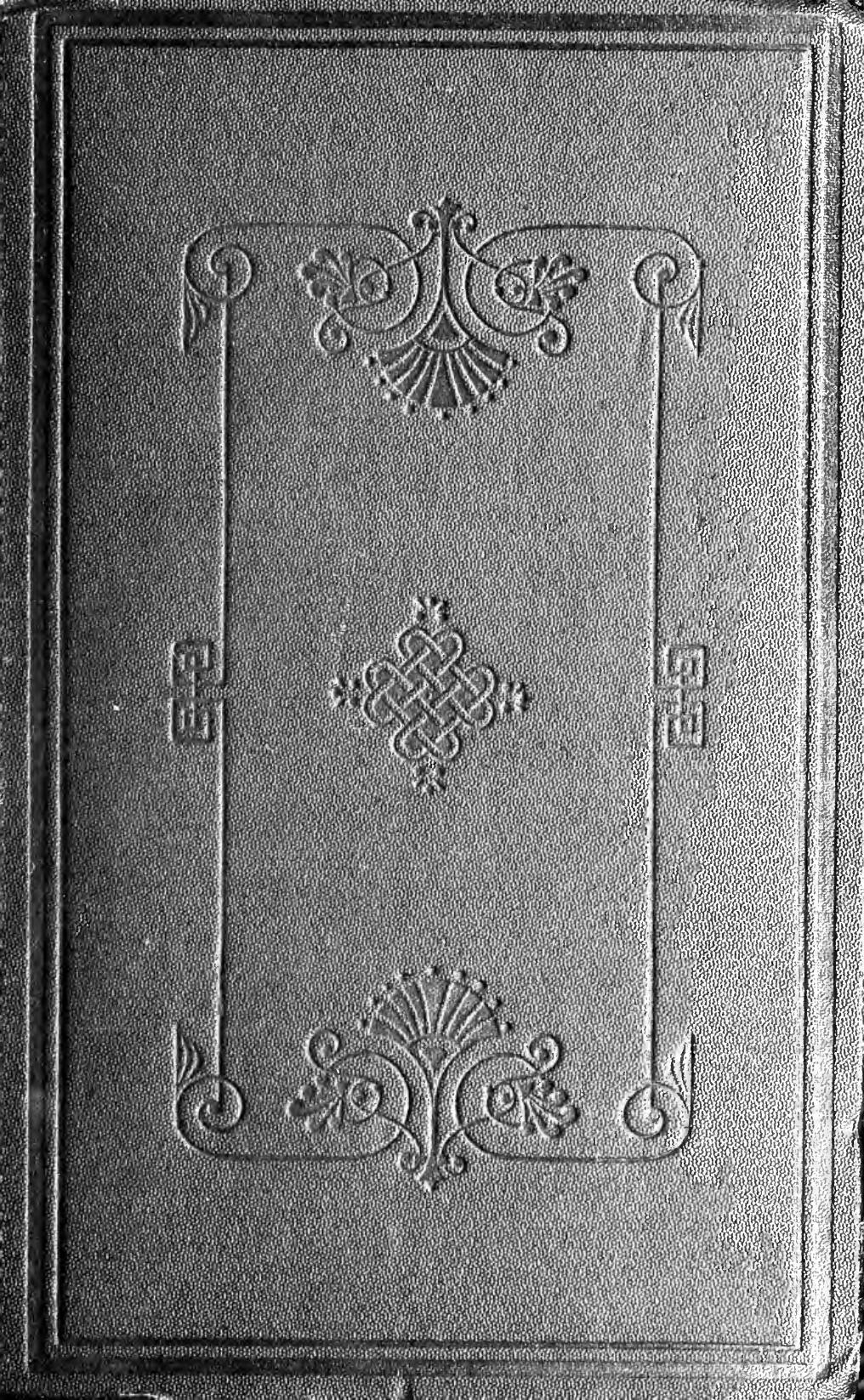

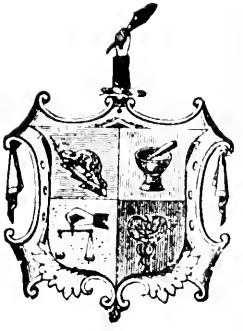

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THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION OF FRIENDLY INTERCOURSE AMONGST PHARMACISTS.

This Association of Chemists and Druggists and others interested in Pharmacy is managed by about twenty unpaid officers annually elected by the members.

ANNUAL MEETINGS OF MEMBERS.

1863, Newcastle. 1864, Bath. 1865, Birmingham. 1866, Nottingham. 1867, Dundee. 1868, Norwich. 1869, Exeter. 1870, Liverpool. 1871, Edinburgh. 1872, Brighton. 1873, Bradford. 1874, London. 1875, Bristol. 1876, Glasgow. 1877, Plymouth. 1878, Dublin. 1879, Sheffield. 1880, Swansea. 1881, York. 1882, Southampton. 1883, Southport. 1884, Hastings. 1885, Aberdeen. 1886, Birmingham. 1887, Manchester. 1888, Bath.

The chief business of the meetings is the communication of written descriptions of original investigations made by members during the year, and includes discussions on such papers by the assembled members and visitors.

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Gentlemen desiring to join the Conference can be nominated at any time on applying to a Secretary or any other Officer or member. The Name and Address of each candidate should be written legibly, and forwarded to "The Asst. Secretary," British Pharmaceutical Conference, 17, Bloomsbury Square, London, W.C., together with the subscription.

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To all members who have previously paid the Annual Subscription, the Year-Book, including Transactions, is posted as soon as published in December, and to other members immediately on receipt of the Subscription.

Extra copies of the Year-Book and Transactions for 1870 and subsequent issues, will be sent to members on receipt of Subscription as above, for each additional copy. To non-members, the price is Ten Shillings per volume, exclusive of postage.

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COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1886, TO JUNE 30,

1887.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

TWENTY-FOURTH ANNUAL MEETING

HELD AT

MANCHESTER,

AUGUST, 1887.

LONDON:
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YEAR-BOOK OF PHARMACY AND TRANSACTIONS

OF THE

British Pharmaceutical Conference.

1886-87.

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BRITISH PHARMACEUTICAL CONFERENCE.

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THE

BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1888 will be held at Bath.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretary, or any other officer or member. The yearly subscription is payable in advance, on July 1st. The amount, which includes free delivery of the Year-Book, is 7*s.* 6*d.* for members residing in any European country, Canada, or the United States of America. For those resident in other countries, if the Year-Book be mailed direct to members, it is as follows:—Australasian Colonies, 10*s.*; South Africa, India, China, and Japan, 9*s.* 6*d.*; West Indies and Mauritius, 8*s.* 10*d.* Further information may be obtained from

THE ASST. SECRETARY; BRIT. PHARM. CONF.,
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THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of about 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 339.

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INTRODUCTION.

The pages of this volume furnish evidence that the steady growth of the various sciences bearing on pharmacy has been more than maintained during the past year, both as regards the number and importance of the contributions to their literature. The reader who has watched the progress of organic chemistry within the last decade, and has followed, step by step, the advance in the direction of organic synthesis, is fully aware that the artificial production of vegetable alkaloids and similar active principles, which but a few years ago seemed little more than a fond dream, has now become a reality, and is the outcome, not of accidental discovery, but of close and systematic studies of the constitution of those bodies. As a striking success in this direction we refer to the complete synthesis of conine recently accomplished by A. Ladenburg. It will be remembered, from his previous researches, that the action of paraldehyde on α-picoline leads to the formation of α-allylpyridine, and that this body, when treated with reducing agents, yields α-propylpiperidine, a base agreeing in most of its properties with conine, but differing from it by its optical inactivity and the lower melting point of its hydrochloride. Subsequently, however, this untiring investigator succeeded in splitting up the inactive product into a dextrorotatory and a lævorotatory base, the former of which proved to be identical in every respect with natural conine. This remarkable result acquires special significance from the fact that α-picoline can be synthetically built up by a series of reactions beginning with the formation of acetic acid from its elements, and that the preparation of conine from α-picoline therefore constitutes the first instance, in the strictest sense of the term, of the complete synthesis of an important vegetable alkaloid.

A. Ladenburg also publishes an account of methyl-, ethyl-, and isopropyl-pyridines, and of the corresponding piperidine bases produced from alcoholic solutions of the former by reduction with sodium. Piperidine obtained in this way is stated to be identical

with the alkaloid prepared from piperine. L. Storch has effected the synthesis of a number of pyridine bases by heating glycerin with a strong solution of ammonium sulphate and sulphuric acid, and a similar result has been obtained by J. Plöchl with ammonium chloride by the action of aldehydes at a high temperature. The transformation of citric acid into pyridine-derivatives is reported upon by S. Ruhemann.

In order to throw further light on the alleged presence in strychnine of a phenylpyridine- as well as a quinoline-group, C. Stoehr has distilled this base with alkali, and has thus obtained, in addition to a hydride of pyridine, γ-picoline, identified as such by its crystalline form and melting point, as well as by the composition of its auro- and mercuro-chlorides. A crystalline dihydrate of strychnine is described by W. F. Loebisch and P. Schoop, who also give an account of a fluorescent derivative of this alkaloid prepared by distilling strychnine with zinc-dust. The constitution of brucine has been further investigated by A. Hanssen, who arrives at the conclusion that this base contains dimethoxyphenylpyridine in addition to a quinoline-group.

A recent report on morphine by D. B. Dott and R. Stockman deals with the methyl-, ethyl-, and acetyl-derivatives of this base, and shows that methylmorphine (codeine), prepared from morphine, agrees as perfectly with codeine from opium in its physiological properties as it does in its chemical and physical characters. The same physiological properties are shared by ethylmorphine; but dimethylmorphine is found to be quite dissimilar in its action from the morphine group; while in the acetyl-derivative the difference from morphine consists merely in a slight increase of the narcotic and tetanizing effects. In another paper, D. B. Dott refers to the meconates of morphine, and records the result of experiments rendering the existence of an acid meconate very doubtful. F. Ditzler has investigated the behaviour of morphine towards potassium chromate, and finds that solutions of salts of this alkaloid, when shaken with excess of potassium chromate, give a precipitate of morphine; whilst morphine chromate is precipitated when only very small quantities of the reagent are gradually added. The *British Medical Journal* publishes an observation to the effect that a solution of morphine hydrochlorate, which had been employed subcutaneously, was found, eleven months later, to produce violent emetic effects, due to the spontaneous formation of apomorphine. No such change, however, has been noticed by other observers; and in the absence of confirma-

tory evidence on this point, the statement in question should be received with due reservation. The conversion of morphine into pseudomorphine may be readily effected, according to O. Hesse, by adding a solution of potassium hydrate and potassium ferricyanide, containing two molecular weights of the former to one of the latter, to a solution of pure morphine hydrochlorate in forty parts of water. The same author now accepts Polstorff's formula for pseudomorphine in the place of the one previously proposed by himself. G. Goldschmiedt defends the formula $C_{20}H_{21}NO_4$, against $C_{21}H_{21}NO_4$, as found by other chemists, and is supported in this view by R. Jahoda. Recent researches on thebaïne, by W. C. Howard and W. Roser, confirm the conclusion that this body is a tertiary base, and that it may be regarded as the dimethyl ether of morphothebaïne. Additional information respecting the alkaloid cryptopine is furnished by E. Kauder in a communication read before the British Pharmaceutical Conference. A paper by P. C. Plugge deals with the opium alkaloids in general and with the classification and arrangement of these bases in accordance with their properties and reactions.

It will be remembered that the substance which, under the name of "hopeine," was brought to the notice of the profession (*Year-Book of Pharmacy*, 1886, 57), as a crystallizable narcotic alkaloid obtained from wild American hops, was subsequently proved to consist of morphine and a variable proportion of another base. W. Williamson now applies this name to the alkaloid distinct from morphine, and gives a description of its properties; but the subject still remains in an unsatisfactory condition calling for further investigation.

Continuing his experiments on the preparation of aconitine, J. Williams has elaborated a new process consisting in the exhaustion of the ground root of *Aconitum Napellus* with amyl alcohol, the removal of the alkaloid from the solution thus obtained by shaking with acidulated water, its subsequent precipitation from the acid liquid by means of sodium carbonate, and final purification of the product by crystallization from ether.

A careful investigation of emetine leads H. Kunz to the conclusion that this substance is a biacid base and a tertiary diamine, like quinine. He considers that its elementary composition is represented by the formula $C_{30}H_{40}N_2O_5$, which differs by C_2 from that attributed to the alkaloid by Lefort and Wurtz. It is thought probable that emetine, like quinine, is a quinoline derivative.

In a contribution to the recent meeting of the British Pharma-

centical Conference, J. Williams recommends a new process for the purification of cocaine hydrochlorate, which is based on the insolubility of this salt in ether. The so-called amorphous cocaine, the true nature of which seems to have escaped the observation of previous investigators, has been re-examined by R. Stockman, and shown to be a solution of ordinary crystalline cocaine in *hygrin*, the liquid alkaloid which is also present in coca leaves. This body is extracted from the leaves in greater or less amount, along with the cocaine, by the processes which are now used by manufacturers, and its presence is stated to account for the disagreeable properties and effects which have been observed in many samples of the hydrochlorate.

The chemistry of coffee and its alkaloid caffeine has engaged the attention of B. H. Paul and A. J. Cownley, whose researches prove that the discordant statements hitherto published in reference to the amount of this principle present in coffee must be ascribed to defective methods of analysis. So far from this proportion being subject to much variation, it shows a most remarkable constancy; so much so, indeed, that it may be relied on as the basis of a method for the direct determination of the percentage of pure coffee in any sample of ground coffee, whether sold as such or as a mixture.

The alkaloids of *Berberis vulgaris* have been re-investigated by O. Hesse, who considers that the root of this plant contains at least four such bodies beside berberine. Of these he describes especially oxyacanthine, and a new base obtained by him from the mother-liquors of oxyacanthine, which he proposes to name *berbamine*. A report on berberine by E. Schmidt and C. Schilbach deals with products obtained from this base by oxidation with potassium permanganate in alkaline solution. The formula of hydrastine is corrected to $C_{21}H_{21}NO_6$ by M. Freund and W. Will, who also give a description of the decomposition-products hydrastinine, hydro-hydrastinine, and hydrastinic acid. Gelsemium root is found by F. A. Thompson to contain two distinct alkaloids, one of which is crystalline and forms an insoluble hydrochlorate, while the other is amorphous and yields a hydrochlorate soluble in its own weight of water. The former of these, for which the name "gelsemine" is retained, corresponds to the formula $C_{34}H_{69}N_4O_{12}$. Conessine, the base recently extracted from East Indian *Holarrhena*, is believed by K. Polstorff to be identical with that obtained by Haines from *Wrightia*. Pilocarpine, pilocarpidine, and jaborine have been further investigated by E. Hardy and G. Calmels; and

the same service has been performed for colchicine by S. Zeisel. Many other vegetable alkaloids discussed or isolated during the past year must be left unnoticed in this place for want of space.

The literature of ptomaines never fails to receive fresh contributions. C. Gram has studied the transformation of choline into the trimethylvinylammonium base, a poisonous product, which, according to Brieger is a frequent constituent of putrid matter, and is formed from choline by the action of putrefactive microphytes. It is found that the same change can also be effected by purely chemical means. Cadaverine is shown by A. Ladenburg to be identical with pentamethylenediamine, with which it agrees in its boiling-point, odour, solubility, and its general reactions, as well as in the composition of the respective mercuriochlorides. A poisonous ptomaine, to which the name lactotoxine is given, is described by R. H. Firth and others as a product of the decomposition of milk. The importance of ptomaines in forensic investigations has induced H. Beckurts to deal with the entire subject in a valuable essay reviewing the work of the last few years in connection with this subject.

In a report on snake poison, R. N. Wolfenden states that the venom of the Indian cobra does not owe its toxicity to any alkaloid, ptomaine, or living organisms, and that the crystalline constituent which has been described under the name of cobric acid is nothing but calcium sulphate. He attributes the poisonous properties of the venom to its proteïd constituents, and more especially to globulin and syntonin. G. Haberlandt believes that the poison of the stinging nettle is also due to an albuminoid, and disposes of the fallacy of attributing the irritating effects of the sting of this plant to formic acid.

Glycyphyllin, the sweet principle extracted from the leaves of *Smilax glycyphylla*, has been further investigated by E. H. Rennie, who reports that the formula previously published for this substance should be replaced by $C_{21}H_{24}O_9$. Rottlerin, extracted from kamala by means of carbon bisulphide or benzene, is stated by L. Jawein to agree in its general characters, but not in its composition, with the principle described by Anderson. The wood of *Pterocarpus Santalinus* has yielded to P. Cazeneuve and L. Hugounenq two new crystalline principles, for which the names pterocarpine and homopterocarpine are proposed respectively. The ripe berries of the mountain ash are found by C. Vincent and M. Delachanal to contain, in addition to sorbine and glucose, an astringent principle having a very acid reaction and approximating closely to caffeo-

tannic acid, and in some respects also to morintannic acid. The tannin of oak bark is considered by C. Böttinger as a methyl salt of digallic acid.

H. Bungener supplies some further information respecting lupulic acid, the bitter principle isolated by him from hops, from which it may be readily obtained by extracting with light petroleum, and purifying by repeated recrystallization. This acid is rapidly oxidized by the air, being converted into an amorphous, yellow, resinous compound which forms a very bitter yellow solution; and it is to this compound, rather than to unaltered lupulic acid, that the bitterness of beer is ascribed. This resinous oxidation product of lupulic acid is also found to have an antiseptic action on the lactic ferment, though it is said to be without effect on alcoholic and acetic fermentations. In an article on jervic and chelidoninic acids, by E. Schmidt, the former is stated to be identical with chelidonic, and the latter with succinic acid. Aconitic acid may be conveniently prepared, according to W. Hentschel, by heating two parts of citric acid with an equal weight of sulphuric acid and one part of water in a reflux apparatus from four to six hours.

Anacardic acid, which was originally obtained by Staedler from the oil contained in the shell of the fruit of *Anacardium occidentale*, is found by S. Ruhemann and S. Skinner to have a composition answering to the formula $C_{22}H_{32}O_3$. The acid extracted from hemp oil by saponification is regarded by A. Bauer and K. Hazura, as identical with linoleic acid. The formula for linoleic acid, $C_{16}H_{28}O_2$, according to which this body would be the isologue of palmitic acid, and convertible into the latter by hydrogenising agents, is called in question by K. Peters, who obtained stearic instead of palmitic acid on heating the acid with such agents. His analytical numbers agree better with the formula $C_{18}H_{28}O_2$, than with the one before mentioned. Erucic and brassic acids, and their glyceryl compounds, form the subject of a paper published by C. L. Reimer and W. Will.

J. F. Eykman calls attention to the occurrence of cinnamic acid in plants belonging to the order *Ericaceæ*, from a member of which he has succeeded in extracting this acid by means of chloroform. Benzoic acid is shown to be convertible into salicylic acid by a suitable treatment with hydrogen peroxide. A report on substitution-products of salicylic acid deals with chloro-, iodo-, and nitro-derivatives of this acid. Phenyl salicylate, which a short time ago was brought to the notice of the medical profession

under the name of salol, is shown by C. Kolbe to be obtained by heating together equivalent quantities of salicylate and carbolate of sodium in the presence of phosphorus pentachloride, the end products of the reaction being sodium chloride, phosphoric anhydride, and salol. Attention is directed by F. H. Alcock to the variable nature, both as regards composition and characters, of salicylate of zinc as met with in commerce.

Further researches respecting the constitution of safrole, the main constituent of oil of sassafras, have induced T. Poleck to adopt Eykman's formula, $C_3H_5.C_6H_3(OH).OMe$, in place of the one previously proposed by himself. The substance known as terpinol proved to be a mixture consisting chiefly of a compound which is either identical or isomorphous with caoutchine monohydrate, and is provisionally named *terpol*.

The oxidizing effects of oil of turpentine in the presence of air have been studied with respect to alcohol by C. E. Steedman, and shown to result in the conversion of the latter into acetic acid after long exposure.

G. Michaelis and W. T. Mayer publish a process for the preparation of chloroform, which consists in subjecting crude acetates to dry distillation at temperatures varying between 300° and 500°, treating the products with hypochlorites, separating the chloroform thus formed by distillation, and purifying by rectification.

An exaggerated estimate seems to have been formed hitherto of the volatility of glycerin during the evaporation of its aqueous solutions. O. Hehner, who has recently investigated this subject, finds that not the slightest loss occurs under such circumstances from solutions containing less than 50 per cent. of glycerin.

The conversion of glucose into dextrin is effected by E. Grimaux and L. Lefèvre, by evaporating a solution of the former in hydrochloric acid of 1·026 sp. gr. in vacuo to the consistence of a syrup, then precipitating by alcohol, and repeatedly purifying the product. The dextrin thus obtained is not coloured by iodine, is left unaffected by infusion of malt, and undergoes hydration somewhat slowly when boiled with dilute acids. The glucose formed from it by the action of acids is readily fermentable. The oxidation of glucose by means of potassium permanganate is found to be complete if the latter be used in excess and the solution boiled, the product of the reaction being carbonic anhydride, water, and potassium hydromanganite, $KH_3Mn_4O_{10}$. With smaller proportions of permanganate, and at lower temperatures, oxalic and formic acids are formed, and a portion of the glucose may remain

unaltered. The so-called soluble starch contained in vegetable tissues does not appear to be a carbohydrate analogous to ordinary starch; but whether it is an albuminoid, as suggested by Nägeli, or a tannin, as believed by Kraus, remains as yet undecided. Inosite, the crystallizable carbohydrate contained in walnut leaves, forms the subject of a paper by L. Maquenne, who attributes to it the formula $C_6H_{12}O_6 + 2H_2O$. A new carbohydrate, described under the name of irisin, has been extracted by O. Wallach from the rhizome of the water-lily. It corresponds to the formula $C_6H_{10}O_5 + H_2O$, and closely resembles inulin, from which it differs, however, by its more powerful action on polarised light.

Saccharin, the coal-tar derivative, which a short time ago attracted much attention on account of its intense sweetness, is stated by Aducco and Mosso to possess antifermentative properties equal to those of benzoic or boracic acid. The conclusions arrived at by Stutzer concerning the innocuousness of this substance when taken into the human body are fully confirmed by E. Salkowski; and it is further stated to cause no increase in the quantity of urine or sugar passed when given to diabetic patients.

The individuality of the new element, "germanium," may now be considered as conclusively established; and a complete description of its properties and its compounds with oxygen, sulphur, chlorine, and iodine, will be found in this volume. It is stated to occupy a position between gallium and arsenic in the periodic arrangement of the elements.

H. Schwarz points out that pure hydrogen may be conveniently prepared by heating a mixture of 20 parts of zinc dust with 22·8 parts of calcium hydrate in a combustion tube. By substituting for the latter 30 parts of calcium carbonate, pure carbonic oxide may be obtained. The removal of organic impurity from water by means of alum has been tested in a further series of experiments by P. T. Austin, who arrives at the conclusion that this method of purification deserves to be strongly recommended. The observation that soft waters containing mere traces of silica have a marked solvent action on lead, while those containing silica in the proportion of half a grain or more per gallon do not dissolve this metal, has led to the recommendation of a process of artificial silication, by which the action of the water on lead pipes is reduced to a minimum.

The reaction between potassium permanganate and sodium hyposulphite is shown by M. Gläser to result in the formation of a stable compound of the formula $KH_3Mn_4O_{10}$, which is not decomposed

by cold or hot water. It will be seen that this body, to which he applies the name potassium manganite, is the same as the potassium hydromanganite referred to by A. Smolka, in connection with the oxidation of glucose by permanganate. Sodium hypophosphite is stated by A. Cavazzi to form a highly explosive mixture with an equal quantity of sodium nitrate, the products of the explosion being trisodium phosphate, water, nitrogen peroxide, and nitric oxide. H. Beckurts directs attention to the almost constant occurrence of traces of potassium chlorate or perchlorate in commercial potassium nitrate, and deduces the quantity of this impurity from the difference in the weight of silver chloride precipitated before and after ignition of the nitrate. S. B. Newbury has continued his research on the so-called subchloride of silver, and arrives at the conclusion that there is no satisfactory evidence of the existence of such a compound. From all that has been published concerning the action of sulphuretted hydrogen on acidified solutions of arsenic acid, it is evident that the composition of the precipitate varies with the conditions under which precipitation takes place. L. W. McCay supplies some further information on this subject by showing that when a solution of arsenic acid or an alkaline arsenate, strongly acidified with hydrochloric acid and saturated with sulphuretted hydrogen, is heated in a closed vessel at 100° for one hour, the arsenic is completely converted into pentasulphide, the precipitate thus formed containing neither trisulphide nor free sulphur.

We conclude our references to chemical subjects in this place with a brief notice of some of the analytical methods published during the past year. Dealing with Reinsch's test for arsenic, H. Hager recommends the use of brass foil in the place of copper, and gives full directions as to the manner in which it is best employed. He also shows that copper foil intended for this test need not be rejected on account of the presence in it of a trace of arsenic in the form of an alloy, since this is not attacked by hydrochloric acid. Zambelli and Luzzato effect the separation of arsenic and antimony by heating the freshly precipitated sulphides with hydrogen peroxide, which converts the arsenic into a solution of arsenic acid, and the antimony into an insoluble oxide. For the determination of arsenic in forensic investigations, F. Reich and T. Richter recommend a process based on the conversion of the arsenic into silver arsenate after previous destruction of the organic matter by evaporation with nitric acid and fusion of the residue with potassium nitrate and sodium carbonate. The disturbing effect of

carbolic acid and of salts of mercury in the detection of phosphorus by Mitscherlich's method is pointed out by M. Mankiewiez and K. Polstorff. For the purpose of separating phenol from organic substances in cases of suspected poisoning, G. Dragendorff prepares an extract by maceration with alcohol and evaporation at a low temperature and under reduced pressure. From the residue he removes fatty matters with petroleum benzin, and then extracts the phenol by repeated shaking with benzol, which solvent is finally allowed to evaporate in watch glasses. An analogous process is recommended by the same author for the separation of chloral, ether being employed in this case in the place of benzol. C. Ludeking shows that chloroform may be detected in the lungs of poisoned animals by the Ragsky method four weeks after death, and that the method gives trustworthy results. A new mode of detecting traces of hydrocyanic acid, suggested by G. Vortmann, is based on the formation of nitroprussides. New colour reactions for the detection of atropine, morphine, pseudomorphine, strychnine, strophanthin, kairine, antipyrin, and antifebrin have also been described, and are recorded in this volume. The well-known thalleioquin test for quinine is modified by E. Mylius by the substitution of potassium chlorate and sulphuric acid for chlorine water. New methods for the assay of quinine sulphate are never wanting, and each year furnishes its quota to the copious literature of this subject. L. Schäfer publishes a process which depends on the insolubility of quinine oxalate and the comparative solubility of the corresponding salt of cinchonidine. In O. Hesse's opinion this method is not less defective than the optical test in giving too high an indication of the amount of cinchonidine. De Vrij proposes to determine the quinine as chromate by precipitation with potassium chromate, and to estimate the cinchonidine in the filtrate with soda; but this process, too, is adversely criticised both by O. Hesse and B. H. Paul. The whole subject of quinine testing is dealt with in valuable contributions by the two last-named chemists, giving a critical review of all the principal tests in use. A test for the purity of chloral hydrate, recommended by A. Kremel, consists in the treatment of a weighed quantity of this substance with a known excess of a standard solution of sodium hydrate, and the subsequent titration with normal hydrochloric acid. The liberation of iodine from solution of potassium iodide by impure ether is traced by W. R. Dunstan and T. S. Dymond to the presence of hydrogen peroxide in the ether. Two new tests for sugar, for which extraordinary

delicacy is claimed, are described by H. Molisch, the reagents being alcoholic solutions of alpha-naphthol and of thymol respectively. It is stated that by means of these reactions the question of the normal occurrence of sugar in healthy urine has been unmistakably decided in the affirmative. H. Prunier criticises the nitric acid test for albumen, and shows that it cannot be relied on in cases where the other well-known tests fail to indicate the presence of this substance. New processes for the detection of blood and mercury in urine, and for the determination in the same liquid of uric and oxalic acids, have also been recommended. Among the contributions to the literature of food analysis which have found a place in this volume, we may mention reports on the detection of adulterations in butter, milk, sugar, flour, beer, wines, and alcoholic liquors.

As usual, a considerable number of new remedies have been proposed and old ones revived during the year. The root of the melon is reported by Heberger to possess emetic and purgative properties, which are attributed by Torosicviez to the presence of a powerful principle soluble in alcohol. In an article on the root bark of *Euphorbiaceæ*, E. Schmidt, referring more particularly to the species indigenous to France, states that the root bark of *E. Lathyris* is used as a purgative in doses of 1½ gram; that *E. Esula* is a hydragogue cathartic, and *E. Cyparissias* acts as an emeto-cathartic in doses of 0·60 to 1 gram. *Euphorbia Peplis* is recommended by Afonsky as a preventive of hydrophobia, the drug being given in the form of powder after cauterizing the wound with hydrochloric acid. The same therapeutic properties are claimed for the bark of *Spiræa Filipendula*, the roots of which were already used for the treatment of hydrophobia more than fifty years ago. The fresh root of *Echinacea angustifolia* is stated to produce an excessive flow of saliva and perspiration, and to be used by the Sioux Indians as a remedy for snake-bite. Strong stimulating properties are attributed by Pinet and Duprat to the root of *Remijia ferruginea*, the extract of which is found to cause a considerable increase of respiratory movements and of cardiac pulsation. The rhizome and rootlets of *Aletris farinosa*, a South American plant belonging to the order Hæmodoraceæ, are described as a tonic bitter, and recommended also in uterine disorders. *Eupatorium Ayapana*, the leaves of which were used in the early part of the present century in the treatment of indigestion, cholera, and pectoral complaints, is now again recommended for similar purposes. Attention is called by L. Naudin to the leaves of

Mutisia viciæfolia, a compositous plant indigenous to the western part of South America, on account of its local reputation as a remedy in phthisis and pulmonary diseases in general. Several species of *Heuchera* are recommended as valuable astringents, particularly in cases of diarrhœa. The alleged value of *Hamamelis Virginica*, as a styptic in cases of hæmoptysis, receives support from R. Pollock, who attributes its effect to a volatile oleo-resin combined with gallic acid. The horse-chestnut, *Æsculus Hippocastanum*, is again revived as a therapeutic agent, its leaves being recommended for the relief of whooping-cough, and its seeds for hemorrhoids. The galactagogue properties of jaborandi are confirmed by Chéron, who states that in order to produce this action the drug must be given in smaller doses than are necessary to cause salivation and diaphoresis. G. Foy reports that *Carduus Marianus* is now being received with professional favour in France, where the tincture and alcoholic extract are prescribed on account of their cholagogue properties. Similar properties are also ascribed by G. Armstrong Atkinson to the pulp of the fruit of *Cucumis Myriocarpus*, when given in non-emetic doses. Z. T. Emery directs attention to the toxic effects of the bark of *Robinia Pseudacacia*, and relates a case of the accidental poisoning of a number of boys who had chewed the bark, and were all seized with violent vomiting, followed by great depression. Since no constituent is known accounting for such action, a chemical examination of this bark appears very desirable. *Leucanthemum vulgare*, the common moon daisy, is stated to be capable of producing very irritating effects on the skin of certain individuals, chiefly those who suffer similarly from the poison of *Rhus Toxicodendron*. *Pulsatilla* is highly recommended by G. Smith as a valuable remedy in acute orchitis; and both *Thuja occidentalis* and *Anchieta salutaris* are favourably reported upon as antisyphilitics. The reputation enjoyed in India by the leaves of *Cassia alata* as a local remedy for the relief and cure of ringworm appears to be justified, since good results have recently been obtained with this plant in Paris by M. Conillebault.

F. S. Halsey gives a very favourable account of the value of *Piscidia Erythrina* as a hypnotic and anodyne, and states that it is free from the unpleasant after-effects so often induced by opium. The leaves of *Rubus Chamæmorus* have proved very useful as a diuretic in dropsy, while the value of *Equisetum hyemale* for the same purpose is called in question. *Agaricus albus* has been used with success for relieving the sweating of consumptive patients,

and the same result has been obtained with minute doses of agaric acid. The seeds of *Eugenia jambolana* are credited with the power of relieving thirst and exhaustion in diabetes. The cultivation of *Anacharis Canadensis* is stated by M. Brandes to have caused the disappearance of malaria and diarrhœa in a marshy district where these diseases formerly appeared yearly in a sporadic or epidemic form. *Parthenium Hysterophorus* is attracting increased attention as a febrifuge; and its alkaloid, parthenine, has also been tried with much success.

Two more synthetically prepared compounds have been added to the list of antipyretics. One of these, to which the name "antifebrin" is given, is acetanilid or phenylacetamide, a well-known chemical compound; while the other, introduced under the name of "antithermin," is phenylhydrazinlevulinic acid, or a compound of phenylhydrazin with acetopropionic (levulinic) acid.

A new adulteration of senega is described by C. Patrouillard, and shown to consist of the rootlets of *Ruscus aculeatus*. In an article on quillaia bark, F. B. Power supports the view, recently expressed by Kobert, that the valuable medicinal properties of this bark render it a desirable substitute for senega in affections for which the latter is indicated. Prof. Schrenk gives a description of some of the microscopic characters of the bark of *Rhamnus Purshiana*, by which this drug may be readily distinguished from the bark of *Rhamnus Frangula*. A spurious chiretta is reported upon by W. Elborne, and referred to *Ophelia alata*. A sample of saffron adulterated with tiny splinters of sandal wood is described by Niederstadt, who also mentions honey, glycerin, and salt as occasional adulterants of this drug. Italian aniseed is found by C. L. Lochman to contain an admixture of conium fruits, amounting on an average to 2·5 per cent. E. Heckel and F. Schlagdenhauffen call attention to a false kola nut, consisting of the kernel of the seed of *Heritiera littoralis*. They believe this to be an intentional adulteration due to the increasing demand for kola nuts. Under the name of "cali nuts," seeds have recently been met with in commerce which, according to E. Merck, present a great similarity to calabar beans. They may be distinguished from the latter by being rounder, their length but slightly, if at all, exceeding the breadth. The adulteration of pepper forms the subject of papers by C. Heisch, J. Campbell Brown, and N. Wender. Another spurious cubeb is described by W. Kirkby in a communication to the recent meeting of the British Pharmaceutical Conference. A report by J. O. Braithwaite, read at the

same meeting, deals with two species of vesicating beetles from South Africa, one of which is poorer and the other much richer in cantharidin than *Cantharis vesicatoria*. In another place the same author, in conjunction with E. H. Farr, describes a suspicious sample of cantharides which, upon examination, proved to have been exhausted.

A recent chemical investigation of *Lobelia inflata* by J. U. and C. G. Lloyd confirms the statement of von Rosen, as to the presence of two alkaloids in the seed; but the properties of the bases isolated by them differ somewhat from those previously described. E. Jahns reports that he has separated from Indian hemp a base which he has identified as choline, and points out that this result corresponds fairly well with the statements of some previous workers. The pharmacognosy and chemistry of *Strophanthus* is dealt with in two papers by W. Elborne, the contents of which, however, cannot be intelligibly summarized in the short space at our disposal in this place. Physiological experiments with various preparations of this drug lead H. D. Rolleston to the conclusion that the ethereal extracts contain some of the active principle upon which the potency of the alcoholic tincture depends. Attempts made by B. H. Paul to detect caffeine in the leaves of *Catha edulis* have proved unsuccessful; and the nature of the constituent to which this plant owes its stimulating properties remains still an open question. A further contradiction is given by C. J. Rademaker to the statement by H. Trimble and H. J. Schuchard, that the principle isolated by him from *Polygonum hydropiper*, and described under the name of polygonic acid, was a mixture of tannic and gallic acids. E. Schmidt shows that sumbul root does not contain angelic acid, as hitherto assumed, but that this acid is a decomposition-product of another substance pre-existing in the root. A preliminary investigation of Mackay beans, the seed of *Entada scandens*, by J. Moss, leads to the inference that they probably contain saponin. A recent examination of asafœtida by E. Schmidt reveals the curious fact that vanillin is one of the normal constituents of this gum-resin.

The assay of ipecacuanha root forms the subject of a communication to the British Pharmaceutical Conference by F. Ransom, and has for its leading feature the use of ammoniated chloroform as a menstruum for percolation. Further reports on the assay of opium are published by Braithwaite and Farr, C. M. Stillwell, V. Venturini, O. Schlicknm, H. Adrian and E. Gallois, E. Dieterich and C. Bullock.

The idea of standardizing pharmaceutical preparations containing powerful alkaloids has been extended by W. R. Dunstan and F. Ransom to the preparations of *Atropa Belladonna*. They recommend a process for the assay of these preparations, and give directions for preparing an extract containing two per cent., a liniment containing 0·2, and a tincture containing 0·034 per cent. of total alkaloids. A. C. Abraham has critically examined the official process for the preparation of fluid extract of cinchona bark, and arrives at the conclusion that, in order to obtain an extract representing as far as possible the bark from which it is made in an unaltered state, the latter should first be fully exhausted with water, and the residue then extracted with the acid menstruum. He considers boiling water preferable to cold, and states that the acid menstruum should be at least double the strength of that ordered by the Pharmacopœia. A report on medicinal extracts in general, by F. J. Lammer, gives the average yield of the finished products prepared in accordance with the directions of the U. S. Pharmacopœia. R. A. Cripps deals with the infusions of the British Pharmacopœia, and publishes tables showing the alterations in the present mode of their preparation as compared with the directions of the Pharmacopœia of 1867, as well as the influence of these alterations on the products. A good deal of attention has recently been devoted to the preparation of tincture of strophanthus. W. Martindale pleads in favour of a weaker tincture (1 in 20) than that obtained by Prof. Fraser's formula, and thinks that the seeds alone should be used, and should be first freed from their oil. These views are concurred in by J. Moss, and have also been adopted by Prof. Fraser himself, who has altered his original directions accordingly. Another modification of the formula for this tincture is suggested by W. Elborne, in his paper on strophanthus and strophanthin already referred to. H. Helbing calls attention to the difficulty of effecting a complete exhaustion of the seeds in the preparation of this tincture, and observes that the white strophanthus seeds yield a tincture similar in nature and colour to that from Kombé seeds.

The results of an examination of a number of samples of aromatic spirit of ammonia lead A. C. Abraham to infer that, although the official process is capable of giving very constant results, such results are not attained by first-class houses, from which most of the samples examined had been obtained. The use of Allen's nitrometer in the estimation of carbonate of ammonia in this spirit is advocated by E. D. Gravill.

In a note on *Liquor Strychniæ*, B. P., E. H. Farr draws attention to the liability of this preparation to deposit crystals of hydrochlorate of strychnine, if exposed to a low temperature, and thus to lose in strength.

Further suggestions respecting the mode of preparing Blaud's pills are published by W. Duncan, T. Thompson, P. Boa, and T. Maben. The formula recommended by the latter is practically identical with the one adopted in the Unofficial Formulary. Simple syrup is recommended by C. W. Holmes as the best excipient for making quinine pills, and simple cerate as a pill excipient adapted for readily decomposable or deliquescent substances. The subject of pill coating is dealt with by W. Gilmour and T. Thompson.

Linimentum terebinthinæ is stated by G. E. Perry to be obtained in a more satisfactory condition by using more soap and less water than the Pharmacopœia directs. T. Redwood, on the other hand, finds that the official formula yields a thick, permanent emulsion, well suited for its intended use, if prepared with a neutral or nearly neutral soap. M. Conroy also defends the official formula, but lays stress on the thoroughly perfect incorporation of the soap and water, and the very slow addition of the oil of turpentine, with constant trituration.

Dealing with the use of antiseptics for the preservation of solutions of alkaloids, R. G. Eccles arrives at the conclusion that boric acid is generally better suited for this purpose than salicylic acid, but that benzoic acid is preferable to both.

Nitrite of amyl and bromide of potassium are both recommended as antidotes to cocaine; urethane is stated to be an efficient antidote to strychnine, picrotoxin, and resorcin; and oil of turpentine is favourably reported upon as an antidote to phosphorus. The effects of chloral hydrate and butylchloral hydrate are found to be effectually counteracted by picrotoxin.

A new and, as we venture to anticipate, most welcome addition to the usual contents of this book has been made in the shape of an "Unofficial Formulary," compiled by a special committee appointed for this purpose by the British Pharmaceutical Conference.

CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I.

CHEMISTRY.

Preparation of Hydrogen and of Carbonic Oxide by means of Zinc-Dust. H. Schwarz. (*Ber. der deutsch. chem. Ges.*, xix. 1140.) Pure hydrogen may be conveniently obtained by heating a mixture of 20 grams of zinc-dust with 22·8 grams of calcium hydrate in a combustion tube. If in the place of the calcium hydrate 30 grams of calcium carbonate are used, the resulting gas is carbonic oxide.

Combustion of Carbonic Oxide. L. Meyer. (*Ber. der deutsch. chem. Ges.*, xix. 1099.) The author confirms Dixon's observation that a well dried mixture of carbonic oxide and oxygen requires a powerful spark and a tolerably high gas pressure for its explosion.

The Purification of Water by Alum. P. T. Austin. (*Chemical News*, July 23, 1886.) The author has further extended his experiments with this method of purification, and feels justified in very strongly recommending it. On an average two grains of alum to each gallon of water will efficiently clarify it by allowing the water thus treated to stand for forty-eight hours. The proportion of alum and the time for standing vary, however, with different waters, but may be easily determined for any particular case which may arise.

Action of Water on Lead. (*Pharm. Journ.*, 3rd series, xvii. 269.) In a report on the action of drinking water on lead, presented by Messrs. Crookes, Odling, and Tidy, to the Chemical Section of the British Association, it is stated that of a large number of first-class soft waters, all those which took up lead in passing through the service pipes contained less than two-tenths of a grain of silica per gallon, while those containing half a grain

or more per gallon did not take up any lead. This observation agrees with results obtained with soft water to which dialysed silica had been added. The reporters therefore believe that artificial silication would minimise to the utmost, and practically prevent, the action of the water on lead pipes, and thus effect a real hygienic improvement. The plan adopted in the Huddersfield works is to pass the water through tanks containing crushed flint, sand, and limestone, the surface of these materials being equal to one foot for every fifty-four gallons of water passing through per hour. Examination shows that considerable solvent action is exercised upon the flint, whilst the undesired action of the water upon the lead service pipes is prevented.

Occurrence of Free Iodine in a Mineral Water. J. A. Wanklyn. (*Chemical News*, liv. 300.) It has been known for many years that the water of the Woodhall Spa, near Lincoln, is exceptionally rich in bromides and iodides. In the course of an investigation, the author has made the observation that there is free iodine in this water sufficient to impart to it a brown colour of considerable depth of tint.

Upon shaking this water with bisulphide of carbon, the latter assumes the characteristic deep violet coloration.

The Woodhall Spa is known as a remedy in skin diseases.

Periodates. C. W. Kimmins. (*Proc. Chem. Soc.*, February 17, 1887.) The author, at the suggestion of Mr. Pattison Muir, has re-examined certain periodates of potassium, silver, and sodium, with the object of explaining the discordant results of various observers.

Besides the salt, $Na H_3 IO_6$, described by Langlois, he has obtained a sodium periodate of the formula $Na_3 H_2 IO_6$; he also describes a potassium periodate $K_3 H I_2 O_9$. He has prepared and analysed the following silver salts:—

$Ag_2 H IO_5$, dark brown.	$Ag IO_4$, bright yellow.
$Ag_2 H_3 IO_6$, dark red.	$Ag_4 I_2 O_9 . 3 H_2 O$, light yellow.
$Ag_3 H_2 IO_6$, slate-coloured.	$Ag_4 I_2 O_9 . H_2 O$, claret-coloured.
$Ag IO_4 . H_2 O$, orange.	$Ag_4 I_2 O_9$, chocolate-coloured.

Presence of Potassium Chlorate in Commercial Potassium Nitrate. H. Beckurts. (*Arch. der Pharm.* [3], xxiv. 333-337.) The author has noticed the presence of traces of potassium chlorate or perchlorate in nearly all samples of nitrate examined by him. The quantity of this impurity may be deduced from the difference in weight of silver chloride precipitated before and after ignition of the nitrate.

Potassium Manganite. M. Gläser. (*Monatsh. Chem.*, vii. 651–654.) The author has studied the action of potassium permanganate on sodium hyposulphite, and states that the potassium manganite formed in this reaction is a stable compound, which is not decomposed by cold or hot water. Numerous analyses confirm the correctness of the formula $KH_3Mn_4O_{10}$.

Compounds of Sodium and Potassium Hydrates with Water. C. Göttig. (*Ber. der deutsch. chem. Ges.*, xx. 543, 544, and 1094–1096.) The author describes compounds of the formulæ, $NaHO+2H_2O$; $2KHO+9H_2O$; and $2KHO+5H_2O$, which he has obtained from concentrated alcoholic solutions of the alkaline hydrates. For particulars as to their formation and properties, reference should be made to the above sources.

Explosive Properties of Sodium Hypophosphite. A. Cavazzi. (*Gazzetta chim. Ital.*, xvi. 172.) Sodium hypophosphite, when mixed with an equal quantity of sodium nitrate, forms a highly explosive mixture. The reaction probably takes place in accordance with the following equation: $NaH_2PO_2+2NaNO_3=Na_3PO_4+H_2O+NO_2+NO$.

Sodium Ferrocyanide. L. Pebal. (*Liebig's Annalen*, ccxxxiii. 165.) The author finds that this salt contains 10 molecules of water of crystallization, and not 12 as hitherto supposed.

Solubility of Lithium Carbonate. M. Bèvade. (*Bull. Soc. Chim.*, xliii. 123.) The author gives the following table, showing the solubility of lithium carbonate in 100 parts of water at different temperatures:—

0° C.	1·539 parts.
10° C.	1·406 ,,
20° C.	1·329 ,,
50° C.	1·181 ,,
75° C.	0·866 ,,
100° C.	0·728 ,,

Action of Sulphur upon Solution of Ammonia. J. B. Senderens. (*Comptes Rendus*, January 3, 1887.) Pure sulphur was digested with solution of ammonia in a closed vessel at about 12° C. After three weeks the liquid began to show a slight yellow tint, which passed gradually into a reddish yellow, and finally to a decided red. This liquid contained an ammoniacal polysulphide and a hyposulphite. On exposure to the air sulphur was deposited.

Ammonium Vanadates. A. Ditte. (*Comptes Rendus*, cii. 918–921.) In addition to the normal salt, $(NH_4)_2V_2O_6$, the author fully describes the sesquivanadate, $3V_2O_5, 2(NH_4)_2O$, the bivana-

date, $(N H_4)_2 O, 2 V_2 O_5$, and the trivanadate, $(N H_4)_2 O, 3 V_2 O_5$. For details, reference should be made to the original paper.

Compounds of Permanganates with Ammonia. T. Klobb. (*Comptes Rendus*, ciii. 384, 385.) Metallic permanganates form combinations with ammonia, from which the latter cannot be liberated by boiling with alkalies, owing to the formation of nitrites, unless the permanganate be first reduced by sulphurous acid. The silver salt, $Ag Mn O_4, 2 N H_3$, is obtained by saturating a solution of potassium permanganate with ammonia, and then precipitating with silver nitrate. It is a crystalline powder, which explodes when struck, and is decomposed on heating. Copper, cadmium, nickel, zinc, and magnesium form similar double salts.

Note on Lime-Water. J. I. Fraser. (*Pharm. Journ.*, 3rd series, xvii. 782.) The author obtained different results of estimations of lime in liq. calcis, prepared strictly according to the B. P. (by shaking the lime in a bottle, allowing it to subside, and siphoning off the clear liquid), and in that prepared in a jar by repeatedly stirring up the slaked lime with water, allowing it to subside, and filtering. The former showed an equivalent of 6·16 grains of Ca O in ten fluid ounces; the other, which had been filtered, 5·26 grains.

An examination of eighteen samples of lime-water, bought in the ordinary way, showed that 50 per cent. of them were below the standard of the Pharmacopœia.

Remarkable Feature in the Specific Gravity of Lime-Water. J. A. Wanklyn. (*Chemical News*, May 13, 1887.) The author has recently had occasion to take the specific gravity of lime-water, and has noticed an interesting peculiarity. According to determinations in his laboratory, a litre of lime-water contains 1·344 grams of Ca O, and the specific gravity of the lime-water reaches the extraordinary figure, 1002·35, compared with distilled water at the same temperature (13° C.), reckoned as 1000·00.

It follows from these observations that in the formation of lime-water a most extraordinary contraction takes place.

Before solution:—

Ca O . . .	0·5 c.c. =	1·344 grams.
$H_2 O$ . . .	1001·0 c.c. =	1001·0 ,,

which contract so as to occupy one litre.

The contraction is, therefore, equal to three times the volume of the lime passing into solution.

The purity of the lime-water was ascertained by exactly pre-

cipitating the lime by means of its equivalent of oxalic acid, filtering, and evaporating the filtrate to dryness; the residue was so small as to be insignificant.

Action of Dry Carbonic Anhydride on the Alkaline Earths and their Hydrates. C. Scheibler. (*Ber. der deutsch. chem. Ges.*, xix. 1973–1982.) Dry carbonic anhydride is without action on the dry oxides and monohydrates of the metals of the alkaline earths.

When dry carbonic anhydride is passed over the normal hydrates of these metals at 100°C. in the presence of moisture the excess of water present will be removed, and the gas thus moistened will act on the hydrate, with formation of carbonate. The hydrate is, however, not completely converted into carbonate, even when 8 molecules of H_2O are present; and for this reason the use of the dry gas in removing water from alkaline earths and converting the latter into carbonates cannot be employed as an analytical method.

Ammonio-Ferrocyanides of Calcium and Magnesium. T. Salzer. (*Ber. der deutsch. chem. Ges.*, xix. 1697.) Strong solutions of calcium chloride, containing a large proportion of ammonium chloride, form with potassium ferrocyanide a crystalline precipitate corresponding to the formula $(NH_4)_2 Ca Fe Cy_6$. Magnesium salts, under the same conditions, behave in a similar manner.

The Composition of Prussian Blue and Turnbull's Blue. E. F. Reynolds. (*Proc. Chem. Soc.*, June 2, 1887.) These compounds are generally represented by the formulæ $Fe_7 Cy_{18}$ and $Fe_5 Cy_{12}$; but Reindel and others have conjectured that they are identical in composition. The author has carefully prepared Prussian blue from hydrogen ferrocyanide and ferric chloride, and Turnbull's blue from hydrogen ferricyanide and ferrous sulphate; his analyses of the products show that the above formulæ are correct expressions of their composition.

Chromates. A. Stanley. (*Chemical News*, liv. 194–196.) The salts described in this paper are sodium bichromate, sodium trichromate, magnesium sodium chromate, and a copper salt of the formula $Na_2 Cr O_4$, $Cu Cr_2 O_7$, $2 Cu O + 4 H_2 O$.

Solubility of Silver Chromate in Alkaline Nitrates. R. F. Carpenter. (*Journ. Soc. Chem. Ind.*, v. 286.) The subjoined table gives the results of some experiments made to determine the relative solubility of silver chromate in cold and hot strong solutions of the nitrates of potassium, sodium, ammonium, and magnesium :—

	One-tenth Normal Silver Nitrate added.		Grains of Silver Chromate dissolved in hot solution.
	10°C.	100°C.	
Pure Water	0·05 c.c.	0·25 c.c.	0·064
Sodium Nitrate	0·05 ,,	0·25 ,,	0·064
Potassium Nitrate . . .	0·10 ,,	0·75 ,,	0·192
Ammonium Nitrate . . .	0·07 ,,	1·25 ,,	0·320
Magnesium Nitrate . . .	0·35 ,,	1·00 ,,	0·256

50 grains of each of the above salts were dissolved in 100 c.c. of water, and the amount of decinormal silver nitrate solution taken to obtain the reaction with potassium chromate is given in the table. In the last three cases the author has deducted the amount of silver chromate dissolved by the water alone, and has given the amount due to the solvent action of the respective nitrates. From all these solutions the silver chromate crystallized out again on cooling.

Silver containing Bismuth. W. Gowland. (*Proc. Chem. Soc.*, March 17, 1887.) An account is given of assays and metallurgical experiments made with the object of determining the effects produced by the presence of small quantities of bismuth on the ductility of silver, and on the uniformity of composition of silver bullion when in ingots of the form and size ordinarily met with in commerce. It was found: α That when silver is obtained from copper containing bismuth by the liquation process, with subsequent cupellation of the argentiferous lead, it contains part of the bismuth which was present in the copper; β that this silver is brittle, even when containing bismuth in but small amounts; γ that ingots of such silver are not uniform in composition throughout their mass, the parts which have solidified last being richer in silver than the others; and δ that when coinage bars of 900° millesimal fineness are prepared from it, they cannot be rolled without special treatment, and even then are hard and unsuitable for mintage.

Silver Subchloride. S. B. Newbury. (*Amer. Chem. Journ.*, viii. 196.) The author has continued his research on the so-called subchloride of silver (compare abstract, *Year-Book of Pharmacy*, 1886, p. 35), and arrives at the conclusion that there is no satisfactory evidence of the existence of such a compound.

Silver Carbonate. G. S. Johnson. (*Chemical News*, liv. 75.) Silver hydroxide suspended in water and exposed to the air in a loosely covered vessel was found after two months to have deposited large, glistening, yellow, prismatic crystals of silver

carbonate. These melt at a low red heat, and soon afterwards decompose rapidly, with the evolution of abundance of gas. Silver carbonate precipitated from solutions by means of sodium carbonate is amorphous, but resembles the crystalline form in other properties. 1 litre of water saturated with carbonic anhydride at 15°C. dissolves 0·846 gram of pure precipitated silver carbonate, and when this solution is exposed to the air for twelve hours, a yellow precipitate of crystalline silver carbonate separates.

Silver Phosphates and Arsenates. A. Joly. (*Comptes Rendus*, ciii. 1071–1074. From *Journ. Chem. Soc.*) Precipitated and amorphous silver phosphate dissolve in phosphoric acid solution, the solubility increasing with the concentration of the acid and the temperature. If a liquid containing less than 38 parts of phosphoric anhydride to 100 parts of water is saturated with silver phosphate at 80°, and allowed to cool, it deposits tri-silver phosphate in pale yellow rhombic dodecahedrons modified by faces of the icositetrahedron. The mother-liquor deposits no more crystals on standing, but will dissolve a further quantity of amorphous silver phosphate if heated, and thus the same solution of phosphoric acid can be used for the crystallization of an unlimited quantity of silver phosphate.

If the solution contains 40 parts of phosphoric anhydride to 100 parts of water, it deposits di-silver hydrogen phosphate, $Ag_2 H P O_4$, in colourless crystals derived from an hexagonal prism. They generally form long prisms with rhombohedral terminations. In contact with water or alcohol they become yellow, and decompose into tri-silver phosphate and phosphoric acid, but they are not affected by ether. If the concentration of the phosphoric acid solution differs much from the strength given, the product is a mixture of crystals very difficult to purify.

When the crystals of di-silver hydrogen phosphate are heated to 110–150°, they yield silver pyrophosphate, $Ag_4 P_2 O_7$, which can also be obtained by heating the syrupy solution of the silver phosphate to the same temperature. Hurtzig and Geuther obtained the same compound by adding ether to the solution which had been heated. The pyrophosphate is not, however, formed in the wet way, as these authors supposed, since under the given conditions of concentration, the fused acid salt, and not its solution, is decomposed. The experiment simply shows that di-silver hydrogen phosphate yields the pyrophosphate at a lower temperature than that at which phosphoric acid is converted into pyrophosphoric acid.

Silver arsenate is much less soluble than the phosphate in the free acid. If the solution contains less than 70 parts of arsenic anhydride to 100 parts of water, the solution saturated with amorphous silver arsenate at 80° deposits very brilliant, black, opaque crystals of tri-silver arsenate, which are unmodified rhombic dodecahedra.

A solution of arsenic acid of the composition $H_3 As O_4 + H_2 O$, when saturated with silver arsenate, yields white monoclinic crystals of silver dihydrogen arsenate, a compound which is very readily prepared. It is decomposed into tri-silver arsenate and arsenic acid by a trace of water, and if heated to 100° yields silver metarsenate in the form of a white powder, which absorbs water very slowly. Before losing water, the crystals of the acid salt become red, probably owing to the formation of arsenic acid and di-silver hydrogen arsenate, $Ag_2 H As O_4$. In fact, if a solution from which silver dihydrogen arsenate will crystallize is saturated with silver arsenate at a temperature a little below 100°, it deposits orange-red hexagonal prisms with rhombohedral terminations. Their form agrees with that of di-silver hydrogen phosphate, and indicates that they are di-silver arsenate, but they could not be purified.

When a syrupy solution of silver arsenate in arsenic acid is heated above 100°, it yields a white granular powder similar in appearance to the compound $Ag_2 O, 2 As_2 O_5$, described by Hurtzig and Geuther.

Arsenic Pentasulphide. L. W. McCay. (*Chemical News*, liv. 287.) When a solution of an alkaline arsenate, strongly acidified with hydrochloric acid and saturated with sulphuretted hydrogen, is heated in a closed vessel at 100° for one hour, the arsenate is completely converted into pentasulphide. It contains no trisulphide, and, if due precautions have been taken to exclude air, no free sulphur. Pure arsenic pentasulphide is lemon-yellow in colour, does not yield any sulphur to carbon bisulphide, and dissolves in ammonia without separation of sulphur. When the ammoniacal solution is agitated with silver nitrate, and filtered, a clear filtrate is obtained, from which nitric acid precipitates silver arsenate. The formation of arsenic pentasulphide in this manner confirms Bunsen's results, he having obtained it by the action of sulphuretted hydrogen on hot solutions of arsenic compounds.

Combination of Stannic Chloride with Hydrochloric Acid. R. Engel. (*Comptes Rendus*, July 19, 1886.) The compound obtained by the author is a chlorostannic acid, corresponding in its composition to chloroplatinic acid.

Preparation of Cuprous Chloride. A. Cavazzi. (*Gazz. chim. Ital.*, xvi. 167.) This salt may be very readily obtained by heating 4 grams of copper sulphate with 2 grams of sodium hypophosphite, and about 50 c.c. of water acidified with 30 drops of fuming hydrochloric acid. Copper hypophosphite is first formed, which is then acted upon by the hydrochloric acid, yielding cuprous chloride and phosphorous acid. The product thus deposited may be purified in the usual way.

Higher Oxides of Copper. T. B. Osborne. (*Amer. Journ. Sc.* [3], xxxii. 333.) The hydrated oxides of copper which have been described as resulting from the action of hydrogen peroxide on cupric hydrate, are found by the author to be mere mixtures, in different proportions, of cupric hydrate with the brown dioxide, $Cu O_2, H_2 O$.

Mercurous Sulphate. G. Buehner. (*Chem. Zeit.*, x. 759, 760, and 790, 791; *Journ. Chem. Soc.*, 1886, 852.) Mercurous sulphate was exposed under various conditions to air, light, moisture, and darkness: numerical data are given from observations extending over three years, and it is shown that light acts to a certain extent on this salt, but nevertheless when exposed under the most adverse conditions, the change produced—the decomposition extending only in one case to 14 per cent. of the mercurous sulphate—was never so great as to justify the classification of this salt amongst the very unstable compounds. It is best preserved in a moist state in presence of metallic mercury; or if dry it should fill a well-stopperd bottle and should be kept in the dark. The change into mercury and mercuric sulphate is reversed by the action of water, therefore for electrical purposes the slight decomposition of mercurous sulphate is of no consequence. For analysis, the mixture of mercurous and mercuric sulphates is digested with dilute hydrochloric acid; the mercuric salt remains in solution whilst the mercurous salt is precipitated as chloride. In the presence of mercury, the mercuric sulphate is also changed into mercurous chloride; therefore when such a change would be detrimental to the results required, titration with iodine and potassium iodide is resorted to. Treating the mixture with water, and observing the formation of yellow $Hg S O_4, 2 Hg O$, does not answer with less than 10 per cent. of mercuric salt present.

Ammonio-Mercuric Chromates. C. Hensgen. (*Rec. Trav. Chim.*, v. 187–198.) On dissolving mercuric oxide in ammonium dichromate, Hirzel obtained a compound to which the formula $(N Hg_2, H_2 O)_2, 4 Hg Cr O_4$, was ascribed, although based only on

determinations of the mercury and chromium. In this paper, it is shown that mercuric oxide dissolves readily in a saturated solution of ammonium dichromate; golden, crystalline leaflets or needles separate out; these are insoluble in water, alcohol, and ether, very soluble in hydrochloric acid, but only sparingly soluble in dilute nitric or sulphuric acid. Analytical results showed the atomic ratio, Hg : N : Cr=1 : 2 : 2; and that three-fourths of the total nitrogen was in the form of ammonium, and the remainder in an amido-group, results which point to the composition $(N Hg_2, H_2 O)_2$, $Cr_2 O_7$ 3 $(N H_4)_2 Cr_2 O_7$. These crystals when treated with excess of ammonia yield a canary-yellow powder, which no longer contains nitrogen in the form of ammonium, and to which the formula $(N Hg_2, H_2 O)_2 Cr O_4$ is ascribed. If mercury chromate be digested with a warm, concentrated solution of ammonium dichromate, a brown solution is obtained, from which, on pouring into an excess of cold water, a yellow powder is deposited; the composition of the substance is $(N Hg_2, H_2 O)_2 Cr O_4$, the analogue of the selenate, $(N Hg_2, H_2 O)_2 Se O_4$.

Platinum Salts. E. Prost. (*Bull. de la Soc. Chim.*, xlvi. 156–160.) An acid solution of platinic sulphate, absolutely free from nitric acid, after standing for several days, yields an abundant brick-red precipitate, having the composition $Pt S O_4 (O H)_2$, 4 $Pt (O H)_4$, 3 $H_2 O$, the liquid becoming almost colourless; if, however, the solution of the sulphate is boiled, a precipitate having the composition $Pt_8 S O_4 O_{13}$, 16 $H_2 O$, is formed.

Double sulphates of platinum and the alkali-metals were prepared by mixing cold concentrated aqueous solutions of the alkaline and platinic sulphates, the latter being in excess; they are all pulverulent brown substances, the ammonium and rubidium compounds being soluble in water, whilst those of potassium are insoluble. The salts prepared were:

$$2 (N H_4)_2 S O_4, Pt_8 (S O_4)_3 + 25 H_2 O; \quad Pt_6 Rb_6 (S O_4)_4 + 17 H_2 O;$$
$$3 K_2 S O_4, Pt_{10} O_{10} (S O_4)_2 + 34 H_2 O;$$
$$5 K_2 S O_4 Pt_{18} O_{22} S O_4 + 34 H_2 O.$$

Germanium, the New Element. C. Winkler. (*Journ. pract. Chem.*, [2] xxxiv. 177–229; from *Journ. Chem. Soc.*, 1886, 985; compare also *Year-Book of Pharmacy*, 1886, 19.) Germanium is obtained by heating finely powdered argyrodite with calcined sodium carbonate and flowers of sulphur at a moderate red heat. The product is extracted with water, and the solution treated with the exact amount of sulphuric acid necessary to decompose the

whole of the sodium sulphide present. After being left for a day, the solution is separated from the precipitate consisting of sulphur, and arsenic and antimony sulphides, and treated with hydrochloric acid so long as a precipitate is formed. The whole is then saturated with sulphuretted hydrogen, filtered, and the white voluminous precipitate of germanium sulphide washed with 90 per cent. alcohol saturated with sulphuretted hydrogen. The sulphide is roasted at a low temperature, warmed with strong nitric acid, and the oxide so obtained ignited; it is then reduced.

Germanium melts at about 900°, and volatilises at a temperature slightly above its melting point. On cooling, it crystallizes in octahedra. It is very brittle, and can be readily powdered. It has a metallic lustre, and is whiter than zirconium. Sp. gr.= 5·469 at 20·4°. When a drop of the fused metal is allowed to fall on to paper, it divides itself into several globules, which move continually over the surface of the paper. The metal is converted by nitric acid into a white oxide; it is soluble in sulphuric, but not in hydrochloric acid. The atomic weight of germanium is 72·32; the number 72·28 was obtained from measurements of the wave-lengths of the most brilliant lines of the spectrum. Determinations of the specific heat of germanium made by Nilson and Petterson, at temperatures from 100 to 440°, point to the number 0·0758; the atomic heat is 5·48. The specific heat of germanium dioxide is 0·1293.

Germanious oxide, Ge O, is obtained by boiling germanious chloride with caustic potash; a *hydroxide*, probably Ge $(H O)_2$, is first formed, and this is converted into the oxide by heating it in a current of carbonic anhydride. It forms a greyish black powder, readily soluble in hydrochloric acid; the solution so obtained yields a yellow precipitate when treated with alkali, and white and reddish brown precipitates with potassium ferrocyanide and with sulphuretted hydrogen respectively. It reduces permanganates to manganates, and precipitates gold and mercury from solutions of their salts.

Germanium dioxide, $Ge O_2$, is formed when germanium is burned in oxygen, and may be obtained in the pure state by decomposing the chloride with water. It is a dense white gritty powder; sp. gr.=4·703 at 18°. It dissolves in 247·1 parts of water at 20°, and in 95·3 parts at 100°, and separates in microscopic rhombic or rhombohedric crystals. The aqueous solution has an acid taste. It dissolves readily in alkaline hydrates and carbonates when fused with them.

Germanious sulphide, Ge S, is obtained in splendid thin plates by heating the disulphide in a slow current of hydrogen. The crystals are greyish-black, and have an almost metallic lustre, but are quite transparent, and are red in transmitted light. When heated in presence of air, it is converted into the dioxide. It dissolves readily in warm potash, leaving a residue of metallic germanium as a microscopic crystalline powder. When the solution is treated with sulphuretted hydrogen, the sulphide separates as a reddish brown amorphous precipitate.

Germanium disulphide, $Ge S_2$, is best prepared by precipitating a solution of the dioxide with sulphuretted hydrogen in presence of much free mineral acid, and washing the white precipitate so obtained with alcohol saturated with sulphuretted hydrogen; it is then washed with ether, and dried in a vacuum. If the sulphide is washed with water until free from acid, and then put into water, it yields an emulsion which requires several weeks to become clear; the liquid appears then to contain the sulphide in a colloïdal state, and after repeated filtration contained one part in 221·9 parts of water. The solution in water decomposes quickly, with evolution of sulphuretted hydrogen. The disulphide dissolves readily in alkaline hydrosulphides, probably with formation of sulpho-salts.

Germanious chloride, $Ge Cl_2$, is obtained by passing hydrochloric acid over heated germanium or its sulphide. It forms a colourless thin liquid, boiling at about 72°. The low boiling point indicates the possibility of the substance being a compound, $Ge H Cl_3$, corresponding with silicium chloroform, the compound not yet having been analysed.

Germanic chloride, $Ge Cl_4$, is prepared by the direct combination of germanium and chlorine; the product of the reaction is shaken with mercury and distilled. It may also be prepared by heating germanium with eight times its weight of dry mercuric chloride. It forms a thin, colourless liquid boiling at 86°; sp. gr.=1·887 at 18°. When exposed to air, it fumes considerably, but less than the dichloride. Water decomposes it with formation of an oxide; the reaction gives rise to considerable development of heat. When a mixture of germanium chloride with hydrogen is passed through a red hot tube, germanium is deposited on the wall of the tube; the reduction is, however, only partial.

Germanic iodide, $Ge I_4$, is best prepared by heating germanium in a current of carbonic anhydride containing iodine vapour. The reaction takes place with much less ease than in the case of the

chloride, and the product always contains free iodine, even when an excess of the metal is present. It is an orange-coloured substance, which melts at 144°, and boils between 350° and 400°; the vapour is yellow, and is inflammable; when mixed with air and ignited it detonates feebly. It is very hygroscopic. In determining the vapour-density, it was found that this compound does not dissociate at 440°, but that it does so considerably at 658°.

Germanium is most readily identified by the formation of the white sulphide when its alkaline solution is treated with ammonium sulphide, and subsequently with a large excess of hydrochloric acid. The quantitative estimation is also carried out by means of the sulphide, which is then converted into the oxide.

The atomic weight and the properties of germanium show that it is identical with Mendeléeff's ekasilicon, occupying the position between gallium and arsenic in the periodic arrangement of the elements.

Action of Acids and Bases on Solutions of Tartar Emetic. M. Guntz. (*Comptes Rendus*, cii. 1472–1474. From *Journ. Chem. Soc.*) When a dilute solution of tartar emetic is mixed with an equivalent quantity of hydrochloric acid, the whole of the antimony is not precipitated, and the precipitate is not antimony hydrate. With one equivalent of hydrochloric acid, 10·5 per cent. of the total antimony is precipitated, and the amount increases with the proportion of acid until sixteen equivalents precipitate 58 per cent. Precipitation is diminished by diluting the solution of tartar emetic, and is increased by a rise of temperature. The precipitate contains tartaric acid, chlorine, and antimony oxide in proportions which vary with the conditions of precipitation and washing. The quantity of antimony precipitated by sulphuric acid is even less than by hydrochloric acid.

It is most probable that when tartar emetic is mixed with hydrochloric acid, potassium chloride and antimony hydrogen tartrate are formed. The latter is decomposed by water into tartaric acid and basic antimony tartrate, which is acted on by the excess of hydrochloric acid, with formation of the oxychloride, $Sb_4O_5Cl_2$. This view is confirmed by the behaviour of barium antimony tartrate. If this salt is treated with an equivalent quantity of sulphuric acid, pure barium sulphate is precipitated, and pure antimony hydrogen tartrate remains in solution. If now this solution is mixed with hydrochloric acid, basic antimony tartrate, containing chlorine, is precipitated; if, on the other hand, dilute sulphuric acid is mixed with a corresponding quantity of solid

barium antimony tartrate, the barium sulphate which is formed always contains tartaric acid and antimony oxide, in proportions which vary with the dilution and the temperature.

When a solution of tartar emetic is mixed with two equivalents of potassium hydrate, 96 per cent. of the antimony is precipitated, and any variation from this proportion of potash is accompanied by a diminution in the amount of antimony thrown down. With one-fourth equivalent, only 23 per cent. of the antimony is precipitated, whilst with sixteen equivalents the precipitate is completely re-dissolved. The potassium hydrate forms normal potassium tartrate and antimony oxide, and the latter combines with the excess of alkali, forming a soluble antimonite.

Aromatic Antimony Compounds. A. Michaelis and A. Reese. (*Liebig's Annalen*, ccxxxiii. 39–60. From *Journ. Chem. Soc.*) After referring to the various researches on organic antimony compounds by Loewig and Schweitzer (*Annalen*, lxxv. 315), Hofmann (*Ibid.*, cviii. 357), Landolt (*Ibid.*, lxxviii. 91, lxxxiv. 44), Buckton (*Journ. Chem. Soc.*, 1860, 15), and others, the authors describe the preparation of triphenylstibine by the action of sodium on a solution of antimony trichloride and chlorobenzene in benzene. The product of the reaction is filtered, the residue repeatedly extracted with benzene, and the extract added to the original filtrate; on evaporation, triphenylstibine, mixed with triphenylstibine chloride, is deposited. The product is purified by treatment with alcohol mixed with strong hydrochloric acid, the residue being washed with alcohol, dried and transferred to a flask containing light petroleum. Chlorine is passed over the surface of the solution until no further precipitate is produced, and the precipitate is then washed with petroleum, and recrystallized from boiling alcohol. The chloride thus obtained is dissolved in alcoholic ammonia, treated with sulphuretted hydrogen, and the precipitated stibine dried and recrystallized from a mixture of alcohol and ether.

Triphenylstibine, $SbPh_3$, forms colourless triclinic plates, which are highly refractive; $a : b : c = 0{\cdot}69695 : 1 : 0{\cdot}88938$; $\alpha = 100° 37' 50''$; $\beta = 103° 36' 50''$; $\gamma = 75° 25' 0''$; sp. gr. = 1·4498 at 12°. It is freely soluble in ether, benzene, glacial acetic acid, light petroleum, carbon bisulphide, and chloroform. It melts at 48°, and boils at 360° with slight decomposition. Triphenylstibine unites directly with chlorine, bromine, and certain metallic chlorides, for instance cupric chloride. It decomposes mercuric chloride, forming antimony trichloride and mercuric phenyl

chloride. Triphenylstibine readily dissolves in strong nitric acid, and the solution deposits crystals of triphenylstibine nitrate, $Ph_3 Sb (N O_3)_2$ (m.p. 156°).

The *dichloride*, $Ph_3 Sb Cl_2$, forms long slender needles, melts at 143°, and is soluble in benzene and carbon bisulphide. It is not decomposed by water, and is slowly acted on by aqueous solutions of alkalies. Alcoholic potash converts it into the hydroxide.

The *dibromide* is prepared by adding bromide to a solution of triphenylstibine in glacial acetic acid. It melts at 216°, and dissolves freely in benzene, carbon bisulphide, and hot acetic acid. The *iodide*, $Ph_3 Sb I_2$, crystallizes in glistening tables; it melts at 153°, and dissolves freely in benzene. The *hydroxide*, $Ph_3 Sb (O H)_2$, melts at 212°; it is soluble in alcohol.

When a mixture of triphenylstibine and methyl iodide is heated at 200°, a brick-red powder is produced, which appears to be identical with the polymeric modification of trimethylstibine iodide observed by Landolt (*J. pr. Chem.*, lxxxiv. 336). Attempts to prepare zinc phenyl by the action of pure zinc methyl on triphenylstibine were unsuccessful.

In the preparation of triphenylstibine, *diphenylstibine chloride*, $Ph_2 Sb Cl_3$, is obtained as a by-product. The yield may be increased by diminishing the quantity of sodium used in the reaction. The crude product is extracted with alcohol mixed with hydrochloric acid, and the residue left on evaporating this extract is repeatedly boiled in dilute hydrochloric acid; on cooling, the solution deposits needle-shaped crystals of the chloride containing 1 mol. $H_2 O$. Diphenylstibine chloride melts at 180°; it is insoluble in water.

Diphenylstibic acid, $Ph_2 Sb O{\cdot}O H$, is obtained as a white precipitate when ammonia is added to an alcoholic solution of the chloride. The acid dissolves in acetic acid, and in sodium hydroxide solution.

Influence of Heat on the Decomposition of Oxalic Acid by Ferric Chloride. G. Lemoine. (*Bull. de la Soc. Chim.*, xlvi. 289–294.) The author has studied the action of heat on the progress of the reaction $Fe_2 Cl_6 + H_2 C_2 O_4 = 2 Fe Cl_2 + 2 H Cl + 2 C O_2$, employing for his experiments equal volumes of solutions containing the two substances named in equivalent proportions. Little or no action took place on heating this mixture in the dark to below 50° C; but at higher temperatures the action was very marked. At 100° C., the evolution of $C O_2$ was very rapid at the beginning, decreasing gradually afterwards; the

decrease being proportional to the decrease of undecomposed oxalic acid in the mixture. The evolution of gas was much increased by dilution with water. Dilution with normal oxalic acid greatly increased the rate of reaction until sufficient of the acid had been added to form an acid ferric oxalate, but further addition of the acid decreased the speed of the action. On the whole the influence of heat seemed to be similar to that of light.

Zinc Salicylate. F. H. Alcock. (*Pharm. Journ.*, 3rd series, xvii. 226). The author's examination of samples tends to show that this salt, as met with in commerce, is not of constant composition, and also differs much with regard to solubility and general characters.

Substitution-Products of Salicylic Acid. E. F. Smith and E. B. Knerr. (*Amer. Chem. Journ.*, viii. 95–101.) The compounds described by the authors are dichlorosalicylic acid, metachloriodosalicylic acid, and two metanitrosalicylic acids. For particulars the reader is referred to the original paper.

Preparation of Salol. C. Kolbe. (*Pharm. Zeitung*, 1886, 544.) Salol is prepared by heating together equivalent quantities of sodium salicylate and sodium carbolate in the presence of phosphorus pentachloride, the end products being sodium chloride, phosphoric anhydride, and salol.

Action of Hydrogen Peroxide on Benzoic Acid. M. Hanriot. (*Comptes Rendus*, cii. 1250–1251. From *Journ. Chem. Soc.*) When benzoic acid is dissolved in 5–10 times its weight of sulphuric acid, and gradually mixed with 3 times its weight of a 200 vol. solution of hydrogen peroxide also dissolved in sulphuric acid, an energetic reaction takes place. When the product is diluted with water and distilled in a current of steam, unaltered benzoic acid first passes over, and then a mixture of benzoic and salicylic acids. These two acids are separated by neutralizing with barium carbonate, filtering, and boiling the filtrate with an excess of baryta solution, when the salicylic acid is precipitated in the form of a basic barium salicylate. A small quantity of another acid is produced, which is more soluble in water than salicylic acid, gives a wine-red coloration with ferric chloride, is turned brown by alkalies and even by ammonium carbonate in presence of air, and dissolves in concentrated sulphuric acid, forming a red solution.

When weaker hydrogen peroxide solution acts on a sulphuric acid solution of benzoic acid at 200°, the liquid contains a certain quantity of phenol, but no salicylic acid. It would seem, therefore, that at a high temperature parahydroxybenzoic acid is

produced, but it is also possible that the phenol is a product of the alteration of salicylic acid at the high temperature.

Presence of Cinnamic Acid in Plants belonging to the Order Ericaceæ. J. F. Eykman. (*Rec. Trav. Chim.*, v. 297, 298.) From the leaves of the *Enkianthus Japonicus*, an ornamental plant in Japanese gardens, the author has extracted by means of chloroform a crystalline substance, proved by analysis and physical properties to be cinnamic acid.

Benzylamine. T. Curtius and G. Lederer. (*Ber. der deutsch. chem. Ges.*, xix. 2462, 2463.) When benzaldehyde and amidoacetic acid are heated together at 130°, carbonic anhydride is evolved and benzylamine formed.

The Reduction of Nitrites to Hydroxylamine by Sulphuretted Hydrogen. E. Divers and T. Haga. (*Proc. Chem. Soc.*, 1886, No. 28.) On decomposing silver nitrite with sulphuretted hydrogen hydroxylamine is formed as the chief product. Mercurous nitrite, supposed hitherto not to exist, has been prepared by the authors, and will be described in a future communication; it also yields hydroxylamine on treatment with sulphuretted hydrogen. In a preliminary note reference was made to the production of yellow crystals of unknown nature, together with metallic mercury and hydroxylamine, on treating mercurous nitrate with nitric oxide. Having since prepared mercurous nitrite, the authors have now learned that these yellow crystals were this salt; and having ascertained that sulphuretted hydrogen converts it partly into hydroxylamine, they further recognised that the apparent formation of this base from mercurous *nitrate* and *nitric oxide* had really been its formation from mercurous *nitrite* and the *hydrogen sulphide* used to remove the mercury from the solution, as mercurous nitrate is soluble in nitric acid with but partial decomposition. The green solution prepared by mixing an alkaline nitrite with copper sulphate also yields hydroxylamine when treated with sulphuretted hydrogen. Alkaline nitrites alone, treated with sulphuretted hydrogen and then acidified, yield no hydroxylamine. The formation, here described, of hydroxylamine from the nitrites of the silver-mercury group of metals, is the only indisputable evidence there yet is of the conversion of an inorganic nitrite into hydroxylamine.

Derivatives of Thymol. G. Mazzara and G. Discalzo. (*Gazzetta chim. Ital.*, xvi. 195–197.) The derivatives dealt with by the authors are bromonitrothymol, bromonitrosothymol, and bromamidothymol. For particulars the original paper must be referred to.

Derivatives of Cymene. G. Mazzara. (*Gazzetta chim. Ital.*, xvi. 191–195.) A description is given in this paper of amidobromocymene, bromhydroxycymene, and several nitrobromo-derivatives of cymene. These compounds were prepared by the author in the course of some experiments made with the object of transforming derivatives of thymol into those of carvacrol.

Constitution of Safrole. T. Poleck. (*Ber. der deutsch. chem. Ges.*, xix. 1094–1098.) Further researches respecting the constitution of this body have induced the author to adopt Eykman's formula, $C_3H_5.C_6H_3(OH).OMe$, in place of the one previously proposed by himself (*see Year-Book of Pharmacy*, 1885, 209).

Terpinol. G. Bouchardat and R. Voiry. (*Comptes Rendus*, April 4th, 1887.) The authors conclude that the substance known as terpinol is a mixture. They have separated from it a compound which they name *terpol;* this forms five-sixths of the whole, and is either identical or isomorphous with caoutchine monohydrate. The second product requires further examination.

Menthol Derivatives. G. Arth. (*Ann. Chim. Phys.* [6], vii. 433–499.) The derivatives described in this paper are oxymenthylic acid and some of its compounds, β-pimelic acid, menthol-urethane, menthyl urethane, methyl carbonate, menthyl benzoate, normal and acid methyl succinate, and the normal and acid menthyl orthophthalate. For particulars reference should be made to the original paper, which is not suited for useful abridgment.

Cinchol. O. Hesse. (*Liebig's Annalen*, ccxxxiv. 375–379.) A further comparison of the properties of cinchol and Liebermann's oxyquinoterpene, or cholestole, confirms the author's previously expressed opinion (abstract, *Year-Book of Pharmacy*, 1886, 173), that these two substances are identical.

Terebenthene Derivatives. L. Pesci and N. Bettelli. (*Archiv der Pharm.* [3], xxiv. 1037.) The preparation of the hydrocarbon phellandrene, of nitro-phellandrene, phellandrendiamine, and amidophellandrene, from *Oleum phellandrii* has been recently described by one of the authors. Subsequently, by similar treatment with nitrous acid, lævorotatory terebenthene has yielded a dextrorotatory nitroterebenthene, $C_{10}H_{15}\cdot NO_2$, from which nascent hydrogen produces the primary base amidoterebenthene, $C_{10}H_{15}\cdot NH_2$, which again is lævorotatory.

Carveol, Borneol, and Menthol. R. Leuckart. (*Ber. der deutsch. chem. Ges.*, xx. 114–116; *Journ. Chem. Soc.*, 1887, 376.) The author gives the name *carveol* to an alcohol, $C_{10}H_{15}OH$, which he has obtained by reducing carvole with sodium and

alcohol. It is a thick liquid, has a characteristic odour quite different from that of carvole, and boils at 218–220°. The acetate and benzoate are liquid. With phenyl cyanate, even in the cold, it yields *carvyl phenylamidoformate*, $NH\,Ph\cdot C\,O\,O\cdot C_{10}H_{15}$. This compound forms small needles, easily soluble in alcohol, sparingly so in ether, and melts at 84°. Borneol similarly forms *bornyl phenylamidoformate*, $NH\,Ph\cdot C\,OO\cdot C_{10}H_{17}$, crystallizing in needles soluble in boiling alcohol and melting at 133°. Menthol, under similar circumstances, yields *menthyl phenylamidoformate*, $NH\,Ph\cdot C\,O\,O\cdot C_{10}H_{19}$, which crystallizes in silky needles soluble in boiling alcohol and melting at 111°. No corresponding compounds are obtainable from carvole, camphor, or bromo-camphor, which seems to point to the absence of an hydroxyl-group in the latter substances. At higher temperatures, reaction takes place between carvole and phenyl isocyanate; carbonic anhydride is evolved, and diphenylcarbamide is among the products of the reaction.

Camphol from Valerian. A. Haller. (*Comptes Rendus*, ciii. 151–153. From *Journ. Chem. Soc.*) Oil of valerian boiling at 220–250° was heated for several hours with alcoholic potash, and the product poured into water. The precipitated camphol was washed with water, sublimed from lime, and repeatedly crystallized from light petroleum. The product crystallizes in very friable transparent, hexagonal tables, with a pungent, camphoraceous odour. It melts at 208·8°, and its solution in toluene has a rotatory power $[\alpha]_D = -37{\cdot}77°$. The corresponding camphor melts at 178·2°, rotatory power $[\alpha]_D = -42{\cdot}96°$; the monobromocamphor melts at 75·2°, rotatory power $[\alpha]_D = -127{\cdot}57°$, and the camphoric acid melts at 186·2°, rotatory power $[\alpha]_D = -46{\cdot}16°$. These values are identical with those obtained for camphol of N'gai and its derivatives, and it follows that the two substances are identical.

Derivatives of Camphor. L. Balbiano. (*Gazz. chim. Ital.*, xvi. 132–139. From *Journ. Chem. Soc.*) In a former paper the author has shown by means of the phenylhydrazine reaction that camphor contains a carbonyl-group. Camphophenylhydrazine is an oil readily decomposed, even when boiled under reduced pressure. In ethereal solution it is converted by hydrochloric acid into aniline hydrochloride and the nitrile of campholenic acid, thus: $C_{10}H_{16}\cdot N_2H\,Ph + HCl = C_9H_{15}\cdot C\,N + NH_2Ph, HCl$. When distilled with concentrated hydrochloric acid, it yields the same products together with camphor and phenylhydrazine hydrochloride, thus:

$$2\,C_9H_{16}N_2H\,Ph + 2\,H\,Cl + H_2O =$$
$$C_9H_{16}C\,O + C_9H_{15}\cdot C\,N + N\,H_2N\,H\,Ph,\,H\,Cl + N\,H_2\,Ph,\,H\,Cl.$$

The reaction between bromocamphor and phenylhydrazine is very violent; to modify it the temperature must be lowered and the solvents perfectly dried. Under these conditions phenylhydrazine hydrobromide is formed, together with a derivative of dihydrazine, which it is proposed to designate *camphylphenyldihydrazine*. This compound, $N_2H_2\,Ph\cdot C_{10}H_{15} : N_2H\,Ph$, is a solid, amorphous substance, melting at 55°, soluble in alcohol and ether, insoluble in water. The reaction leading to its formation is as follows:

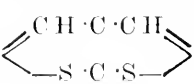
$$C_{10}H_{15}Br\,O + 3\,Ph\,H\,N_2H_2 =$$
$$N_2H_2\,Ph\cdot C_{10}H_{15} : N_2H\,Ph + Ph\,N_2H_3,\,H\,Br + H_2O.$$

Cyano-Camphor. A. Haller. (*Comptes Rendus*, cxii. 1477–1479.) The author describes the preparation of ethyl camphocarbonate, $C_{10}H_{15}O\cdot C\,O\,O\,Et$, and shows that cyano-camphor may be regarded as the nitrile of camphocarbonic acid.

The formation and properties of sodium and potassium camphocyanates, $C_{10}H_{14}Na\,C\,N\,O$ and $C_{10}H_{14}K\,C\,N\,O$, are described in the same paper.

Combinations of Nitro-Camphor. P. Cazeneuve. (*Comptes Rendus*, July 26, 1886.) On treating normal chloronitrous camphor with zinc, copper, iron, or alkalies in presence of dilute alcohol, it is decomposed with formation of a metallic chloride and oxide or an alkaline chloride or chlorate, whilst a compound of nitrocamphor with the metal in question is produced.

Thiopten. A. Biedermann and P. Jacobsen. (*Ber. der deutsch. chem. Ges.*, xix. 2444–2447; *Journ. Chem. Soc.*, 1886, 1032.) On theoretical grounds the existence of a compound, $C_6H_4S_2$, is probable, which bears to thiophen the same relation as that of naphthalene to benzene, and whose constitution is expressible by the formula,



Such a compound (*thiopten*) is obtained in small quantities by the distillation of citric or tricarballylic acid with phosphorus sulphide, and can be purified by means of its crystalline compound with picric acid. It is an oil boiling at 224–226°, of faint, pleasant odour; it gives the indophenine reaction. The *picrate*, $C_6H_4S_2$, $C_6H_3O\,(NO_2)_3$, crystallizes in golden needles, melting at 133°, and the tetrabromoderivative, $C_6Br_4S_2$, in long white

needles, melting at 172°, soluble in benzene, sparingly soluble in alcohol.

Derivatives of Tribromophenol. A. Purgotti. (*Gazzetta chim. Ital.*, xvi. 526–531.) The *calcium*-derivative of tribromophenol crystallizes in white, silky needles; the *ammonium*-derivative forms minute crystals, more soluble in cold water than in hot; the *silver*-derivative is a red, insoluble powder darkening rapidly on exposure; the *lead* and *zinc*-derivatives are white precipitates, and the *copper*-derivative a violet powder, insoluble in water but soluble in ammonia. The *ethyl*-derivative crystallizes in brilliant prisms melting at 69°. As an antiseptic tribromophenol seems to be superior to phenol and thymol.

Derivatives of Umbelliferone. W. Will and P. Beck. (*Ber. der deutsch. chem. Ges.*, xix. 1777–1786.) In this paper the authors describe bromo-derivatives of umbelliferone ethyl and methyl ethers, and arrive at the conclusion that these ethers are true coumarins, and, like the latter, yield two isomeric alkyloxy-acids.

Formation of Quinol from Quinone. G. Ciamician. (*Gazz. chim. Ital.*, xvi. 111, 112.) When an alcoholic solution of quinone is exposed to bright sunlight for a few days it yields quinol and ethaldehyde, in accordance with the following equation:—

$$C_6H_4O_2 + C_2H_6O = C_6H_6O_2 + C_2H_4O_2.$$

Preparation of Quinone and Quinol. R. Nietzki. (*Ber. der deutsch. chem. Ges.*, xix. 1467–1469.) The author points out several objectionable points in Seyda's modifications of his own processes for the preparation of these substances. He now recommends the following procedure:—A concentrated solution of sodium bichromate (one part of salt in two to three parts of water) is slowly added to a mixture of one part of aniline, twenty-five parts of water, and eight parts of sulphuric acid, the liquid being well cooled; the addition of the chromate solution is continued until any quinhydrone formed has been oxidized to quinone. Instead of extracting the quinone with ether and then reducing it to quinol, it is best to reduce at once with sulphurous anhydride, filter off the insoluble impurities, and extract the quinol with ether. Operating in this way, a yield of 85 per cent. of crude quinol (on the aniline employed) has been obtained.

Quinol and Formic Acid. F. Mylius. (*Ber. der deutsch. chem. Ges.*, xix. 999–1009; *Journ. Chem. Soc.*, 1886, 796). *Quinolformic acid*, $C_{25}H_{26}O_{10}$, is formed when quinol (4 mols.) is dissolved in

hot formic acid, and separates on cooling in colourless, pointed crystals; it melts at about 60° with evolution of formic acid. When dissolved in water, it is decomposed into its constituents.

When quinol is heated with twice its weight of crystallizable formic acid for three or four hours at 250°, a product is obtained consisting of glassy needles; a large quantity of carbonic oxide is formed. The new compound cannot be purified by crystallization, as all solvents, water, alcohol, etc., decompose it into quinol and carbonic oxide, and a small quantity of formic acid. It melts at 170° with evolution of carbonic oxide, and leaves a residue of quinol. It is probably formed by the elimination of water (1 mol.) from quinolformic acid (2 mols.), and would thus be *quinolformic anhydride* $(C_6H_6O_2)_8$, $C_2H_2O_3$. Concordant analytical results could not be obtained, but the results of quantitative experiments, in which the carbonic oxide and the formic acid were estimated, support this view.

Quinolhydrocyanic acid $(C_6H_6O_2)_2$, HCN, is obtained by heating quinol with anhydrous hydrocyanic acid at 100°; it forms colourless, lustrous needles, and decomposes into its constituents when heated, or by contact with water.

Saccharin. (*Journ. Soc. Chem. Ind.*, July, 1886, 422. From *Pharm. Journ.*) The conclusions arrived at by Stutzer concerning the innocuousness of saccharin when taken into the human body have recently been confirmed by Professor E. Salkowski (*Virchow's Archiv*, cv. 46), and Professor Dreschfeld has ascertained that when given in diabetes it does not affect either the quantity of urine or of sugar passed. It has scarcely any retarding effect on the digestion of either proteids or carbohydrates, and in two cases of acid dyspepsia, it was found to relieve some of the troublesome symptoms. It has also been found that added in small quantities it increases the diastatic action of malt in presence of sugar.

Antifermentative Properties of Saccharin. MM. Aducco and Mosso. (*Chem. Zeitung*, Oct. 10, 1886. From *Pharm. Journ.*) It was found that in the proportion of 0·16 per cent. saccharin distinctly and persistently diminished the activity of beer yeast at a temperature both of 16° and 30° C. In a mixture of equal parts of a 0·32 per cent. saccharin solution and urine, kept at a temperature of 16° to 17° C., ammoniacal fermentation had not commenced at the end of seven days, when a mixture containing the same proportion of salicylic acid had broken down. A saccharin solution retarded the lactic fermentation in milk, and the action of a preparation of pancreas was also considerably

slackened by it. Added to a pepsin liquor in the proportion of 0·16 to 0·032 per cent., saccharin retarded the peptonizing of coagulated albumen, though without stopping it; but upon reduction of the saccharin to 0·0064 per cent., the gastric juice was then scarcely affected. Comparative experiments showed benzoic acid to be equally powerful in this respect, and salicylic acid a little more so. In the proportion of 0·16 to 0·32 per cent. in acid and neutral solutions, saccharin proved capable of affecting the amylotic action of saliva, the effect being least in the neutral solution. Salicylic acid proved rather more powerful in similar solutions, and boric acid had about the same effect as saccharin.

So-called Soluble Starch. J. Kraus. (*Ann. Agronom.*, xii. 540, 541. From *Journ. Chem. Soc.*) Janis and Schenk have found in the epidermis of *Ornithogalum* and of *Gagea* a substance dissolved in the cell sap which strikes a blue colour with iodine. Nägeli has shown that it is not starch, and believes it to be an albuminoid. The author, having met with this same substance in the epidermis of some *Arums*, has come to the conclusion that it is allied to the tannins. Chloriodide of zinc colours it rose, ferric chloride and ferrous sulphate strike a brownish green; on the other hand, potassium dichromate and Gardiner's reagent give no reactions. The substance behaves like a tannin in being developed under the influence of light, and in persisting without alteration in dead or dying leaves. That iodine should strike a blue colour with a tannin is not surprising, since Giessmayer has shown that a solution of tannin gives with a weak solution of iodine, in feebly alkaline water, a bright red colour, and Nasser has recognised that tannic and gallic acids and pyrogallol, in the presence of neutral salts or acids, are coloured red-purple by iodine.

The so-called Soluble Starch contained in Vegetable Tissues. J. Dufour. (*Ann. Agronom.*, xii. 297, 298; *Journ. Chem. Soc.*, 1886, 903.) The so-called "soluble starch" found in the cell contents of the epidermis of certain plants is considered by Kraus to be really a tannin. The author's observations tend to show that at any rate it is not a carbohydrate analogous to ordinary starch. It may be a glucoside, but it gives none of the reactions of tannin with ammonium molybdate, ferric chloride, potassium bichromate, and gelatin. The author does not concur in Nägeli's suggestion that it is an albuminoid.

The plants containing most of this substance are *Saponaria officinalis* and *Gypsophila perfoliata*, *Arum Italicum*, *Bryonia dioica*; several species of *Hordeum*, *Ornithogalum umbellatum*, and *Gagea*

lutea also contain it. In all these plants it occurs in the epidermis, but Nägeli believes that a similar body exists in various seeds (*Anagyris fœtida*, *Peganum harmala*, etc). A fragment of the epidermis of *Saponaria officinalis* is speedily coloured an intense violet when immersed in iodised potassium iodide. An alcoholic tincture of iodine produces the same effect only after evaporation of the alcohol, when the blue compound is deposited in crystalline needles. The alcoholic extract of the leaves of *S. officinalis*, treated with ether to dissolve out chlorophyll, etc., and then with water to dissolve out the "soluble starch," yields a yellowish neutral solution. A drop of this evaporated on a glass slide deposits yellowish spheroidal crystals, with radial lines, but no trace of concentric striæ. These crystals do not swell out in hot water like starch granules.

Inosite. L. Maquenne. (*Comptes Rendus*, civ. 225–227; *Journ. Chem. Soc.*, 1887, 355.) Walnut leaves are extracted methodically with about four times their weight of water, and the boiling solution is precipitated first with milk of lime, then with lead acetate, and finally with basic lead acetate, which forms an insoluble compound with the inosite. The last precipitate is washed with water, decomposed by sulphuretted hydrogen, and the solution concentrated to a syrup. The boiling liquid is then mixed with 7 or 8 per cent. of concentrated nitric acid, which destroys nearly all the foreign matter without attacking the inosite, and, after cooling, a mixture of 4–5 vols. of alcohol with 1 vol. of ether is gradually added to the nearly colourless liquid. Inosite is thus separated as a colourless flocculent precipitate, which is recrystallized from dilute acetic acid, dissolved in water, again treated with nitric acid, and again precipitated with alcohol and ether. A small quantity of calcium sulphate, which always occurs in the product, is decomposed by adding barium hydrate, and the barium is removed by means of ammonium carbonate, the product being finally recrystallized from water. The yield is about 2·91 grams per kilo. of leaves.

Anhydrous inosite has the composition $C_6H_{12}O_6$, whilst the crystals have the composition $C_6H_{12}O_6 + 2H_2O$; they lose all their water at 110°. Inosite does not volatilise without decomposition, but its molecular weight can be determined by Raoult's cryoscopic method; that is, by determining the freezing point of its aqueous solution. The freezing point of a solution of 2·5 grams of inosite in 100 grams of water is −0·29°, whilst the calculated value for $C_6H_{12}O_6$ is −0·27°.

Inosite is only slightly soluble in cold, but very soluble in warm water. It is insoluble in alcohol, ether, and glacial acetic acid, but dissolves readily in dilute acetic acid, from which it can be easily crystallized. It melts at 217° without carbonisation, and boils with slight decomposition in a vacuum at 319°. When heated in the air, it burns readily. Solutions of inosite are optically inactive, both when freshly prepared and after they have been in contact with *Penicillium glaucum* for six weeks. Inosite is not attacked by boiling dilute acids or alkalies, does not reduce copper solutions, and is not acted on by ammoniacal silver nitrate alone, but in presence of sodium hydrate it yields a mirror of metallic silver. It does not combine with sodium hydrogen sulphite, is not reduced by sodium amalgam, and is not sensibly affected by halogens in the cold. When heated with bromine and water at 100°, it yields brown products precipitable by salts of barium, and similar to those obtained in Scherer's reaction. These compounds contain no bromine, and are oxidation-products which can be more readily prepared by the action of nitric acid.

A New Compound of Saccharose. A. Herzfeld. (*Chem. Centr.*, 1886, 271.) The combination described by the author is obtained by suspending saccharates of alkaline earths in alcohol and treating with hydrochloric acid. A solution is thus obtained from which a calcium chloride compound of an ethyl ether of the sugar is slowly precipitated.

Oxidation-Products of Levulose. A. Herzfeld and E. Börnstein. (*Chem. Centr.*, 1886, 187.) In order to study the action of weak oxidizing agents, the authors operated with mercuric oxide in presence of barium hydrate upon a boiling aqueous solution of levulose. The products obtained were glycollic acid and normal trihydroxybutyric acid.

Oxidation-Products of Levulose. A. Herzfeld and H. Winter. (*Chem. Centr.*, 1886, 271–273.) The oxidation of solutions of levulose by the gradual addition of bromine, continued over a period of several weeks, yielded (after removal of the bromine by treatment with lead and silver oxides) glycollic and trihydroxybutyric acids, the same products as were obtained by oxidation with mercuric oxide and barium hydrate (see preceding abstract).

Irisin. O. Wallach. (*Liebig's Annalen*, ccxxxiv. 364–375.) The rhizome of the water lily, *Iris pseudacorus*, contains a peculiar carbohydrate, called "irisin" by the author. *Irisin*, $C_6H_{10}O_5 + H_2O$, closely resembles inulin, but is distinguished from the latter by its more powerful action on polarised light; $[\alpha]_D = -49° 9'$

for a 2 per cent. solution of irisin, and $[\alpha]_D = -37° 27'$ for a solution of inulin of the same strength. Fehling's solution is not reduced by irisin, but the carbohydrate is easily attacked by dilute acids, yielding levulose as the chief product. Irisin is four times as soluble as inulin in water at 22°. Under the microscope the globules of irisin resemble the minute globules of inulin in size, but they do not exhibit double refraction.

Action of Potassium Permanganate on Glucose. A. Smolka. (*Monatsh. Chem.*, viii. 1–26.) In the presence of an excess of permanganate the oxidation of the glucose is complete, especially on boiling; the products of the reaction being water, carbonic anhydride, and potassium hydromanganite, $K H_3 Mn_4 O_{10}$. With smaller proportions of permanganate, and at ordinary temperatures, oxalic and formic acids are formed, along with water and carbonic anhydride, and a portion of the glucose may remain unaltered.

Conversion of Glucose into Dextrins. E. Grimaux and L. Lefèvre. (*Comptes Rendus*, ciii. 146–149. From *Journ. Chem. Soc.*) Pure glucose was dissolved in eight times its weight of hydrochloric acid of sp. gr. 1·026, the solution distilled in a vacuum on the water-bath, and the syrupy amber-coloured residue dissolved in water and precipitated by alcohol, solution and precipitation being repeated several times. The product was then dissolved in water, decolorised by animal charcoal, the solution concentrated by evaporation in a vacuum on the water-bath, and then allowed to evaporate in a vacuum at the ordinary temperature. The product thus obtained is a white powder which resembles ordinary white dextrin, is very hygroscopic, and forms gummy solutions. Its reducing and rotatory power vary with the number of times the substance has been redissolved and reprecipitated. When prepared by the method just described, the dextrin contains a small proportion of fermentable sugar, which can be removed by treatment with yeast. After purification in this way, one product had a reducing power of 17·8 per cent., whilst its rotatory power for $[\alpha]_D = +97·48$.

The dextrin obtained in this way has the composition $3 C_6 H_{10} O_5 + H_2 O$, and belongs to the class of achroodextrins. Its general properties resemble those of the dextrin obtained by Musculus by the action of sulphuric acid on glucose in presence of alcohol, but it has a lower rotatory and reducing power. It is not coloured by iodine, is unaffected by infusion of malt, and undergoes hydration somewhat slowly when boiled with dilute acids. The glucose formed from it by the action of acids is readily fermentable.

The alcoholic liquid from which the dextrin has been precipitated contains other dextrins with higher reducing powers, together with a fermentable sugar, which is found by Fischer's reaction with phenylhydrazine and sodium acetate to be a mixture of glucose and maltose.

Galactose from milk-sugar behaves like dextrose, and yields a galactodextrin which resembles glucodextrin. Its reducing power in terms of glucose is 10 per cent., and its rotatory power for $[\alpha]_D = +80$.

Acid Fermentation of Glucose. M. Boutroux. (*Comptes Rendus*, cii. 924–927; *Journ. Chem. Soc.*, 1886, 682.) The acid fermentation of glucose takes place under the influence of a micrococcus resembling that to which the author has previously given the name *M. oblongus*. If this ferment is sown in a solution of glucose in yeast-water containing an excess of chalk, and kept at 35°, crystals of the calcium salt of an acid separate, and before long the surface of the liquid is covered with a crystalline crust. If the zymo-gluconic acid obtained by the action of *M. oblongus* on glucose is mixed with yeast-water and the ferment under the same conditions, it yields the same product. In order to obtain the free acid, the calcium salt is converted into the cadmium salt, which is purified by recrystallization, and then decomposed by sulphuretted hydrogen. The free acid is an almost colourless syrup, with a distinctly acid reaction, very soluble in water and alcohol, but only slightly soluble in ether. It is turned brown by a slight elevation of temperature, or by the addition of a slight excess of alkali, especially ammonia.

The calcium, strontium, and cadmium salts are crystallizable, but show great tendency to form supersaturated solutions; the potassium, sodium, ammonium, and thallium salts have only been obtained in the form of syrups. The calcium salt crystallizes in prisms with a rhombic base, which seem to belong to the monoclinic system; it is only slightly soluble in cold water, but dissolves much more readily in boiling water; the hydrochloric acid solution is distinctly lævogyrate. The strontium salt forms microscopic crystals, which seem to be derived from a prism with a rhombic base; it is only slightly soluble in cold water, but is much more soluble in boiling water. The cadmium salt forms very brilliant crystals, which seem to belong to the monoclinic system; it dissolves in about 65 parts of water at 15°, and is very soluble in boiling water. Concentrated solutions of the salt are gradually decomposed by ebullition.

With normal or basic lead acetate, or with bismuth nitrate, solutions of the salts give white amorphous precipitate, soluble in acetic acid. Concentrated solutions also give crystalline precipitates, which form slowly with salts of calcium and strontium, but they give no precipitate with salts of barium, magnesium, cerium, zinc, iron, or copper. The solutions of the acid and its salts have considerable reducing power. They decolorise alkaline potassium permanganate; reduce silver nitrate slowly in the cold, instantly on boiling, and with ammoniacal silver nitrate they form a silver mirror. Boiling solutions also reduce Fehling's solution, mercurous nitrate, bismuth nitrate, and mercuric chloride.

Analysis of the cadmium and calcium salts shows that the acid has the formula $C_6 H_{12} O_8$. It is probably not identical with Maumene's hexepic acid, and the author gives to it the name "*oxygluconic acid.*"

Saccharose yields no acid under the same conditions.

The Action of Potassium Hydrate upon Alcohol. R. Engel. (*Comptes Rendus*, ciii. 155–157.) Potassium hydrate was suspended in a platinum basket in alcohol until the latter was saturated. Under these conditions the liquid separates into two layers, the lower being an aqueous and the upper an alcoholic solution of potassium hydrate. If the alcoholic solution is kept at 0° for twenty-four hours, it deposits unctuous, white, crystalline plates, which have the composition K H O + 2 Et H O, and alter rapidly when exposed to air. This alcoholate of potassium hydrate may be kept in closed vessels at 0° without undergoing alteration, but at 30° it gradually decomposes. At 60° the crystals melt, and after some hours the liquid separates into two layers; this decomposition is very rapid at 100–120°. The alcoholate decomposes in accordance with the equation, K H O, 2 Et H O = Et O K + Et O H + H_2 O. The liberated water is saturated with potassium hydrate, and forms the lower layer of liquid. The upper alcoholic layer when cooled deposits slender needles which seem to have the composition Et O K + Et O H.

The formation of potassium ethoxide by the action of heat on alcoholic potash, explains the action of the latter on certain organic compounds.

The Oxidation of Ethyl Alcohol in the Presence of Turpentine. C. E. Steedman. (*Proc. Chem. Soc.*, June 2, 1887.) The author finds that dilute ethyl alcohol in the presence of air and turpentine becomes oxidised to acetic acid. The experiment was made by placing in a clear glass 16-oz. bottle a mixture of 2 drams

of alcohol, 1 dram of turpentine, and 1 oz. of water; the bottle was securely corked and left exposed to a varying temperature, averaging about 80° F., for three months; at the end of that time the liquid was strongly acid from the presence of acetic acid.

One curious fact appears to have light thrown upon it by this observation. Mr. McAlpine, Professor of Biology at Ormond College, Melbourne University, has a method of preserving biological specimens by abstracting their moisture with alcohol after hardening in chromic acid, and then placing the specimen in turpentine for some time; great discrepancies arise, however, according as the alcohol is allowed or not to evaporate from the specimen before dipping it into turpentine.

Preparation of Chloroform. G. Michaelis and W. T. Mayer. (*Dingl. polyt. Journ.*, cclxi. 496.) The authors' process of preparing chloroform consists in subjecting crude acetates to dry distillation at temperatures varying between 300° and 500°, treating the products with hypochlorites, condensing the chloroform therefrom by distillation, and purifying by rectification.

Non-Volatility of Glycerin with Aqueous Vapour. O. Hehner. (*Analyst*, April, 1887, 65.) The experiments recorded by the author show that glycerin is *not* volatilized with aqueous vapour from any solution containing less than 50 per cent. of glycerin.

Lactates. H. Meyer. (*Ber. der deutsch. chem. Ges.*, xix. 2454–2456.) *Barium lactate*, with two or one mol. H_2O, crystallizes in rectangular needles, soluble in water and glycerin, insoluble in alcohol, the last molecule of water of crystallization is not removed without decomposition. *Aluminium lactate* crystallizes in anhydrous triclinic octahedra; *sodium aluminium lactate*, $Al_2(C_3H_5O_3)_3$, $(C_3H_4NaO_3)_3 + OH_2$, crystallizes in rectangular prisms or tables.

Preparation of Phenylacetic Acid. W. Staedel. (*Ber. der deutsch. chem. Ges.*, xix. 1949–1952.) 100 grams of benzyl cyanide, boiling at 210–235° (prepared from the chloride by Mann's method) are added to 300 grams of dilute sulphuric acid (3 vols. acid to 2 vols. water), and the whole heated over a flame until a reaction begins; the flame is then removed, and in a few seconds the reaction becomes very violent. To avoid loss, the flask containing the substance is provided with a tube bent twice at right angles, the end of which is fitted into a double-necked flask containing water. A funnel is fitted into the second neck of the flask, so that it dips under the water. To avoid water being ejected through the funnel, a dish is placed at the opening. When

the first violence of the reaction ceases, the whole is heated for some time; the product is then mixed with water, and washed to remove sulphuric acid. The best results are obtained when the reaction is very violent; care should therefore be taken that the mixture is sufficiently heated at first. The yield was 71·5 per cent. of the theoretical amount.

Gluconic Acids. F. Volpert. (*Ber. der deutsch. chem. Ges.*, xix. 2621–2623.) The author's experiments lead to the inference that Hoenig's paragluconic acid is identical with gluconic acid.

A Peculiar Reaction of Malonic Acid. S. Klumann. (*Journ. Chem. Soc.*, 1886, 935.) Malonic acid dissolves readily in cold acetic anhydride, but on heating the solution, carbonic anhydride is evolved, and the liquid becomes of a yellowish red colour with a strong yellowish green fluorescence; the latter is especially marked on adding glacial acetic acid. The reaction is very sensitive, being produced with a milligram of malonic acid. Metallic malonates show the reaction slightly, but the ethyl salt does not do so at all.

In preparing the new compound, it is best to heat a mixture of one part of malonic acid, one part of anhydrous sodium acetate, and three parts of acetic anhydride gently on a water-bath. The yield is small, much of the malonic acid being decomposed into acetic acid and carbonic anhydride. The sodium compound, $C_{11}H_3O_8Na$, forms a brownish yellow powder. Hydrochloric acid precipitates the free acid from its aqueous solution in pale yellow flocks, having the composition $C_{11}H_4O_8$.

A solution in dilute acetic acid evolves carbonic anhydride, and the remaining liquid appears to contain resinous matter only. When the sodium compound in acetic solution is boiled with phenylhydrazine, carbonic anhydride is evolved, and an orange-yellow compound, of the formula $C_{22}H_{16}N_4O_4$, is formed. The reaction appears to take place according to the equation,—

$$C_{11}H_3O_8Na + 2\,NH\,Ph{\cdot}NH_2 + C_2H_4O_2 = C_{10}H_4O_4\,(N{\cdot}NH\,Ph)_2 + CO_2 + 2\,H_2O + Na\,C_2H_3O_2.$$

This hydrazine is soluble in alcohol, glacial acetic acid, alkalies, and strong hydrochloric acid; insoluble in water and ether. Strong sulphuric acid dissolves it, yielding a green solution, from which it is again precipitated on the addition of water. It melts with decomposition at 180°.

Cholic Acid. F. Mylius. (*Ber. der deutsch. chem. Ges.*, xix. 2000–2009.) When a solution of cholic acid in acetic acid is

saturated with hydrochloric acid, a *compound*, $C_{24}H_{40}O_5$, H Cl, separates in slender needles. It is decomposed by water into its components; and when kept for some hours in contact with the solution from which it is prepared, it gradually dissolves, with formation of *monacetylcholic acid*, $C_{24}H_{39}$ Ac O_5. When exposed to the air, it deliquesces, and yields a resinous mass. The *diacetyl compound*, $C_{24}H_{38}Ac_2O_5$, is prepared by treating cholic acid with twice its weight of acetic anhydride in the cold. It is a feeble acid, and dissolves very readily in alcohol, ether, and benzene, etc.; it is almost insoluble in water. Its solutions have an intensely bitter taste. The salts are more sparingly soluble than those of cholic acid; the *barium salt* is quite insoluble in water.

Dehydrocholic acid, prepared by oxidising cholic acid, was found to have the formula $C_{24}H_{34}O_5$, and not $C_{25}H_{36}O_5$.

The trialdoxime of dehydrocholic acid, $C_{24}H_{37}N_3O_5$, is obtained by the action of free hydroxylamine on dehydrocholic acid. It crystallizes from alcohol in microscopic plates, which decompose at 270°. It is almost insoluble in water and ether, sparingly soluble in hot alcohol. When warmed with dilute hydrochloric acid, it is decomposed into its constituents.

The results of the experiments described above show that cholic acid contains three alcoholic hydroxyl-groups, of which two are primary alcohol-groups; also that dehydrocholic acid contains three atoms of oxygen, which react with hydroxylamine, of which at least two are aldehydic.

It is probable that bilianic acid, which is formed by further oxidizing dehydrocholic acid, has the formula $C_{24}H_{34}O_8$, and that it is formed by the conversion of two aldehyde-groups of dehydrocholic acid into carboxyl-groups.

Solubility of Choleic Acid. P. Latschinoff. (*Ber. der deutsch. chem. Ges.*, xix. 1140.) This acid is soluble at 20° C. in 22,000 parts of water, 750 parts of ether, 14·1 parts of 98·5 per cent. alcohol, and 25 parts of 75 per cent. alcohol. Its barium salt dissolves in 1200 parts of water, the solubility rapidly increasing with rise of temperature.

Linoleic Acid. A. Bauer and K. Hazura. (*Monatsh. Chem.*, vii. 216–229.) The crude acid from hemp oil, prepared by saponifying the oil with soda and decomposing the sodium salt with sulphuric acid, is further purified by solution in spirit, saponification with ammonia, and precipitation of the barium salt, with subsequent saponification and extraction with ether. The pure acid gave numbers agreeing with the formula $C_{16}H_{28}O_2$, and

proved to be identical with linoleic acid. When fused with potash, it yields myristic, acetic, and formic acids, together with a small quantity of azelaic acid.

When oxidized with potassium permanganate, both in the presence and absence of water, with manganese dioxide and sulphuric acid, and with hydrogen peroxide, linoleic acid yields azelaic acid. With a large excess of alkaline permanganate, it yields *sativic acid*, $C_{32}H_{62}O_{11}$, together with a small quantity of another substance. Both these products are described in the paper.

Linoleic Acid. K. Peters. (*Monatsh. Chem.*, vii. 552–555.) The author questions the accuracy of the formula $C_{16}H_{28}O_2$, according to which this body would be the isologue of palmitic acid, and convertible into the latter by hydrogenising agents. He finds that upon heating with phosphorus and hydriodic acid, it yields stearic instead of palmitic acid; and the numbers obtained by him in the combustion of pure linoleic acid harmonise better with the formula $C_{18}H_{32}O_2$, than with the one above mentioned.

Oxidation-Product of Linoleic Acid. K. Hazura. (*Monatsh. Chem.*, vii. 637, 638.) When linoleic acid is oxidised with potassium permanganate in alkaline solution, *linusic acid*, $C_{18}H_{36}O_7$, is formed. It crystallizes in lustrous needles very sparingly soluble in water, and melts at 188°.

Action of Nitric Acid on Myristic Acid. H. Noerdlinger. (*Ber. der deutsch. chem. Ges.*, xix. 1893–1899.) 100 grams of myristic acid were distilled with 700–800 grams of nitric acid (sp. gr. 1·3), until the liquid was homogeneous; hydrocyanic acid and carbonic anhydride were evolved. The product in the retort was found to consist chiefly of succinic and adipic acids, with a small quantity of glutaric and less of pimelic, rubric, and oxalic acids.

Non-Acid Constituents of Beeswax. F. Schwalb. (*Chemical News*, liv. 226.) Beeswax, in addition to the higher fatty acids and alcohols, contains several hydrocarbons, two of which, having the melting-points 60·5° and 68°, have been isolated by the author, and are probably identical with Krafft's normal heptacosan and hentriacontan. The alcohol of wax having the highest melting-point, to which Brodie ascribes the formula $C_{30}H_{62}O$, is more probably $C_{31}H_{64}O$, whilst Brodie's formula seems to suit the alcohol of carnauba wax. In addition to myricylalcohol there exists in beeswax ceryl alcohol, and a third alcohol, $C_{24}H_{50}O$.

Cantharidin and Cantharic Acid. B. Homolka. (*Ber. der deutsch. chem. Ges.*, xix. 1082–1089. From *Journ. Chem. Soc.*) Although this substance has been the subject of very many investigations, and the determination of its vapour-density by Piccard proved its molecule to have the formula $C_{10}H_{12}O_4$, little is known as to its constitution. Dragendorff and Masing showed that when boiled with alkalies, it gradually dissolved, and formed a salt, $C_{10}H_{12}O_5M_2$, but stated that on the addition of acids cantharidin was reprecipitated unchanged in the form of needles. The author finds that, although this latter statement is true when an acid is added to the *hot* alkaline solution, no precipitate is formed in a *cold* weak solution. When this clear solution is heated to 60–70°, however, cantharidin is at once precipitated. There is thus little doubt that the free *cantharidic acid*, $C_{10}H_{12}O_5$, was present in the cold solution, but, owing to the readiness with which it gives up water, and forms its anhydride, cantharidin, the author was unable to isolate the acid. *Silver cantharidate* forms a precipitate, $C_{10}H_{12}O_5Ag_2 + H_2O$; *methyl cantharidate*, $C_{10}H_{12}O_5Me_2$, prepared from the silver salt, crystallizes in flat prisms easily soluble in alcohol, boiling ether, and water; it melts at 91°. With hydroxylamine, cantharidin yields *cantharidoxime*, $C_{10}H_{12}O_3(N{\cdot}OH)$, crystallizing in stellate needles or prisms soluble in ether, alcohol, and warm water; it melts at 166°. When heated with hydrochloric acid at 150°, it is resolved into its constituents. The author also, by the action of free hydroxylamine on sodium cantharidate, obtained the *sodium* and *lead* salts of a *cantharidoximic acid*, but was unable to obtain the free acid, as this is at once converted into its anhydride, cantharidoxime. Cantharidoxime dissolves unchanged in soda, but on boiling the solution ammonia is evolved. The *silver-derivative*, $C_{10}H_{12}O_4NAg$, crystallizes in quadratic prisms; the *methyl ether* forms large, colourless prisms melting at 134°.

Cantharic acid yields a white *silver salt*, and a *methyl salt* boiling at 210–220° under 50mm. pressure. With hydroxylamine, this acid forms *cantharoximic acid*, $C_{10}H_{13}O_4N$ (isomeric with cantharidoxime), crystallizing in colourless, quadratic scales, which melt with decomposition between 175 and 180°. When heated with hydrochloric acid at 150°, cantharic acid and hydroxylamine are re-formed, together with a small quantity of an oily product having the properties of an aldehyde.

When cantharic acid is heated at 140–150° with dimethylaniline and zinc chloride, carbonic anhydride is evolved, and a leuco-base

obtained, which forms a colourless crystalline mass having basic properties, and becoming green on contact with the air. Its *platinochloride*, $C_{22}H_{32}ON_2, H_2PtCl_6$, forms orange crystals. When oxidized, the base forms colouring matters, the colour varying with the oxidizing agent employed. Thus, braunite and dilute sulphuric acid produce a green, chloranil or arsenic acid in acid solutions a violet colour. Such a condensation of an aromatic carboxylic acid with dimethylaniline, accompanied by the evolution of carbonic anhydride, only takes place when the acid contains the *a*-ketone-group, $CO \cdot COOH$.

From the results of his experiments, the author concludes that both cantharidic and cantharic acids must contain this group, and their formulæ must therefore be $C_5H_{13}O_2 \cdot CO \cdot COOH$ and $C_5H_{11}O \cdot CO \cdot COOH$ respectively.

Anacardic Acid. S. Ruhemann and S. Skinner. (*Proc. Chem. Soc.*, June 16, 1887). Anacardic acid was originally obtained by Staedler from the oil contained in the shell of the fruit of *Anacardium occidentale;* he assigned to it the formula $C_{11}H_{32}O_7$ ($C = 6$). The authors find that it is an hydroxy-carbolic acid of the formula $C_{22}H_{32}O_3$. They describe several salts, and give the results of their analyses.

Lupulic Acid. H. Bungener. (*Bull. de la Soc. Chim.*, xlv. 487–496.) The bitter principle which the author has designated *lupulic acid*, $C_{50}H_{70}O_8$ (*Year-Book of Pharmacy*, 1886, 193), may be obtained from hops by extracting with light petroleum and purifying by repeated recrystallization. It forms colourless, prismatic crystals, melts at 92–93°, and is readily soluble in the usual solvents with the exception of water; on treating its ethereal solution with an aqueous solution of copper acetate, *copper lupulate*, $C_{50}H_{68}O_8Cu$, is precipitated as a green, crystalline powder. The author was unable to obtain the salts of potassium, sodium, calcium, and barium in the crystalline form; the salts of the alkalies are very soluble in water, whilst those of calcium and barium are insoluble in water but dissolve in alcohol. Lupulic acid reduces ammoniacal silver solutions, it is also rapidly oxidized by the air, being converted into an amorphous, yellow, resinous compound, very similar in its properties to the unaltered acid, a small amount of valeric acid and aldehyde being formed at the same time; it is probable that the unpleasant odour of old hops is due to this. The oxidised resinous product is soluble in water (0·3 gram per litre), forming a very bitter yellow solution, from which it is precipitated on the addition of sulphuric acid. It is

to this resinous compound that the bitterness of beer is due; in aqueous infusions of hops, however, a considerable amount of the unaltered lupulic acid is present, dissolved in minute floating globules of oil.

The resinous oxidation-product of lupulic acid has an antiseptic action on the lactic acid ferment, but the various saccharomyces and the acetic acid ferment are unaffected by it.

Angelic Acid. E. Schmidt. (*Archiv der Pharm.* [3], xxiv. 528–531; *Journ. Chem. Soc.*, 1886, 867.) This acid was obtained from sumbul root by Reinsch in 1884. O. Sasse, at the instance of the author, has investigated the occurrence of the acid in this root, and finds that the acid is a decomposition-product, and does not occur as such in sumbul root. The root was extracted with light petroleum, and the solution was distilled until a pale yellow balsam-like residue was obtained. This was digested for an hour with an alcoholic potash solution, the alcohol removed, and the residue digested with water; a brownish mass crystallized out, and a considerable amount of angelic acid went into solution. To obtain the acid, the liquid was neutralized with sulphuric acid, evaporated to dryness, supersaturated with sulphuric acid, and extracted with ether. Finally, after removing water, there resulted from 1 kilo. of the root about 4 grams of a liquid boiling at 180–190°, and an equal quantity boiling at 190–200°. Both distillates gave a crop of colourless crystals when placed in a cooling mixture. Those from the 180–190° liquid fused at 45°, agreed in properties with angelic acid; whilst those from the 190–200° fraction fused at 64°, and agreed with the properties of methylcrotonic acid, an isomeride of angelic acid. The two acids were produced in nearly equal amounts, and they appear to be formed simultaneously, although angelic acid is gradually converted into methylcrotonic acid by long boiling.

Erucic and Brassic Acids. C. L. Reimer and W. Will. (*Ber. der deutsch. chem. Ges.*, xix. 3320–3327; *Journ. Chem. Soc.*, 1887, 233.) Erucic acid is best obtained by saponifying rape oil with alcoholic potash, distilling off the alcohol, and dissolving the acid liberated on addition of sulphuric acid in three times its volume of 95 per cent. alcohol; on cooling to 0° crystals of erucic acid separate in an almost pure condition. The melting point of the acid was found to be 34°. *Ethyl erucate*, $C_{22}H_{41}O_2Et$, is a colourless, odourless oil, boiling above 360° without decomposition; its vapour-density, however, could not be determined. The *anhydride*, $C_{44}H_{82}O_3$, is prepared by heating erucic acid and

phosphorus trichloride in molecular proportions. It is an oil crystallizing in a freezing mixture to a mass of scales, and is very readily soluble in ether, benzene, and chloroform, sparingly soluble in alcohol. The *amide*, $C_{22}H_{41}O(NH_2)$, crystallizes in colourless needles, melts at 84°, and is readily soluble in ether and benzene, sparingly soluble in alcohol, insoluble in water. The *anilide* is crystalline, melts at 55°, and is readily soluble in ether and benzene, sparingly soluble in alcohol.

Dierucin, $C_3H_5OH(C_{22}H_{41}O_2)_2$.—When rape oil is allowed to stand for a long time, a yellowish, tallow-like deposit is frequently found in the casks; this, by repeated solution in ether and subsequent addition of alcohol, can be obtained in silky needles. Dierucin melts at 47°, and is readily soluble in ether and light petroleum, insoluble in cold, but soluble in hot alcohol. A trierucin could not be separated from rape oil.

Brassic acid is best prepared by warming erucic acid with dilute nitric acid to the melting point, and then adding sodium nitrite; the product is quite pure after two crystallizations from alcohol. The *ethyl* salt is obtained directly from the acid, or by the action of nitrous acid on ethyl erucate; it crystallizes in laminæ showing a vitreous lustre, melts at 29–30°, and boils above 360° without decomposition; the vapour-density could not, however, be determined. The *anhydride*, $C_{44}H_{82}O_3$, formed by heating the acid with phosphorus trichloride, crystallizes in lustrous tables, melts at 28–29°, and is insoluble in water and alcohol, readily soluble in ether and benzene. The *amide* melts at 90°, and resembles in its properties the amide of erucic acid; both amides can be obtained by heating the corresponding ethyl salts to 230° with ammonia.

Tribrassidin is formed when rape oil (100 parts) is treated with nitric acid of sp. gr. = 1·2 (5 parts) and sodium nitrite (1 part); after some time, the resulting crystalline mass is washed, dissolved in ether, and from the solution cooled to 0° a lustreless, crystalline powder is obtained. Tribrassidin melts at 47°, but when heated above its melting point and allowed to cool, the melting point is subsequently found to be 36°; it is insoluble in alcohol, readily soluble in ether and chloroform. *Dibrassidin*, $C_3H_5OH(C_{22}H_{41}O_2)_2$, is formed when dierucin is treated with nitrous acid; it forms feebly lustrous crystals, melts at 65°, and is less soluble in ether than tribrassidin.

By distilling the calcium salts of erucic and brassic acids, two ketones are obtained which seem to be different; they are both very sparingly soluble in alcohol.

Jervic and Chelidoninic Acids. E. Schmidt. (*Archiv der Pharm.* [3], xxiv. 513–522, and 531–534.) The author finds that jervic acid, a constituent of white hellebore, has the formula $C_5 H_2 O_2$ $(C O O H)_2$, and is identical with chelidonic acid.

Chelidoninic acid, described by C. Zwenger a long time ago, is found by the author to be identical with succinic acid.

Aconitic Acids. W. Hentschel. (*Journ. prakt. Chem.*, xxxv. 205, 206.) Aconitic acid is readily obtained when crystallized citric acid (2 parts) is heated with sulphuric acid (2 parts) and water (1 part) for from four to six hours in a reflux apparatus; the yield amounts to from 35 to 45 per cent. of the citric acid employed. Acetone is also formed in the reaction, and gas is evolved consisting of 2 vols. of carbonic anhydride and 1 vol. of carbonic oxide.

Transformation of Maleic and Fumaric Acids into Aspartic Acid by Ammonia. M. Engel. (*Comptes Rendus*, June 20, 1887.) Maleic and fumaric acid take up directly the elements of ammonia, and are thus converted into inactive aspartic acid. If the transformation is not total it is because aspartic acid is partially decomposed by water at 140° to 150°.

Rottlerin. L. Jawein. (*Ber. der deutsch. chem. Ges.*, xx. 182, 183.) Rottlerin was obtained from kamala by Anderson, who attributed to it the formula $C_{11} H_{10} O_3$. By extracting the drug with carbon bisulphide or benzene, the author obtained a yellow crystalline substance melting at 200°. It resembles Anderson's compound in its solubility and in giving a red liquid with alkali; but the analytical results do not agree with the formula suggested by Anderson.

Morindin and Morindon. T. E. Thorpe and T. H. Greenall. (*Proc. Chem. Soc.*, December 2, 1886.) Morindin was discovered by Anderson in the *Surangi*, the roots of *Morinda citrifolia*, which are extensively used in India as a dye-stuff, more especially for dyeing reds, purples, and chocolates. The substance occurs mainly in the root bark, and can be extracted by treatment with dilute alcohol, from which it crystallizes in lustrous sulphur-yellow prisms. According to Anderson it has the formula $C_{28} H_{30} O_{15}$.

On heating in closed tubes it is decomposed, and yields a sublimate of *morindon*, crystallizing in long, red, needle-shaped crystals, to which Anderson assigned the formula $C_{28} H_{20} O_{10}$.

According to Rochleder and Stenhouse, morindin is identical with ruberythric acid, $C_{26} H_{28} O_{14}$, and hence morindon is alizarin. Stein (*Journ. prakt. Chem.*, xcvii. 234), has, however, pointed out

several facts which are inconsistent with this supposition. Morindin, like ruberythric acid, is a glucoside, but the product which it yields on hydrolysis, in addition to glucose, is not alizarin.

The authors have examined this question, and in the main their results agree with those of Stein. They extracted morindin from the roots of *Morinda citrifolia*, for a sample of which they are indebted to the Director of the Royal Gardens, Kew, and have compared its properties with those of ruberythric acid, obtained through the kindness of Dr. Schunck. The two substances are not identical, and they behave very differently on hydrolysis. Morindin gives, with sulphuric acid, ferric chloride, and on treatment with nitric acid perfectly different reactions from those afforded by alizarin. The analytical numbers obtained for morindin agree closely with those of Anderson; those obtained for morindon indicate that it is probably trihydroxymethylanthraquinone. The quantity of the two products at the disposal of the authors was insufficient to definitely settle the constitution of the substances. Through the kindness of Mr. Wardle, of Leek, they have obtained a large supply of *M. citrifolia*, and also of *M. tinctoria*, and a further communication on the subject is promised.

Carrotene. A. Arnaud. (*Comptes Rendus*, cii. 1119–1122. From *Journ. Chem. Soc.*) The author has previously shown that carrotene is identical with the orange-red crystalline substance which can be obtained from leaves, and which also exists in many fruits, especially the tomato.

In order to prepare carrotene, carrots are rasped and pressed, and the juice mixed with lead acetate, which precipitates the carrotene in the form of a lake. The precipitate is dried in a vacuum and extracted with carbon bisulphide, which is then evaporated, and the residue treated systematically with cold light petroleum. The pressed pulp is also treated with the same solvents, and the crude carrotene is dissolved in carbon bisulphide, precipitated by adding alcohol, and recrystallized from benzene.

Carrotene has the composition $C_{26}H_{38}$ (C 88·67, H 10·63 per cent.), and crystallizes in rhombic plates with a metallic lustre, blue by reflected light, and orange-red by transmitted light. It decomposes above 300° in a vacuum, and forms a colourless, viscous liquid. It combines readily with oxygen, chlorine, and bromine. If carrotene is dissolved in dry benzene and mixed with iodine, the di-iodide, $C_{26}H_{38}I_2$, is obtained in deep green crystals with a coppery lustre. Carrotene oxidizes in the air even at the ordinary

temperature, oxidation taking place very rapidly if the carrotene is in solution or if it is heated to 70°. The product is soluble in cold alcohol, but only slightly soluble in carbon bisulphide, and does not crystallize from its alcoholic solution. It melts at 125°, and has the composition C 70·10, H 8·57, O 21·42.

It follows from these results that carrotene is not an oxygen compound, but an unsaturated hydrocarbon; and the author proposes to change the name carrotine previously assigned to it. It dissolves in concentrated sulphuric acid with formation of an intense indigo-blue solution.

The carrotene analysed by Husemann must have undergone considerable oxidation. Husemann's hydrocarrotene is really vegetable cholesterin, $C_{26}H_{44}O, H_2O$.

The Blue Colouring Matter of Decaying Birch Wood. S. Rideal. (*Journ. Chem. Soc.*, 1886, 810.) The blue colouring matter formed in decaying birch wood (*Betula alba*) is soluble in chloroform and glacial acetic acid to a fine blue solution; potash changes it to brown, but on acidifying the blue colour returns. On evaporating the chloroform solution, a blue, amorphous mass is left, soluble in glacial acetic acid but turned brown by concentrated hydrochloric acid. The acetic solution loses its blue colour after a time or on warming; hence, on partial evaporation, a brown residue is obtained. This residue gives a brown precipitate in water, insoluble in chloroform or carbon bisulphide, but soluble in glacial acetic acid, potash or ammonia yielding a yellowish brown solution. When acidified with hydrochloric acid, the alkaline solutions give a bright blue precipitate. The colouring matter is non-nitrogenous, and is destitute of mineral matter, the blue colour is destroyed by reducing agents, but may be restored by careful treatment with nitric acid. The chloroform solution exhibits a faint but distinct absorption-band in the spectrum, situated between the C and D lines. Coniferin has not been detected in birch wood. Moreover, comparative experiments establish the distinction of this blue colouring matter from that found in decaying Canadian balsam pine-wood (*Abies balsamea*), and from that produced by the action of sulphuric acid on coniferin. It is suggested that its origin may probably be traced back to the action of an organism.

Fisetin, the Colouring Matter of Young Fustic (Rhus Cotinus). J. Schmid. (*Ber. der deutsch. chem. Ges.*, xix. 1734–1749.) The author has reinvestigated this substance. He finds that it occurs in the wood of *Rhus cotinus* in the form of a glucoside (to which

the author gives the name fustin) combined with tannin. This compound is readily broken up into its constituents by either alkalies or acids, and the supposed red and brown colouring matters of former investigators were probably only the coloured oxidation-products of this tannin. The *fustin-tannide* (the compound of the glucoside with tannin) was extracted with water, impurities precipitated by lead acetate in acetic solution, and the tannide extracted from the aqueous solution with ethyl acetate. Thus obtained, it formed long yellowish white needles, easily soluble in water, alcohol, and ether. The aqueous solution gives with ammonia a brown, with potash a brownish red coloration. It reduces Fehling's solution. The substance is decomposed when heated above 200°. When dissolved in a little warm glacial acetic acid, and the solution diluted with water, the tannide yields yellowish white lustrous needles of the glucoside *fustin*, $(C_{23}H_{12}O_5, C_6H_{11}O_6)_2$. This substance begins to blacken at 200°, and melts with decomposition at 218–219°. It is easily soluble in boiling water, in alcohol, and in alkalies, sparingly in ether. With lead acetate or stannous chloride, it gives a yellow, with copper acetate a brown precipitate, all of which are soluble in acetic acid. Ferric chloride gives a green coloration, which, on the addition of dilute soda, changes through violet-blue to red. When warmed with dilute sulphuric acid, this glucoside is gradually decomposed into a sugar and fisetin, $C_{23}H_{10}O_3(OH)_6$. The fisetin thus obtained was identical with that obtained from cotinin, a commercial extract of young fustic, prepared by extracting the wood with dilute soda. Pure fisetin crystallizes from dilute alcohol or from acetic acid in small yellow prisms, which are readily soluble in alcohol, but sparingly soluble in boiling water, ether, and chloroform, and contain six molecules of water of crystallization, which they lose at 110°. Fisetin is stated to be very similar in properties to quercetin, from which it differs in composition by CO_2. A full description of its properties and of some of its derivatives will be found in the original paper.

Pterocarpine and Homopterocarpine: two Crystalline Principles obtained from Red Santal-Wood. P. Cazeneuve and L. Hugounenq. (*Comptes Rendus*, June 13, 1887. From *Chemical News.*) From the wood of red santal (*Pterocarpus Santalinus*) there have been already isolated santaline, the colouring-matter, and a crystalline compound, santal, isomeric with piperonal. Pterocarpine is a white crystalline body, insoluble in water and in cold alcohol, slightly soluble in boiling alcohol and in ether. It

dissolves in chloroform, from which it separates in splendid clinorhombic prisms. It softens and melts at 152°, taking a yellow colour. This compound is insoluble in acids and potash lye, even at a boil. Homopterocarpine is a white crystalline substance, soluble in ether, chloroform, benzene, and carbon disulphide. From ether it crystallizes in fine needles.

Glucosides from Japanese Oleaceæ. J. F. Eykman. (*Rec. Trav. Chim.*, v. 127–140; *Journ. Chem. Soc.*, 1886, 1040.) Several species of the Oleaceæ are used as febrifuges, not only in Europe, but also in Asia. In this paper, the extraction and properties of a glucoside obtained from Japanese species are described. The glucosides from the *Olea fragrans* and *Forsythia suspensa* are found to be identical with one another, and also in general properties, with exception of the melting point, with the glucoside philyrine, $C_{27}H_{34}O_{11}$, obtained from the *Philyria*. The compound, $C_{26}H_{32}O_{11}$, thus obtained, crystallizes in colourless, silky needles, sparingly soluble in cold, more readily in hot water, insoluble in ether and petroleum; its aqueous solution is not precipitated by lead acetate and other mineral salts. It is decomposed by acids into glucose and another substance of phenolic properties; this melts under water at 70°, is readily soluble in alcohol and ether, sparingly soluble in water, insoluble in petroleum. Its product of oxidation by chromic acid has the odour of vanillin, but has not been further examined.

The Tannin of Mountain Ash Berries. C. Vincent and M. Delachanal. (*Bull. de la Soc. Chim.*, April 5, 1887; *Chemical News*, lvi. 24.) The juice of ripe mountain-ash berries contains, besides sorbine and glucose, an astringent principle having a very acid reaction. Caustic alkalies and ammonia turn it an intense gold-yellow, which disappears on acidification. It does not precipitate solutions of alum; it reduces salts of silver on heating, precipitates copper acetate olive-green, and turns a very intense dark green with ferric salts, which alkalies and ammonia alter to a reddish brown. With neutral lead acetate it gives a light yellow precipitate; with the sub-acetate a very pure lemon-yellow. It does not precipitate gelatin. On distillation it gives a thick brown liquid, rich in pryocatechin, and leaves a voluminous charcoal. This tannin approximates closely to morintannic acid, and especially to caffeotannic acid, but differs from them in several respects. The authors propose to name it sorbitannic acid.

Oak Tannin. C. Böttinger. (*Ber. der deutsch. chem. Ges.*, xx. 761–766.) The author arrives at the conclusion that oak tannin is a methyl salt of digallic acid.

Vernine. MM. Schulze and Boschard. (*Journ. de Pharm. et de Chim.*, July 15, 1886.) Vernine is a nitrogenous crystalline substance occurring in *Vicia sativa*, *Pinus sylvestris* and other species of *Pinus*. It is sparingly soluble in cold water, readily soluble in boiling water, ammonia, and dilute acids, and insoluble in alcohol. A solution in dilute nitric acid, when evaporated in a porcelain dish, leaves a yellow residue, which changes to an intense red on being touched with ammonia.

Formation of Asparagin. K. O. Müller. (*Pharm. Journ.*, 3rd series, xvii. 1016.) The author has investigated the mode of formation of albuminoids, especially of asparagin, in a variety of plants, and has arrived at the following conclusions. Asparagin is formed in the dark, and disappears again in the light, but has no pathogenic properties. Its formation does not appear to depend on the absence of carbohydrates. Its formation commences as soon as the process of assimilation is suspended; it is a secondary product of assimilation, being formed out of the carbohydrates, and the nitrogenous inorganic constituents of plants.

A New Asparagine. A. Piutti. (*Ber. der deutsch. chem. Ges.*, xix. 1691–1695; *Journ. Chem. Soc.*, 1886, 870.) A new form of asparagine was found in the mother-liquor from crude asparagine from vetch buds. The amount obtained was 100 grams of pure product from 20 kilos. of crude asparagine, which had been extracted from 6,500 kilos. of vetch buds. The results of crystallographic measurements show it to have the reverse form to ordinary asparagine; its aqueous solution has the same power of rotation as a solution of ordinary asparagine of equal strength, but it is dextrorotatory. It is only slightly more soluble in water than ordinary asparagine. Both forms of asparagine yield compounds having the same chemical properties; when optically active products are formed, they have the same rotatory power, but in different directions. Dextrorotatory asparagine has an intensely sweet taste. Both asparagines, when heated above 200°, yield the same product (polyfumaric acid?). When heated with 2 mols. of dilute hydrochloric acid at 170–180°, they both yield inactive aspartic acid, identical with the acid obtained by Dessaignes from ammonium malate. Inactive aspartic acid is also formed when aqueous solutions of dextro- and lævo-rotatory aspartic acids are

mixed and allowed to crystallize slowly. The inactive acid thus obtained differs in appearance from both active acids.

Lactucerin. G. Kassner. (*Liebig's Annalen*, ccxxxviii. 220–228; *Journ. Chem. Soc.*, 1887, 605.) Lactucerin can be obtained in a pure state by treating the ethereal solution with an aqueous solution of potassium hydrate. Alcohol is then added to the ethereal extract, until a small precipitate forms. On the addition of water to the filtrate, lactucerin is deposited in white, microscopic, needle-shaped crystals. Lactucerin, purified in this manner, melts at 200°; but after it is purified by sublimation in an atmosphere of carbonic anhydride, it melts at 210°. The results of analyses agree with the formula $C_{28}H_{44}O_2$ more closely than they do with Hesse's formula, $C_{20}H_{32}O_2$. On fusion with potash hydrogen is evolved, and *lactucol* $C_{13}H_{20}O$, is formed according to the equation, $C_{28}H_{44}O_2 + 2H_2O = C_2H_4O_2 + 2C_{13}H_{19}\cdot OH + 2H_2$. Lactucol melts at 160–162°, and crystallizes in needles. The acetate melts at 198–200°. Solutions of the alcohol and of the acetate in ether, chloroform, and carbon bisulphide are dextrogyrate. These results differ in some important respects from those of Hesse.

Glycyphyllin, the Sweet Principle of Smilax Glycyphylla. E. H. Rennie. (*Proc. Chem. Soc.*, 1886, No. 27.) *Smilax glycyphylla* is a plant which grows in abundance on the shores of Port Jackson, and is common on the coast of the northern parts of New South Wales and the southern parts of Queensland; the sweet principle extracted from its leaves has already been partially examined by Dr. Wright and the author. The author now corrects the formula previously given to $C_{21}H_{24}O_9$; glycyphyllin separates from aqueous ether with three, and from water with four and a half molecules of water of crystallization. On hydrolysis, it yields *phloretin* and *isodulcite*, $C_{21}H_{24}O_9 + 2H_2O = C_{15}H_{14}O_5 + C_6H_{14}O_6$, and is therefore closely allied to phlorizin, with which it is proposed to carefully compare it.

Alkaloids of Gelsemium. F. A. Thompson. (*Pharm. Journ.*, 3rd series, xvii. 606.) The author describes two alkaloids obtained by him from gelsemium root, thus confirming so far Messrs. Ringer and Murrell's hypothesis that the root contained two alkaloids, one of them exercising a paralysing and the other a tetanising influence. The alkaloids were obtained by percolating the finely powdered root mixed with freshly slacked lime with alcohol, shaking the percolate with chloroform, and then treating the chloroform solution with water acidulated with sulphuric acid. The separation of the alkaloids is effected by the addition of

hydrochloric acid, the hydrochlorate of one of them, which is crystalline, being insoluble, and that of the other, which is amorphous, being soluble in its own weight of water. The crystalline alkaloid, for which the author proposes to retain the name "gelsemine," gave upon analysis results corresponding with the formula $C_{54}H_{69}N_4O_{12}$, differing, therefore, considerably from that attributed by Mr. Gerrard to the alkaloid analysed by him. The amorphous alkaloid has not yet been obtained sufficiently pure for analysis.

Hopeine. W. Williamson. (*Chem. Zeit.* x. 491.) The substance now described by the author under this name is the base, distinct from morphine, referred to by Ladenburg (abstract, *Year-Book of Pharmacy*, 1886, 57). It crystallizes from weak alcohol in needles, fuses below 100° C., and sublimes partially below 160°. It is slightly lævorotatory. Solutions of its salts form precipitates with the usual alkaloidal reagents.

The Bitter Principle of Hops. F. Davis. (*Pharm. Journ.*, 3rd series, xvii. 20.) The author made an ethereal extract from the green strobiles, and obtained from this a mass of minute white acicular crystals, soluble in water, ether, and bisulphide of carbon. Three grains of the crystals dissolved in water, and injected hypodermically into the jugular vein of a medium sized cat, caused the death of the animal in seven minutes. The cat appeared in no pain, but showed a peculiar twitching of the muscles.

Note on the Solubilities of Morphine Hydrochloride, Salicin, and Gallic Acid. D. B. Dott. (*Pharm. Journ.*, 3rd series, xvii. 941.) The mean results of the author's experiments are as follows:—

Solubility of Morphine Hydrochloride in Rectified Spirit.—One part is soluble in 40 parts at 16° C.

Solubility of Salicin in Rectified Spirit.—One part is soluble in 66 parts at 16° C.

Solubility of Gallic Acid in Water.—One part is soluble in 118 parts at 16° C.

The Evidence for the Existence of Acid Morphine Meconate. D. B. Dott. (*Pharm. Journ.*, 3rd series, xvii. 690.) The author's experiments render the existence of such a compound very doubtful. Morphine and meconic acid, in various proportions, dissolved in anhydrous alcohol and evaporated, leave an amorphous hygroscopic residue which is extremely soluble in water and quickly combines with its water of hydration, when the neutral meconate with $5\,H_2O$ crystallizes out, even in the presence of sufficient acid to form the bimeconate.

Behaviour of Morphine towards Potassium Chromate. F. Ditzler. (*Archiv der Pharm.* [3], xxiv. 701–705.) Morphine salts in solution, when shaken with excess of potassium chromate solution, give a precipitate of morphine; whilst morphine chromate is precipitated when only very small quantities of potassium chromate are gradually added. Morphine chromate attaches itself to the walls of the precipitating vessel in the form of light yellow needles of the formula $(C_{17}H_{19}NO_3)_2$, H_2CrO_4.

Spontaneous Transformation of Morphine into Apomorphine. (*Amer. Pharm. Journ.*, November 1886.) A solution of morphine hydrochlorate, which had been employed subcutaneously, was found, eleven months later, to be violently emetic, and was ascertained to contain apomorphine. This observation points to the necessity of keeping such solutions for a short period only.

Pseudomorphine. O. Hesse. (*Liebig's Annalen*, ccxxxv. 229–232.) When two molecules of potassium hydrate and one molecule of potassium ferricyanide are added to a solution of pure morphine hydrochloride dissolved in 40 parts of water, pseudomorphine is deposited; 100 parts by weight of morphine yield 88·4 parts of pseudomorphine.

The author finds that the formula for pseudomorphine is $C_{17}H_{18}NO_3 \cdot C_{17}H_{18}NO_3$, as proposed by Polstorff, instead of $C_{17}H_{17}NO_3$, as formerly proposed by himself.

Papaverine and Papaveraldine. G. Goldschmiedt. (*Monatsh. Chem.*, vii. 485–505.) In this paper derivatives of papaveraldine, and the most convenient method of its preparation, are described.

In an additional note, the author defends the formula, $C_{20}H_{21}NO_4$, for papaverine, as against $C_{21}H_{21}NO_4$, that proposed by Hesse, Beckett, Wright, and others; exception is also taken to a statement of Hesse relative to the existence of an alkaloid, pseudopapaverine.

Papaverine and its Salts. R. Jahoda. (*Monatsh. Chem.*, vii. 506–516.) As a further effort to arrive at a correct formula for papaverine, the author has prepared and analysed a number of its salts. The results obtained afford confirmatory evidence of the correctness of the formula $C_{20}H_{21}NO_4$. (See preceding abstract.)

Thebaïne. W. C. Howard and W. Roser. (*Ber. der deutsch. chem. Ges.*, xix. 1596–1604. From *Journ. Chem. Soc.*) Former experiments by one of the authors (abstract, *Year-Book of Pharmacy*, 1885, 53), have shown that thebaïne is a tertiary base, and that when heated with hydrochloric or hydrobromic acid, it yields

morphothebaïne, together with either methyl or ethyl chloride. By repeating the experiment with hydriodic acid it is shown that methyl iodide is formed, thus:

$$C_{19}H_{21}NO_3 + 2HI = C_{17}H_{17}NO_3 + 2MeI.$$

Thebaïne, $C_{17}H_{15}NO(OMe)_2$, is therefore the dimethyl ether of morphothebaïne, $C_{17}H_{15}NO(OH)_2$.

Morphothebaïne is also characterised as a tertiary base by its combining directly with the halogen-derivatives of the hydrocarbons; its *methiodide* crystallizes in quadratic tables, the ethiodide in the rhombic form, and the benzochloride in small needles.

Among the products of the decomposition of thebaïne-methylhydroxide are trimethylamine, and a substance of the composition $C_{14}H_{12}O_3$, which is probably an oxy-derivative of phenanthrene.

Opium Alkaloïds. P. C. Plugge. (*Archiv der Pharm.* [3], xxiv. 993-1014; *Journ. Chem. Soc.*, 1887, 280.) Morphine, codeïne, thebaïne, papaverine, narcotine, and narceïne are the most important opium alkaloids. Their physiological action varies from strongly narcotic or sleep-inducing, to strongly exciting or cramp-producing; but different observers are not agreed as to the exact order of the members of the series. In the arrangement of the bases according to their poisonous nature, different observers are more nearly in accord. The author examined the reactions of salts of these alkaloids with alkaline salts of organic acids. Morphine, codeïne, and thebaïne, in neutral liquids, react strongly alkaline to litmus, and afford stable salts. Narcotine, papaverine, and narceïne, on the contrary, do not affect litmus paper, and combine only feebly with acids. Thus narceïne sulphate and chloride are slowly decomposed by cold water, more quickly by hot water. It appeared probable from this that solutions of salts of the stronger bases would give no precipitate with alkaline salts of organic acids, whilst in the case of the weak bases, the alkaloïd would be precipitated as such. The following salts were employed: sodium and ammonium acetate, ammonium oxalate, sodium salicylate, sodium potassium tartrate, sodium benzoate and hydrogen sodium carbonate.

Besides the six opium bases, many other alkaloids were examined in the course of the investigation, such as caffeïne, cocaïne, atropine, pilocarpine, coniine, strychnine, brucine, quinine, cinchonine, and cinchonidine; the latter, however, only with sodium acetate. None of these bases were liberated and precipitated; in the case of the cinchona bases, however, it was necessary

to carefully neutralize the sodium acetate with acetic acid, or precipitation took place. With a perfectly neutral solution of sodium acetate, the only alkaloids precipitated are the three weak opium bases, papaverine, narcotine and narceïne. These three bases are also precipitated both by slightly acid and by slightly alkaline acetate solution. Neither of the two solutions exerts any influence on the strong opium bases, consequently the ordinary non-neutralized acetate solution can be used for the separation of the bases with advantage in point of time, and perhaps completeness. Narcotine, papaverine, and narceïne were precipitated as pure bases by all the alkaline salts mentioned previously. Thebaïne was precipitated by sodium salicylate as salicylate, and by hydrogen sodium carbonate. Morphine and codeïne were not precipitated by any of the salts. Arranging the alkaloïds in series, according to their molecular weights, it will be seen that the first three are strong bases, and the last three feeble ones: morphine, $C_{17}H_{21}NO_3$; codeïne, $C_{18}H_{21}NO_3$; thebaïne, $C_{19}H_{21}NO_3$; papaverine, $C_{21}H_{21}NO_4$; narcotine, $C_{22}H_{23}NO_7$; narceïne, $C_{22}H_{29}NO_9$. Slightly acidified sodium acetate solution will indicate as little as 1 : 40,000 of narcotine in solution. With papaverine, the limit is 1 : 30,000. Narceïne is not nearly so sensitive, the limit being about 1 : 600. The precipitation of thebaïne as salicylate gave a limit of about 1 : 2,000. For quantitative estimation, narcotine is best precipitated by ammonia, where it is the only substance thrown down by this reagent; sodium acetate has, however, the advantage of precipitating it for qualitative purposes from faintly acid solutions in which all other alkaloïds, excepting papaverine and narceïne, remain in solution. Papaverine and narceïne are also best precipitated quantitatively by ammonia.

Decomposition-Products of Strychnine. C. Stoehr. (*Ber. der deutsch. chem. Ges.*, xx. 810–814.) In order to obtain evidence on the view of Hanssen that strychnine contains a phenylpyridine-group as well as a quinoline-group, the author has distilled strychnine with alkali, and obtained, in addition to a hydride of pyridine, not fully examined, γ-picoline, identified by analyses of its auro- and mercuro-chlorides, and crystalline form, as also by the melting point of the latter. Experiments to obtain methyl chloride as a product of the decomposition of strychnine were unsuccessful. It is shown that strychnine does not contain a hydroxyl-group, in that by treatment with phosphorus pentachloride the atoms of oxygen remain intact, whilst three hydro-

gen-atoms are displaced by chlorine to form a *trichloro*-derivative, $C_{21}H_{19}Cl_3N_2O_2$, the hydrochloride and sulphate of which crystallize in leaflets.

A Derivative of Strychnine. W. F. Loebisch and P. Schoop. (*Monatsh. Chem.*, vii. 609–616.) The products obtained on distilling strychnine with zinc-dust vary according to the temperature; at a lower temperature, one atom of oxygen is removed from the molecule with formation of a compound, $C_{21}H_{22}N_2O$, a solid substance, soluble in alcohol with a blue fluorescence, sparingly soluble in dilute acids, insoluble in water. It does not give the strychnine reaction with potassium dichromate and sulphuric acid. At a higher temperature the strychnine molecule is completely decomposed; hydrogen, ethylene, acetylene, and ammonia are evolved, whilst carbazole distils over.

Specific Gravity of Crystalline Strychnine. T. P. Blunt. (*Pharm. Journ.*, 3rd series, xvii. 62.) The gravity was determined in the following manner:—A solution of subacetate of lead was prepared, of such strength that a crystal of strychnine was suspended indifferently in any part of the fluid; the specific gravity of the liquid was found to be 1·13, which was therefore that of the crystal.

Strychnol. W. F. Loebisch and P. Schoop. (*Pharm. Journ.*, 3rd series, xvii. 352, from *Monatshefte für Chemie.*)

Strychnol or *strychnine hydrate*, $C_{21}H_{22}N_2O_2+2H_2O$, is prepared by boiling strychnine with a mixture of sodium ethoxide and absolute alcohol. The strychnine dissolves with a yellow coloration. On evaporating the mixture to expel the alcohol, a brown oil remains, which in time becomes solid. On dissolving this in water and passing a stream of carbonic anhydride, strychnol separates as a slightly yellow precipitate, which can be further purified by solution in ammonia and reprecipitation. It then forms a white, crystalline mass, consisting of microscopic, wedge-shaped needles; it does not give the strychnine reaction with potassium dichromate and sulphuric acid, but is coloured an intense carmine-red with sulphuric and nitric acids. At 150° the greater part of the water is lost, but decomposition takes place, and strychnine cannot be obtained from the residue. Strychnol is precipitated from acetic acid solution by the usual alkaloidal reagents; it is very sparingly soluble in cold water, easily in hot. Boiled with dilute acids, or allowed to remain for some time with strong acids, it is dehydrated, and strychnine is formed. Strychnol differs

from strychnine in being very readily oxidized, it even reduces an ammoniacal solution of silver oxide.

The authors point out the close relation between the colour reaction of strychnine and brucine, and also the identity of their respective actions with bromine. Strychnol gives no compounds with ammonia, trimethylamine, or aniline; it dissolves in all these, but any compound formed is dissociated on evaporation.

Strychnine, when heated with aqueous potash, does not yield strychnol in the same way that nitrostrychnine yields xanthostrychnol, but a substance is formed which is probably identical with Gal and Etard's *dihydrostrychnine*.

The authors have also repeated Goldschmidt's experiments, and have confirmed the formation of indole by fusing strychnine with potassium hydroxide. They also obtained evidence of the presence of butyric acid in the fused mass.

When an alcoholic solution of strychnine is reduced with metallic sodium, an additive product—strychnine hydride—is apparently formed.

Constitution of Brucine. A. Hanssen. (*Ber. der deutsch. chem. Ges.*, 451–460; *Journ. Chem. Soc*, 1887, 505.) With the view of throwing further light upon the constitution of brucine, the preparation and composition of kakotheline, originally obtained by Streeker, have been further investigated. To this substance is ascribed the formula $C_{21}H_{22}N_4O_9$, instead of $C_{20}H_{22}N_4O_9$, hitherto accepted. When reduced, it yields a base, the analysis of whose hydrochloride pointed to a formula $C_{21}H_{25}N_3O_5$, derived from kakotheline by the reduction of one nitro-group and elimination of another. With bromine, kakotheline yields an acid substance, $C_{19}H_{24}N_2O_7$, the platinochloride of which crystallizes in orange-yellow needles, its silver salt in glistening needles; its methyl salt could not, however, be obtained, but the crude product treated with ammonium chloride yielded a base, $C_{19}H_{22}Me_2N_2O_7$, crystallizing in yellow, sparingly soluble prisms. In this reaction, the acid seems to be analogous to nicotinic acid; and thus it would appear that in kakotheline, as also in brucine, a pyridine grouping is present. The above acid when oxidized with chromic acid yields the base, $C_{16}H_{18}N_2O_4$, obtained formerly as a product of decomposition of brucine. According to the author there is present in brucine, besides a quinoline-group, also a dimethoxyphenylpyridine, and in strychnine, a phenylpyridine residue; the stability of brucine seems to indicate a ring-arrangement.

Colchicine. S. Zeisel. *Monatsh. Chem.*, vii. 557–597; *Journ. Chem. Soc.*, 1887, 284.) Previous observations on the composition and properties of colchicine have, for the most part, been very discordant; in this paper a long summary is given. The principal results obtained by the author are as follows: the composition of colchicine is expressed by the formula $C_{22}H_{25}NO_6$; it combines with chloroform to form a crystalline compound, $C_{22}H_{25}NO_6$, $2CHCl_3$, readily decomposed by water into its components. Colchicine is slightly basic, but its salts, with the exception of an aurochloride, $C_{22}H_{25}NO_6$, $HAuCl_4$, cannot be obtained from their aqueous solutions. Colchiceïne, formed from colchinine, when heated with a trace of hydrochloric or sulphuric acid, has the composition $2C_{21}H_{23}NO_6$, H_2O. As the difference between the two compounds is one CH_2 or methylene group, and as methyl alcohol is produced in the decomposition, it follows that colchiceïne is a demethylated colchicine.

Colchiceïne possesses at once the properties of a base, as evidenced by the formation of an aurochloride, $C_{21}H_{23}NO_6$, $HAuCl_4$, and also those of a monobasic acid, or more probably of a phenol, as shown by the formation of a copper derivative $(C_{21}H_{22}NO_6)_2Cu$, and by the readiness with which it dissolves in alkalies. As colchicine has no acidic properties, it is probably a methoxy-derivative of a compound, of which colchiceïne is the corresponding hydroxy-derivative.

It is suggested that the molecular formula of each of the above substances is the double of that given; owing to the complex composition of the substances, the number of hydrogen-atoms is given with a certain reserve.

Sparteine. E. Bamberger. (*Liebig's Annalen*, ccxxxv. 368–376.) The author has re-examined the sulphate, hydriodide, ethiodide, and methiodide of this alkaloid, and has obtained results differing in many instances from those obtained by Mills. Fuller information will be found in the original article.

Ecgonine. C. E. Merck. (*Ber. der deutsch. chem. Ges.*, xix. 3002, 3003.) The author has repeated an experiment made by Calmels and Gossin (abstract, *Year-Book of Pharmacy*, 1886, 53), and finds that ecgonine, when distilled with almost dry barium hydrate, yields methylamine and not ethylamine as one of the products: this corresponds with the behaviour of tropine under like conditions.

Amorphous Cocaine. R. Stockman. (*Pharm. Journ.*, 3rd series, xvii., 861–863.) In isolating cocaine from coca leaves there

is found in the mother liquors a varying quantity of a body generally known as "amorphous cocaine." The names "cocaicine" and "cocainoidine" have also been proposed for it, but have not met with much acceptance. A short description of this body has been given by Lyons (*Amer. Journ. of Pharm.*, Oct., 1885) and by Bender (*Year-Book of Pharmacy* 1886, 182), but neither of them have appreciated its true nature.

The samples examined by the author were practically similar but differed slightly in outward appearance. The colour varied from dark yellow to dark brown, and the consistence from that of treacle to a sticky, tenacious solid. The smell was peculiar, recalling that of nicotine, but more aromatic and less pungent; while the taste was bitter and aromatic. It is alkaline in reaction, and soluble in alcohol, ether, acetic ether, chloroform, benzol, amylic alcohol, and petroleum ether. Its solubility in water varies with its consistence. The solid specimens are nearly quite insoluble, while on adding water to the more fluid specimens, a dense whitish precipitate is at first formed, which becomes dissolved upon agitation. It therefore, in this case, dissolves the water, rather than *vice versâ*.

On gently heating it becomes quite fluid. It is very soluble in dilute acids, with which it forms non-crystalline salts, all of which dissolve readily in water. If it be dissolved in rectified spirit, and treated with animal charcoal, or with acetate of lead in the usual way, to get rid of the colouring matter, the body ultimately obtained is pale yellow in colour, sticky in consistence, and non-crystalline, nor do crystals form in it even after standing for months. By repeated solution in alcohol, and repeated precipitation with ammonia, a nearly white non-crystalline, flocculent body is obtained. The original odour and taste remain, no matter how often the purifying process is repeated. It can be dried *in vacuo* over sulphuric acid, but on exposure to the air rapidly absorbs moisture again. The purified hydrochlorate of amorphous cocaine is also pale yellow in colour, and retains the characteristic disagreeable smell and taste. It is hygroscopic, but if tolerably pure and thoroughly dried shows sometimes a tendency to form imperfect crystals. It is very soluble in water, alcohol, chloroform, acetic ether, and amylic alcohol; insoluble in ether, petroleum ether, and benzol. From a study of the physiological action and chemical relations of this body, the author has been led to the conclusion that it is a *solution* of ordinary crystalline *cocaine* in *hygrin*, the liquid alkaloid which is also present in the coca leaves.

This body is extracted from the leaves in greater or less amount, along with the cocaine, by the processes which are now used by manufacturers, and its presence accounts for the disagreeable properties and effects which have been observed in many samples of the hydrochlorate.

Cocaine is extremely soluble in hygrin, and when once solution has occurred, it is practically impossible to separate the two bodies, as they are both soluble in the same menstrua, and are both precipitated by the same reagents. The same holds good for their salts, but to the same extent. These facts account as ordinarily fully for the presence of hygrin in the hydrochlorate of cocaine sold, and it is the admixture of hydrochlorate of hygrin which makes the salt hygroscopic, and imparts to it the peculiar odour.

The great solubility of cocaine in hygrin also accounts for the peculiar behaviour of fluid amorphous cocaine when water is added to it. The addition of a small quantity of water precipitates the cocaine from its solution, and it is not until the water has become thoroughly incorporated with the hygrin that the precipitate is dissolved up. The addition of more water than the hygrin can dissolve precipitates the cocaine permanently; the latter, as is well known, being only slightly soluble in water.

As regards the physiological action, the author found that amorphous cocaine and its hydrochlorate produced the same effects as the pure substances, the activity being proportionately detracted from by the amount of hygrin present.

There is, however, one very important difference. In using amorphous hydrochlorate of cocaine to cause anæsthesia of the conjunctiva, it was observed that considerable irritation followed, this being without doubt due to the hygrin.

The Amount of Caffeine in Various Kinds of Coffee. B. H. Paul and A. J. Cownley. (*Pharm. Journ.*, 3rd series, xvii. 565 and 648.) The method adopted and recommended by the authors for estimating the proportion of caffeine in coffee beans is as follows:—

The finely powdered coffee is mixed with moist lime, and percolated with alcohol. The residue left on evaporating the percolate is treated with water and a few drops of dilute sulphuric acid, filtered, and the filtrate exhausted with chloroform, which on evaporation leaves the caffeine fit for weighing. By this method the following results have been obtained with different kinds o unroasted coffee:—

Kinds of Coffee.	Moisture per cent.	Caffeine.	
		Berries dried at 212° F. per cent.	Air dried Berries. per cent.
Coorg	8·0	1·20	1·10
Guatemala	8·6	1·29	1·18
Travancore	10·0	1·29	1·16
Liberian	8·0	1·30	1·20
Liberian	8·0	1·39	1·28
Rio	9·1	1·20	—
Santos, Brazil	9·0	1·29	—
Manilla	6·6	1·20	—
Ceylon	6·2	1·24	—
Perak	7·3	1·22	—
Costa Rica	7·2	1·24	—
Pale Jamaica	8·7	1·21	—
Mysore	8·0	1·28	—
Jamaica	9·0	1·28	—

Roasted coffee contains about 1·3 per cent. of caffeine, but this amount varies slightly.

It is evident from the results quoted in this table that the discordant statements hitherto published in reference to the amount of caffeine in coffee must be ascribed to defective methods of analysis; and that, in reality, the determination of the amount of caffeine in a sample of coffee by the method described would be one of the most conclusive data to rely upon in any question as to the adulteration of coffee.

In some further notes on the chemistry of coffee (*ibid*, 821, 822, and 921, 922) the authors describe experiments proving that there is no appreciable loss of caffeine by volatilization in the roasting operation, when it is carefully carried out; also confirming their previous observation that the amount of caffeine in moderately roasted coffee may be fixed at 1·3 per cent.

The practical advantages of the proposed method of analysis, as applied to the detection of adulterants in coffee, are that the results obtained by it give at one and the same time an indication of the actual amount of coffee present in the sample examined, and also an indication of the amount of admixture independently of its actual nature, which is, for the purpose in view, a matter of comparatively little importance. By the application of this method of testing there is no difficulty in ascertaining the amount of real coffee present in any sample.

Caffeine Methhydroxide. E. Schmidt. (*Archiv der Pharm.* [3], xxiv. 522–528.) The body described in this paper was obtained by the action of moist silver oxide on caffeine methiodide. It appears to differ from the analogous quaternary ammonium bases in yielding, not methylcaffeine, but caffeine, on dry distillation.

Guanine. E. v. Brücke. (*Monatsh. Chem.*, vii. 617–620.) It has long been known that guanine, when evaporated with nitric acid, gives a yellow residue, soluble in potash with yellow coloration: the solution thus obtained, on evaporation to dryness, gives at first a purple then a violet coloration; on exposure to air the original colour returns. In this paper, it is shown that these changes are due to the proportion of water present; thus there exist two compounds: the one, golden-red, with the greater, the other, indigo-blue, with the less proportion of water. It is not improbable that an intermediate purple-red compound is also formed. Experiments confirmatory of this view are described, in which the coloured solutions are exposed to conditions of the presence and absence of water respectively.

Cinchonine Derivatives. W. J. Comstock and W. Koenigs. (*Ber. der deutsch. chem. Ges.*, xix. 2853–2859.) From considerations based on its chemical behaviour, the authors have adopted the formula $C_{19}H_{22}Br_2N_2O$ for *cinchonine dibromide*, instead of that given in their previous paper. A crystalline *sulphate* is obtained by allowing a solution of cinchonine dibromide in 7 to 8 parts of concentrated sulphuric acid to remain for several hours. It is soluble in hot water and dilute alkalies, excess of alkali throwing out the salt, but dilute acids dissolve it with difficulty. When heated at 130° in a sealed tube with hydrogen bromide, it is decomposed into cinchonine dibromide and sulphuric acid.

Dehydrocinchonine, $C_{19}H_{20}N_2O$, is obtained in practically colourless needles by heating cinchonine dibromide with alcoholic potash in a reflux apparatus for sixteen to twenty hours, distilling off three-fourths of the alcohol, and adding water to the residue. It is purified by precipitating its hydrochloride with ammonia, and crystallizing from alcohol. The base melts at 202–203°, and sublimes without decomposition if the temperature be carefully raised. It dissolves easily in alcohol, acetone, and chloroform, less easily in ether and hot benzene, and is practically insoluble in water. The *hydrobromide*, $C_{19}H_{20}N_2O$, HBr, crystallizes from water in colourless, transparent prisms, the *hydrochloride* in long, silky needles.

Dehydrocinchonine chloride, $C_{19}H_{19}N_2Cl$, is prepared by treating

dehydrocinchonine hydrochloride with phosphorus pentachloride and phosphoric oxychloride, adding ammonia, and crystallizing from benzene. It melts at 148–149°, and is readily soluble in benzene, alcohol, acetone, chloroform, and ether, but insoluble in light petroleum.

Dehydrocinchene, $C_{19}H_{18}N_2$, is obtained by boiling dehydrocinchonine chloride with alcoholic potash for sixteen hours, and is purified by recrystallizing its hydrogen tartrate. The free base crystallizes from dilute alcohol, forms long colourless needles, which melt at abont 60°, and contain at least 3 mols. H_2O. The *hydrobromide*, $C_{19}H_{18}N_2$, 2 H Br, is obtained in small, broad, transparent, concentrically-grouped prisms, which dissolve readily in water, but only sparingly in alcohol and ether. The *platinochloride*, $C_{19}H_{18}N_2$, H_2PtCl_6, a very sparingly soluble salt, is obtained in bright red tables from the solution of the base in concentrated hydrochloric acid.

Cinchene dibromide, $C_{19}H_{20}Br_2N_2$, is best prepared by gradually adding bromine to a solution of cinchene in chloroform until the yellow perbromide begins to separate, sodium hydrogen sulphite and hydrochloric acid are added, and the base, precipitated from the separated aqueous layer by ammonia, is purified by conversion into the hydrobromide, etc. From its ethereal solution it is obtained in beautiful colourless crystals, which begin to fuse at 110° and melt at 113°. The *hydrobromide* crystallizes in concentrically-grouped colourless needles; the *nitrate* and *zincochloride* also crystallize well. Boiling for twenty hours with alcoholic potash converts cinchene dibromide into dehydrocinchene.

Glycyrrhizate of Quinidine. H. Hager. (*Pharm. Zeitung*, xxxi. 641.) The author prepares this compound as follows:— 1000 grams of coarsely powdered peeled liquorice root are macerated in 1·5 litres of distilled water at abont 40° C. for twelve hours; it is then displaced with a mixture of 1·5 litres of distilled water, 70 c. c. of ammonia water (10 per cent.), and 15 grams of bicarbonate of ammonium; and lastly with distilled water until the liquid has a pale yellow colour and a scarcely perceptible sweet taste. The mixed liquids, if turbid (owing to the presence of carbonate of calcium), must be filtered. To the filtrate is added by agitation a solution of 75 grams of sulphate of quinidine in 500 c. c. of luke-warm distilled water and 300 grams of hydrochloric acid, sp. gr. 1·124. If, after the lapse of one hour, the solution should have a strong alkaline reaction, it must be neutralized with dilute acetic acid. It must be stirred frequently, and then put

aside for several hours. The precipitate is collected on a wetted linen strainer, and washed with cold distilled water, gently expressed, and spread on porcelain plates in layers about 1·5 cm. thick, and only covering one-half of the plate. The plates are placed in a slanting position, so that the liquid can drain off. When dry it is powdered in a cold porcelain mortar. The yield is about 200 grams. Thus prepared, glycyrrhizate of quinidine is a grey-yellow powder, of a bitter-sweet taste, insoluble in water, and sparingly soluble in alcohol. Acids and alkalies decompose it. Its composition corresponds to the formula, $C_{20}H_{24}N_2O_2$. $C_{14}H_{63}NO_{18}+2H_2O=1577$. It contains 41·09 per cent. of quinidine.

Quinoline. A. Claus and F. Collischonn. (*Ber. der deutsch. chem. Ges.*, xix. 2502–2508.) In this paper the authors describe a number of halogen additive products of the propio-haloid compounds of quinoline. These products were obtained by treating a chloroform solution of the propio-haloid salt with the halogen.

Phenyl-Derivatives of Piperidine. E. Lellmann. (*Ber. der deutsch. chem. Ges.*, xx. 680, 681.) The compounds described by the author are: *phenylpiperidine*, *dinitrophenylpiperidine*, *paranitrophenylpiperidine*, and *amidophenylpiperidine*. For details reference must be made to the original article.

Pyridine Bases. A. Ladenburg. (*Comptes Rendus*, ciii. 692–695.) Several methyl, ethyl, and isopropyl-pyridines are described in this paper, along with their platinochlorides and other compounds. For particulars the reader is referred to the original article.

Piperidine Bases. A. Ladenburg. (*Comptes Rendus*, ciii. 747–749.) The bases dealt with in this paper were obtained by treating boiling alcoholic solutions of the corresponding pyridine bases mentioned in the preceding abstract with a large excess of sodium. Piperidine obtained in this way is identical with the alkaloid prepared from piperine.

Action of Chlorine on Pyridine. E. H. Keiser. (*Amer. Chem. Journ.*, viii. 308–315; *Journ. Chem. Soc.*, 1887, 277.) Anderson has worked on this subject (*Annalen*, cv. 340). When anhydrous pyridine is treated with dry chlorine, it finally solidifies, and by distillation a white crystalline solid boiling at 130°, and a yellow solid boiling at 218°, are obtained. The first is purified by crystallization from alcohol; it melts at 72°, is very stable, and with platinum chloride gives a precipitate having the composition $(C_5H_3Cl_2N)_2$, H_2PtCl_6. The second substance cannot be dis-

tilled without partial decomposition; it is very deliquescent, and is soluble in water; with platinum chloride, the solution gives a precipitate of pyridine platinochloride; the yellow compound itself has the composition C_5H_5NCl, and is evidently an unstable additive product.

When chlorine is passed into pyridine diluted with its own bulk of water, nitrogen and carbonic anhydride are evolved, and on further dilution a white precipitate is thrown down, which when dry smells like bleaching powder, and with platinum chloride gives a precipitate of pyridine platinochloride; it is therefore an additive product of pyridine, probably the hypochlorite, and the carbonic anhydride and nitrogen are derived from the decomposition of this substance. When chlorine is passed into a pyridine solution containing free alkali, nitrogen is evolved with explosive violence; but if the contents of the flask be kept cool the action is more gentle, and chloroform and dichloracetic acid are to be found in the distillate. This decomposition of pyridine by chlorine is far more readily explained by Riedel's formula than by Körner's.

The Transformation of Citric Acid into Pyridine-Derivatives, and the Constitution of Pyridine. S. Ruhemann. (*Proc. Chem. Soc.*, March 17, 1887.) Hofmann and Behrmann have shown that citramide is converted by heating with sulphuric acid into citrazinic acid, the dihydroxypyridinecarboxylic acid in which both hydroxyls are in ortho-positions to the nitrogen-atom, the carboxyl being in the para-position. The author finds that the formation of the pyridine-derivative takes place even at ordinary temperatures if ethylic aceto-citrate be mixed with strong aqueous ammonia, and the mixture allowed to stand several days; dilute chlorhydric acid then precipitates citrazinamide. The production of a pyridine-derivative in this manner is a strong argument, he thinks, in favour of Riedel's contention that the nitrogen-atom in pyridine is in connection with the carbon-atom, which relatively to it is in the para-position; and in further support of this view he states that no condensation takes place if methylamine be substituted for ammonia, there being in this case no available hydrogen-atom associated with the nitrogen-atom to separate with the hydroxyl and thus permit of the union of the nitrogen-atom with the para-carbon-atom. Incidentally it is mentioned as an indication of the mobility of the acetyl-group, that if ethylic aceto-citrate be treated with phenyl hydrazine, the acetyl-derivative of the latter is formed; ethylic acetomalate and diacetotartrate behave similarly.

Synthesis of Pyridine Bases. J. Plöchl. (*Ber. der deutsch. chem. Ges.*, xx. 722, 723.) Pyridines are formed by the action of aldehydes on concentrated solutions of ammonium chloride at a high temperature. Collidine was obtained from paraldehyde, and parvoline from propaldehyde. The reactions are analogous to those by means of which quinoline-derivatives are obtained from the hydrochlorides of primary amines and aldehydes, ketones, etc.

Preparation of Pyridine Bases by the Action of Ammonium Salts on Glycerin. L. Storch. (*Ber. der deutsch. chem. Ges.*, xix. 2456–2459.) The close affinity of the pyridine with the quinoline bases would lead to the supposition that the former would be obtained from glycerin and ammonia or its derivatives by Skraup's synthetic method. It is here shown that if glycerin is heated with a 30–40 per cent. solution of ammonium sulphate and concentrated sulphuric acid at 200–230°, the resultant distillate contains pyridine, β-picoline, and lutidine, together with higher homologues. With ammonium phosphate, a precisely similar result was obtained; but experiments with alcoholic ammonia, ammonium oxalate, and ammonium chloride were unsuccessful.

Synthesis of Active Conine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xix. 2578–2583; *Journ. Chem. Soc.*, 1887, 160.) Further experiments on a larger scale, and with pure materials, have confirmed the author's previous results. *α-Allylpyridine* boils at 187·5–192·5°, and is a strongly refracting liquid of sp. gr. 0·9595 at 0°, sparingly soluble in water, and having a distinct conyrine-like odour. The *platinochloride*, $(C_3H_5{\cdot}C_5H_4N)_2$, H_2PtCl_6, melts at 185–186°, and crystallizes in needles sparingly soluble in water. The *aurochloride* melts at 135–136°; the mercuriochloride and cadmio-iodide are also described. By the action of sodium on an alcoholic solution at the boiling point, α-allylpyridine is reduced almost quantitatively to *α-propylpiperidine*. This base has a sp. gr. 0·8626 at 0°, and boils at 166–167°; its hydrochloride crystallizes in white, silky needles, melting at 203–205°. In smell, solubility, specific gravity, and physiological action, α-propylpiperidine resembles conine, and not only are the platinochlorides, aurochlorides, and cadmio-iodides similar, but when α-propylpiperidine is converted into conyrine by Hofmann's method, a blue fluorescence is obtained just as with conine. This fluorescence is due to an accompanying product, for if the fluorescent base after separation from unaltered conine be converted into the platinochloride, the conyrine regenerated from it is no longer fluorescent. Conyrine platinochloride from conine crystallizes in monoclinic

forms: $a:b:c = 1{\cdot}0614:1:1{\cdot}5374$; $\beta = 87^\circ\ 8'$; and the crystals from the synthetical base give practically the same value on measurement.

α-Propylpiperidine, however, in addition to the lower melting point of its hydrochloride, is optically inactive, and must be regarded as a physical isomeride of conine. To effect a separation into two optically active bases, a sterilised nutritive solution containing 0·5 per cent. of the tartrate was seeded with *Penicillium glaucum*, but without result. The active base, however, was obtained by introducing a crystal of the salt into a very concentrated solution of α-propylpiperidine hydrogen tartrate; a slow separation of crystals took place, which yielded a dextrorotatory base, whose specific rotation was $[\alpha]_D = 13^\circ\ 87'$, compared with $[\alpha]_D = 13^\circ\ 79'$ for conine. The hydrochloride of the synthetical active base melts at 217·5°, that of conine at 217·5–218·5°.

From the mother-liquor a lævorotatory base was obtained, but it contained a large proportion of the dextrorotatory modification, which could not be further separated by the crystallization method. However, on converting this lævorotatory mixture into the cadmio-iodide, it was found that after crystallization, the crystallized salt yielded a base which was less lævorotatory than before, whilst from the mother-liquor a base was obtained which in a 50 per cent. alcoholic solution gave a rotation of $-3^\circ\ 30'$ in a decimetre tube, compared with $3^\circ\ 10'$ for conine under the same conditions.

Conyrine Platinochloride. T. Liweh. (*Ber. der deutsch. chem. Ges.*, xx. 67, 68.) The author has submitted synthetical conyrine platinochloride to a crystallographic examination, and gives results which show that the crystals are precisely similar in form to those of the conyrine platinochloride obtained from natural conine.

Action of Ethyl Iodide on Nicotine. O. de Coninck. (*Comptes Rendus*, civ. 513–515.) Nicotine reacts readily with ethyl iodide, and yields a yellow, translucent solid which dissolves in warm, absolute alcohol, forming a deep brown solution. If this is mixed with potash of 45°, and heated on a water-bath for ten hours, a garnet-red coloration is produced, which afterwards changes to carmine. When the solution is mixed with an excess of hydrochloric acid, and is poured into acidified water, there is no change of colour and no fluorescence, but after twenty-four hours the liquid becomes yellow.

Derivatives of Picolinic and Nicotinic Acids. E. Seyfferth. (*Journ. prakt. Chem.* [2], xxxiv. 241–263.) The researches recorded in this paper deal with the following compounds: chloro-

picolinic acid, chlorohydroxypicolinic acid, trichloropyridine, and dichloronicotinic acid. For details reference must be made to the original article.

Synthesis of Pyrroline. G. Ciamician and P. Silber. (*Ber. der deutsch. chem. Ges.*, xix. 3027.) The authors showed previously that succinimide may be readily converted into tetrachloropyrroline, but were unable to completely reduce the latter to pyrroline. This can be readily effected by boiling the chloride with the corresponding amount of potassium iodide in a reflex apparatus. The iodide so obtained is very readily reduced to pyrroline by warming with potash solution in presence of zinc-dust.

The Alkaloids of Berberis Vulgaris. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xix. 3190–3194; *Journ. Chem. Soc.*, 1887, 283.) The author has reinvestigated the alkaloids in the root of this plant. He believes that there are therein at least four alkaloids besides berberine, and describes especially oxyacanthine (Wacker, *Chem. Centr.*, 1861, 321), and a new alkaloid he has obtained from the mother-liquors of oxyacanthine, and which he names *berbamine*.

He finds the true formula of oxyacanthine to be $C_{18}H_{19}NO_3$, and not $C_{19}H_{21}NO_3$, as he has previously given. When crystallized from water and dried at 100°, this alkaloid melts at 138–150°; but when crystallized from alcohol or ether, it forms needles melting at 208–214°. It is easily soluble in chloroform, and then gives $[\alpha]_D = +131{\cdot}6°$ ($p = 4$, $t = 15°$). In light petroleum and alkalies, it is only slightly soluble, and ether extracts it completely from the alkaline solutions. The *hydrochloride*, $C_{18}H_{19}NO_3$, $HCl + 2H_2O$, forms small colourless needles which in aqueous solutions give $[\alpha]_D = +163{\cdot}6°$ ($p = 2$, $t = 15°$.) The *platinochloride* is a yellow, flocculent precipitate. The *nitrate* and *sulphate* are both crystalline. When heated with potash and a little water, the base melts to a brown mass which floats on the surface of the fused potash. This brown mass is the potassium compound of *β-oxyacanthine*. This conversion into a β-modification also takes place very readily, even at ordinary temperatures, when the alkaloid is acted on by alkalies or barium hydroxide in the presence of alcohol. Ether now no longer extracts the alkaloid from the alkaline solution. Hydrochloric acid precipitates β-oxyacanthine, which is soluble both in alkalies and in excess of acid. If, however, the alkaline solution of the β-compound is supersaturated with hydrochloric acid, α-oxyacanthine hydrochloride crystallizes out. The author believes the β-modifi-

cation is due to the alkaloid taking up an additional molecule of water. Oxyacanthine very closely resembles narcotine in properties.

Berbamine crystallizes in small scales of the composition $C_{18}H_{19}NO_3 + 2H_2O$. It is easily soluble in ether. When anhydrous, it melts at 156°. The *hydrochloride* crystallizes in scales, the *nitrate* in needles; the *platinochloride* forms a yellow crystalline precipitate.

Action of Potassium Permanganate on Berberine. E. Schmidt and C. Schilbach. (*Archiv der Pharm.* [3], xxv. 164–170; *Journ. Chem. Soc.*, 1887, 604.) Berberine, under the action of concentrated nitric acid, yields a tribasic nitrogenous acid, berberonic acid, $C_5H_2N(CO\cdot OH)_3$, as has been shown by Weidel and again by Fürth. It is remarkable that the principal effect of the action of potassium permanganate on berberine should be the production of non-nitrogenous acid analogous to hemipinic acid, as J. Court has shown in an investigation instigated by one of the authors. The authors, in supplementing this investigation, conducted the oxidation in an alkaline solution, and in general followed the course taken by Court. A hot dilute solution of berberine was treated with aqueous potash and then with hot potassium permanganate solution. The slight excess of permanganate was decomposed by a few drops of alcohol. Preliminary tests indicated the formation of only very minute quantities of oxalic acid. On the contrary, carbonic anhydride was freely evolved on adding excess of sulphuric acid, and a strong odour of nitric acid was perceptible. The filtrate from the manganese oxide was neutralized with sulphuric acid, evaporated to dryness, powdered, well shaken with ether, and treated with excess of moderately dilute sulphuric acid. On distilling off the ether, a brown liquid remained which deposited a considerable quantity of crystals when placed over sulphuric acid. To avoid loss, the brown liquid was dissolved in water and the contained acids were precipitated by means of a slight excess of lead acetate. The well-washed precipitate was treated with sulphuretted hydrogen, the lead sulphide and excess of sulphuretted hydrogen removed, and the liquid evaporated and set to crystallize over sulphuric acid. The filtrate from the lead precipitate was freed from acetic acid by repeated evaporation, and again treated with lead acetate, when a further crop of crystals was obtained. The lead acetate treatment gave crystals much purer than those obtained by direct crystallization of the ether extract. These crystals, dried at 100°

have a constant melting point of 160–162°, and amount to about 30 per cent. of the original berberine. A small quantity of nitrogenous, nodular crystals was obtained by treating the mother-liquor of the ether extract with water, dissolving the precipitate obtained in hot water, and purifying with the aid of lead acetate. No other well characterised compounds were isolated. A considerable portion of the nitrogen of berberine was evidently converted into nitric acid during the oxidation. Another portion appeared in the form mentioned above. A further portion was converted into ammonia, or at least into compounds which gave ammonia on distillation with potash. The copious oxidation product melting at 160–162°, obtained as above, was compared with hemipinic acid, specially prepared by Schilbach from narcotine, and the two compounds were shown to be identical.

Hydrastine and Hydrastinine. M. Freund and W. Will. (*Ber. der deutsch. chem. Ges.*, xx. 88–95.) The authors substitute the formula $C_{21}H_{21}NO_6$ for that previously ascribed to hydrastine. They have examined the base *hydrastinine*, $C_{11}H_{11}NO_2 + H_2O$, obtained together with opianic acid when hydrastine is treated with oxidizing agents. Hydrastinine forms white crystals, melts at 116–117°, fusion, however, occurring if it be kept at 100° for some time, and is soluble in benzene, ethyl acetate (these solvents produce a partial decomposition), light petroleum, ether, and water; the aqueous solution is strongly alkaline and intensely bitter. Like cotarnine, of which it is the next lower homologue, hydrastinine crystallizes from all solvents with 1 mol. H_2O; this, however, is not present in its salts. The *hydrochloride*, $C_{11}H_{11}NO_2$, HCl, crystallizes in feebly coloured needles, melts at about 212° with decomposition, and is readily soluble in alcohol and water; the aqueous solution shows a feeble fluorescence, and is optically inactive. The *sulphate*, $C_{11}H_{11}NO_2$, H_2SO_4, forms yellow crystals showing a green fluorescence, and is soluble in alcohol. The *dichromate*, $C_{11}H_{11}NO_2$, $H_2Cr_2O_7$, crystallizes in slender, golden-yellow needles, and is soluble in water. The *methiodide*, $C_{11}H_{11}NO_2$, MeI, crystallizes in slender, yellow needles showing a vitreous lustre, and is soluble in alcohol and water. The *platinochloride*, $C_{11}H_{11}NO_2$, H_2PtCl_6, and the *aurochloride* form yellow crystals, whilst with potassium ferricyanide a compound crystallizing in reddish brown needles is obtained.

The authors also give a description of *hydrohydrastinine*, $C_{11}H_{13}NO_2$, a crystalline base obtained from hydrastinine by reduction with zinc and hydrochloric acid; and of *hydrastinic acid*,

$C_8 H_7 N O_4$, which is obtained by boiling hydrastine with dilute nitric acid until potassium hydrate ceases to precipitate the product.

Pilocarpine. E. Hardy and G. Calmels. (*Comptes Rendus*, cii. 1116–1119. From *Journ. Chem. Soc.*) The authors have analysed the following compounds of pilocarpine: the nitrate, $C_{11} H_{16} N_2 O_2$, $H N O_3$, which forms rhombic lamellæ, very soluble in water but less soluble in alcohol; the platinochloride, $(C_{11} H_{16} N_2 O_2)_2$, $H_2 Pt Cl_6$, which forms somewhat soluble quadratic prisms and lamellæ; the modified platinochloride, $(C_{11} H_{16} N_2 O_2)_2 Pt Cl_4$, a very soluble, crystalline, yellow powder; the aurochloride, $C_{11} H_{16} N_2 O_2 Au Cl_3$, formed in slender needles when the pilocarpine is in excess; the aurochloride, $C_{11} H_{16} N_2 O_2$, $2 Au Cl_3$, obtained in microscopic needles when the auric chloride is in excess. Both these compounds form viscous oils when heated in presence of water, and combine with only one equivalent of hydrochloric acid. The acid aurochloride, $C_{11} H_{16} N_2 O_2$, $H Au Cl_4$, obtained in needles by adding a limited quantity of auric chloride to a solution containing free hydrochloric acid; the acid diaurochloride, $C_{11} H_{16} N_2 O_2$, $2 H Au Cl_4$, obtained in needles or right rectangular prisms by adding excess of auric chloride in presence of hydrochloric acid; the mercurochlorides, which crystallize in slender needles and are very soluble in acids; and the hydrochloride, which forms a gummy mass. Pilocarpine itself is a viscous substance, very soluble in alcohol and water, slightly soluble in cold ether or chloroform, more soluble on heating, and readily soluble in ether or chloroform mixed with alcohol. Pilocarpine does not act on carbonates, but with alkaline hydrates it forms compounds which are decomposed by carbonic acid. These facts point to the presence of an internal anhydride. Pilocarpic acid does not exist in the free state. The copper salt, $(C_{11} H_{17} N_2 O_3)_2 Cu$, is a slightly soluble green powder, and the silver salt forms a curdy precipitate. Free pilocarpine forms with silver nitrate two compounds,

$$Ag N O_3, C_{11} H_{16} N_2 O_2,$$

and $(Ag N O_3)_2$, $C_{11} H_{16} N_2 O_2$, which crystallizes in needles. The constitution of pilocarpine is represented by the formula

$$C_5 H_4 N\beta.C Me\begin{cases} -C O- \\ N Me_3 \end{cases}O.$$

Pilocarpidine.—The substance produced by the action of nitric

or hydrochloric acid on pilocarpine or by boiling pilocarpine or its salts with water in presence of air, is pilocarpidine,

$$C_8 H_4 N\beta.C Me (N Me_2)\cdot C O O H.$$

Its salts are similar to those of pilocarpine; they are gummy substances decomposed by carbonic anhydride, soluble in water and alcohol of 90°, but insoluble in absolute alcohol if they are dry. The copper salt is green, the silver salt crystallizes in a mass of small needles. The hydrochloride is soluble in water and crystallizes badly from an acid solution; it is a gummy substance which crystallizes slowly from alcohol in scales with a prismatic structure. The aurochloride, $C_{10} H_{14} N_2 O_2$, $H Au Cl_4$, is obtained in right rectangular prisms by adding pilocarpidine hydrochloride gradually to an acid solution of auric chloride, and allowing the liquid to evaporate spontaneously. In solutions containing no free acid, the aurochloride, $C_{10} H_{14} N_2 O_2$, $Au Cl_3$, is formed. The platinochloride, $(C_{10} H_{14} N_2 O_2)_2$, $H_2 Pt Cl_6 + 2 H_2 O$, is formed in lamellæ by adding the hydrochloride to an excess of platinum chloride solution. If these crystals are dissolved in a large quantity of cold water and allowed to recrystallize in the cold, the platinochloride separates in large, yellow lamellæ similar to those of naphthalene. If crystallization takes place in a warm solution, small red prismatic crystals, of the composition $(C_{10} H_{14} N_2 O_2)_2$, $H_2 Pt Cl_6 + H_2 O$, separate. This second modification is also obtained by heating the dihydrated salt.

Jaborine. E. Hardy and G. Calmels. (*Comptes Rendus*, cii. 1251–1254. From *Journ. Chem. Soc.*) Pure dry pilocarpine does not yield jaborine when heated at 100° for six hours, neither can this substance be obtained by the action of alcoholic iodides on argento-pilocarpidine. If, however, carefully dried pilocarpine is heated rapidly to 175°, kept at this temperature for about half an hour, and the product extracted with water made alkaline with baryta, and shaken with ether, the ether contains jaborine, and the aqueous solution contains pilocarpidine and jaboric acid. *Jaborine* separates from alcohol or ether in a brown mass, which changes to a brittle, resinous solid. It is insoluble in water, but dissolves readily in ether, and is also soluble in jaboric acid. From solutions of the hydrochloride it is thrown down by potash as a curdy precipitate, which readily agglomerates under warm water. When boiled with concentrated aqueous potash it is converted into pilocarpidine.

Jaborine hydrochloride is extremely soluble in water and alcohol. When boiled with excess of hydrochloric acid, it is converted into

pilocarpidine hydrochloride. Solutions of jaborine are brown with a greenish fluorescence, which is not completely removed by animal charcoal. An alcoholic solution of free jaborine yields with a limited quantity of platinic chloride, a dirty white, gelatinous precipitate of the composition $(C_{22}H_{32}N_4O_4)_2, PtCl_4$; with platinic chloride in excess, a yellowish-white precipitate of the composition $C_{22}H_{32}N_4O_4, PtCl_4$, and with auric chloride a precipitate of the composition $C_{22}H_{32}N_4O_4, 2AuCl_3$. In presence of a slight excess of hydrochloric acid, platinic chloride, whether in excess or otherwise, precipitates the compound

$$C_{22}H_{32}N_4O_4H_2PtCl_6.$$

Jaboric acid is separated from pilocarpidine by precipitating with excess of silver nitrate, which forms a curdy precipitate of the composition $C_{19}H_{24}N_3O_5Ag, AgNO_3$. Jaboric acid resembles jaborine in appearance, but is very soluble in water, and is not removed from its aqueous solution by ether. With alkalies it forms gummy salts which dissolve in water and alcohol, and are not decomposed by carbonic anhydride. With silver nitrate in limited quantity it forms the compound $C_{19}H_{24}N_3O_5Ag$, which is precipitated by alcohol in the form of a brown powder. Hot concentrated potash or boiling hydrochloric acid converts jaboric acid into pilocarpidine and β-pyridine-α-lactic acid. Alcoholic solutions of jaboric acid give with platinic chloride in limited quantity a viscous precipitate of the compound

$$(C_{19}H_{25}N_3O_5)_2, PtCl_4;$$

with platinic chloride in excess, a yellow precipitate of a hemiplatino-chloride,

$$(C_{19}H_{25}N_3O_5)_2, PtCl_4 + 2C_{19}H_{25}N_3O_5PtCl_4.$$

With auric chloride a diaurochloride, $C_{19}H_{25}N_3O_5, 2AuCl_3$, is formed. The hydrochloride and nitrate of jaboric acid are viscous substances: an aqueous solution of the former gives a viscous precipitate of the composition $(C_{19}H_{25}N_3O_5)_2, H_2PtCl_6$, with a limited quantity of platinic chloride.

Jaborine and jaboric acid are products of the condensation of pilocarpine, this condensation taking place on the betain nucleus, and may be thus represented (Py = pyridyl):—

$$NMe_3\begin{matrix}<\\>\end{matrix}\begin{matrix}CMePy\beta.CO\cdot O\\O\cdot CO\cdot CMePy\beta\end{matrix}\begin{matrix}>\\<\end{matrix}NMe_3.$$

Jaborine.

$$OH\cdot CMePy\beta\cdot CO\cdot O\cdot NMe_3\cdot CMePy\beta\cdot COOH.$$

Jaboric acid.

A New Synthesis of Acridine. R. Möhlau. (*Ber. der deutsch. chem. Ges.*, xix. 2451–2453.) The constitutional formula of acridine has been confirmed by its synthesis from diphenylamine and formic acid or chloroform, as also from the condensation of orthotolylaniline. In this paper, a synthesis from aniline and salicylic aldehyde, in presence of zinc chloride, is described, the reaction being as follows:

$$Ph\,N\,H_2 + O\,H \cdot C_6\,H_4 \cdot C\,O\,H = C_{13}\,H_9\,N + 2\,H_2\,O.$$

The product was identical in chemical and physical properties with the acridine originally obtained from crude anthracene by Graebe and Caro. It is also shown that parahydroxybenzaldehyde, as also benzaldehyde, form acridine with diphenylamine, probably from an intermediate decomposition of the aldehyde into phenol or benzene on the one hand, and formic acid on the other, and this latter substance reacts in accordance with the above-mentioned synthesis.

Emetine. H. Kunz. (*Archiv der Pharm.*, 1887, 461; *Pharm. Journ.*, 3rd series, xvii. 1049.) A careful investigation has led the author to the conclusion that emetine is a biacid base and a tertiary diamine, like quinine. He considers that its elementary composition is represented by the formula $C_{30}\,H_{40}\,N_2\,O_5$, which differs by C_2 from that attributed to the alkaloid by Lefort and Wurtz. The introduction of a methyl group yielded a new base which was obtained as a hydrate,—"methylemetonium hydrate,"—to which the formula $C_{30}\,H_{40}\,(C\,H_3)\,N_2\,O_5$ is attributed. This compound was amorphous and very hygroscopic, and the sulphate was the only crystalline salt prepared from it. "Methylemetonium" differs sharply from emetine in its physiological action, in which it resembles curare, 0·0037 gram injected subcutaneously into a frog producing total paralysis of the motor system in two minutes. It is thought very probable that emetine, like quinine, is a quinoline derivative. Besides emetine, ipecacuanha root contains choline.

Conessine. K. Polstorff. (*Ber. der deutsch. chem. Ges.*, xix. 1682–1685; *Journ. Chem. Soc.*, 1886, 991.) Conessine (see abstract, *Year-Book of Pharmacy*, 1886, 75) was found to be present in East Indian *Holarrhena* to the extent of 0·08 per cent. It was purified by dissolving it in very dilute acetic acid, almost neutralizing with ammonia, treating with lead acetate, and removing the lead by means of sulphuretted hydrogen. After repeating this treatment four or five times an almost colourless solution is obtained. The *nitrate*, $C_{12}\,H_{20}\,N_2\,H\,N\,O_3$, forms small needles; the

picrate (with 1 mol. H_2O) crystallizes from alcohol in broad, lustrous, gold-coloured needles, which explode violently when heated.

The author considers the substance to be identical with that obtained by Haines from *Wrightia* (*Journ. de Pharm.* [2], vi. 432). The results of analyses of Haines' compound made by Warnecke agree with the formula $C_{12}H_{20}N$, as well as with $C_{11}H_{18}N$. Also the reaction given by Warnecke for Haines' compound holds good with conessine from Holarrhena.

Piliganine, a New Alkaloid. H. Adrian. (*Comptes Rendus*, cii. 1322, 1323. From *Journ. Chem. Soc.*) The *Piligan* is a Brazilian lycopod, which resembles *L. Selago*, and is probably the variety *L. Saussurus*.

Piliganine forms a soft, yellowish, transparent mass, with an odour recalling that of pelletierine. It has an alkaline reaction, and gives white fumes with hydrochloric acid. It dissolves in water, alcohol, and chloroform, but is only slightly soluble in ether. The hydrochloride forms highly deliquescent, microscopic crystals. Solutions of piliganine give the following reactions:—Sodium phosphomolybdate, yellowish white precipitate; iodine solution, pale brown precipitate; tannin, white precipitate; mercuric potassium iodide, bulky white curdy precipitate; mercuric chloride and platinum chloride, no reaction; picric acid, yellowish, crystalline precipitate after some time.

Piliganine is very poisonous, and has a distinct emeto-cathartic action.

A New Constituent of the Germinated Seeds of Lupinus Luteus. E. Schulze and E. Steiger. (*Ber. der deutsch. chem. Ges.*, xix. 1177–1180.) The body described by the authors under the name of *arginine* is a nitrogenous base somewhat similar in its properties to creatinine. It is obtained from the germinated cotyledons by precipitating the aqueous extract with tannin and lead acetate, acidifying the filtrate with sulphuric acid, filtering again, then adding phosphotungstic acid, treating the precipitate thus formed with milk of lime, and removing the excess of lime from the filtered solution by a current of CO_2. The clear liquid, when neutralized with nitric acid and concentrated to a syrup, yields needle-shaped crystals of the nitrate corresponding to the formula, $C_6H_{14}N_4O_2$, $HNO_3+\frac{1}{2}H_2O$.

Asiminine. T. U. Lloyd. (*Amer. Journ. Pharm.*, December, 1886.)

Process for obtaining the Alkaloid.—Extract the seeds of *Asimina*

triloba (papaw) with alcohol; evaporate the alcohol, adding towards the last water enough to precipitate the oils; acidulate with acetic acid, stir well, and after twenty-four hours filter. Ammonia water is cautiously added to the filtrate until in slight excess, care being taken to avoid a strong alkaline reaction. The precipitate is collected and, while moist, agitated with sulphuric ether in successive portions; the ethereal layers are decanted, mixed, evaporated, and the residue is dissolved in a little alcohol. To this solution, hydrochloric acid in slight excess is added, when, if concentrated, a magma of crystals of the hydrochlorate of the alkaloid will be produced. If the solution is dilute, evaporation will be necessary. These crystals are purified by crystallization from hot alcohol, then dissolved in water, precipitated with ammonia, and the amorphous alkaloid is dried. The yield is small, but a considerable quantity of the alkaloid is lost in the process of purification. In working large amounts, an increased yield would result after the first batch.

Properties.—This alkaloid is white, odourless, tasteless, and practically insoluble in water. It dissolves freely in ether and alcohol, less freely in chloroform and benzol. Upon evaporation of the solvents, it separates in an amorphous condition. The soluble salts are bitter, and produce copious precipitates with the usual alkaloidal reagents. Salts of asiminine and the usual acids employed in the commercial production of alkaloidal salts, dissolve freely in water (excepting the hydrochlorate, which is less soluble), producing bitter liquids, from which dilute alkalies precipitate the alkaloid. The author did not succeed in crystallizing either the nitrate or the acetate, but the hydrochlorate crystallizes easily from alcohol, forming beautiful squares, and the sulphate in laminæ of crystalline nature. The principal salt, owing to its easy production in a pure crystalline condition, will be the hydrochlorate if this alkaloid should come into demand as a medicinal agent.

Hydrochlorate of asiminine is white, odourless, and to the taste at first sweetish and then bitter, leaving a bitter after-taste. It crystallizes from alcohol in transparent square plates or in groups of crystals composed mainly of the interlocked sections of cubes. Even if the alkaloid be in minute amount, it forms, with nitric acid, at once a carmine red, which quickly changes to a deep dark purple colour. This reaction is very delicate, and is similar to that of concentrated nitric acid on morphine salts, excepting that the colour is not blood red, and instead of becoming lighter, darkens

for a time to purple, and then changes to deep red, but not yellow. Without due care one might possibly confuse asiminine with morphine by this test. With sulphuric acid it effervesces, dissolves, turns greenish yellow slowly, afterwards yellowish red, then dark red, and the liquid remains this colour. Hydrochloric acid does not affect it; but the addition of a little sulphuric acid and a gentle heat produces a purple colour similar to the morphine reaction with the same reagent. Mercuric chloride causes a precipitate in solutions of this salt. Chlorine water does not affect the alkaloid, but the solution of its hydrochloride is precipitated white.

Antithermin. (*Pharm. Journ.*, from *Nouv. Remèdes*, March, 1887, 102.) "Antithermin" is the name proposed for a new synthetically prepared compound which has just been added to the army of antipyretics. The systematic name of the compound is "phenylhydrazinlevulinic acid," from which it is evident that it has a near chemical relationship with "antipyrin." One of the intermediate products in the formation of this widely used antipyretic is phenylhydrazin, the composition of which is represented by the formula:—

$$N_2 \begin{cases} C_6H_5 \\ H \\ H \\ H \end{cases}$$

This compound has the property of combining with other compounds to a remarkable extent; as, for instance, with aldehydes, ketones, sugars, and ketone acids; antipyrin being, in fact, a methylated derivative from a compound of phenylhydrazin with acetoacetic acid. The new antipyretic is a compound of phenylhydrazin with acetopropionic acid, a homologue of acetoacetic acid, to which the name levulinic acid also has been applied, because it can be prepared by oxidizing levulose. Phenylhydrazinlevulinic acid, or antithermin, is said to be obtained by dissolving phenylhydrazin in dilute acetic acid, and adding to it a solution of levulinic acid, which gives rise to a yellow precipitate that yields well-formed crystals upon recrystallization from alcohol.

Tyrotoxicon: its Presence in Poisonous Ice Cream; its Development in Milk; and its Probable Relation to Cholera Infantum and Kindred Diseases. V. C. Vaughan. (*Amer. Journ. Pharm.*, 1886, 452, 1887, 291; also *Pharm. Journ.*, 3rd series, xvii. 147.) This paper is full of interest and importance; but as it is not suited for abstraction, we can only recommend it to the reader's attention, and refer him to either of the sources above mentioned.

Poisonous Ptomaine in Milk. R. H. Firth. (*Lancet*, i., 1887, 213, 214.) An epidemic of attacks of violent purging and vomiting among the soldiers in the Punjab was traced to the use of certain milk. The residue of the suspected milk was found to be of sp. gr. 1·025; casein, 4·1; fat, 3·9; and sugar, 5·04 per cent. The dairy pans were found to be unwashed, and some emitted a repulsive odour; the weather at the same time was very hot. The milk was coagulated, filtered; the filtrate was neutralized and made feebly alkaline by potassium hydrate, and shaken with ether. On evaporating the ethereal extract, a crystalline residue of sickly odour and pungent taste was obtained. Given to men in small quantities, it produced nausea and headache. Given to dogs, in fifteen minutes it produced violent purging and vomiting.

First, milk tested in a similar way gave negative results. Eight samples of milk were allowed to stand, and tested every twenty days. After two months, three of the samples yielded the same crystalline substance which produced the same symptoms when given to animals. This substance—which seems to be a ptomaine—is evidently the result of decomposition. No specific organisms on which to fasten it—beyond some common forms of oidium and penicillium—were found. The name proposed for it is *lactotoxine*.

Formation of a Poisonous Alkaloid from Choline. C. Gram. (*Chem. Centr.*, 1886, 647.) The author has studied the transformation of choline into the trimethylvinylammonium base. According to Brieger, the latter poisonous product is a frequent constituent of putrid matter, and arises from the action of putrefactive microphytes on choline.

This same change can be effected by purely chemical means. The lactate of choline when heated gives rise to a poisonous substance with muscarine-like action. Inasmuch as many researches have shown that choline is widely distributed throughout animal and vegetable organisms, and as it is moreover capable of being converted into a poisonous substance by simple chemical action, the author considers it necessary to conduct researches on ptomaines with more caution, and perhaps to regard with mistrust ptomaines possessing a muscarine-like action.

Cadaverine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xix. 2585, 2586.) The author shows this alkaloid to be identical with pentamethylenediamine, with which it agrees in its boiling point, solubility, odour, in its general reactions, and in the composition of the respective mercuriochlorides. The imine obtained from either base is the same, and is identical with piperidine.

Ptomaines. H. Beckurts. (*Archiv der Pharm.* [3], xxiv. 1041–1065; *Journ. Chem. Soc.*, 1887, 385.) The importance of ptomaines in forensic investigations has induced the author to review the recent literature of this subject. Until very recently only ptomaines of unknown composition had been isolated, and in all cases by the methods of Stas-Otto and Dragendorff. It is mainly to Brieger's investigations during the past four years that we are indebted for a more accurate knowledge of the composition of these compounds. From decomposing flesh, Brieger obtained neuridine, $C_5H_{14}N_2$, and neurine, $C_5H_{13}NO$. From decomposing fish he obtained a poisonous isomeride of ethylendiamine, possibly ethylidenediamine, $C_2H_4(NH_2)_2$, muscarine, $C_5H_{15}NO_3$, and the physiologically inactive gadinine, $C_6H_{17}NO_2$. Fully decomposed cheese yielded neuridine. Decomposing glue gave neuridine, dimethylamine, and a muscarine-like base; whilst rotten yeast gave dimethylamine only. As these compounds result from the action of bacteria on animal tissues, so Brieger showed that the same or analogous compounds were similarly formed in the human subject. In the earlier stages of decomposition, only choline was found. After three days, neuridine appeared in increasing amounts, whilst choline gradually disappeared, being replaced by trimethylamine. After fourteen days neuridine had also disappeared. Later, there most commonly appeared cadaverine, $C_5H_{16}N_2$, and putrescine, $C_4H_{12}N_2$. With cadaverine is also found a substance of the same composition, called *saprine*, but differing considerably in its reactions. The bases choline, neuridine, cadaverine, putrescine, and saprine, are physiologically indifferent; but after fourteen days' decomposition a new poisonous base, *mydaleine*, was obtained, which seems to be a diamine. In human remains (heart, lung, liver, etc.), maintained at —9 to 5° C. during four months, a new base, mydine, $C_8H_{11}NO$, was found, a strongly reducing agent, and a poisonous base, mydatoxine, $C_6H_{13}NO_2$, also the poisonous methyl-guanidine was isolated. O. Bocklisch, employing Brieger's method, obtained a large number of bases from decomposing fish. The bases so obtained were not poisonous, and attempts to separate the injurious compounds were unsuccessful. The fact that decomposition bacteria induce the formation of numerous basic substances from albuminoid compounds, makes it highly probable that pathogenic bacteria possess similar properties. Thus, Koch, Nicati, and Rietsch have found poisonous ptomaines in cholera. In cultivations of typhus bacilla, a strongly basic poison, typhotoxine, $C_7H_{17}NO_2$, was obtained; and from tetanus cultivations a

strong base, tetanine, $C_{13}H_{20}N_2O_4$, was obtained. The bases obtained by Brieger are either liquids of definite boiling-point, or solid crystalline substances. The salts show the so-called general alkaloid reactions, so that as a group the ptomaines cannot be separated from the alkaloids. The non-poisonous ptomaines readily give rise to poisonous compounds; thus, cadaverine, which has been shown by Ladenburg to be pentamethylenediamine, is converted by rapid distillation of the hydrochloride into the poisonous piperidine. Whilst the constitution of cadaverine has just been indicated, putrescine is either a dimethylethylendiamine or methyl-ethyl-methyl-endiamine; which of the two, further investigation must decide. The present methods of isolating the alkaloids do not yield absolutely certain results, and further extended investigation is required.

Tetanine, a New Ptomaine. L. Brieger. (*Ber. der deutsch. chem. Ges.*, xix. 3119–3121.) The beef extract in which Rosenbach's microbe had been cultivated for four to six weeks, was acidified with hydrochloric acid, boiled, and filtered; the filtrate evaporated and treated with lead acetate and alcohol, filtered, and the lead removed as far as possible as chloride, and finally as sulphide. The strongly alkaline filtrate was distilled with steam, acidified with hydrochloric acid, evaporated to dryness, and treated with alcohol to remove ammonium chloride. After removing the alcohol, the new base was separated as its aurochloride.

The free base, $C_5H_{11}N$, is volatile, boils about 100°, but was not obtained free from water. The *hydrochloride* is crystalline, melts at 205°, and is very readily soluble in water and absolute alcohol. The *aurochloride*, $C_5H_{11}N$, $HAuCl_4$, crystallizes in plates, and melts at 130° The *platinochloride*, $(C_5H_{11}N)_2$, H_2PtCl_6, crystallizes in plates, is decomposed at 240°, and is sparingly soluble in water. The picrate crystallizes in readily soluble needles. The base gives a yellow precipitate with phosphomolybdic acid, a white precipitate with phosphotungstic acid, and a red crystalline precipitate with potassium bismuth iodide. Injected hypodermically in a comparatively large dose, it produces the symptoms of tetanus.

Snake Poison. R. N. Wolfenden. (*J. Physiol.*, vii. 327–370; *Journ. Chem. Soc.*, 1886, 1057.) With regard to the venom of the Indian cobra (*Naja tripudians*), it is found that its toxicity is not due to any bacterium or living organism, nor to any alkaloid—alkaloids and ptomaines are entirely absent from the venom—nor

is it due to any cobric acid such as was described by Blyth (*Analyst* i. 204). The author finds that the crystals to which the name cobric acid was given are in reality composed of calcium sulphate. The venom, however, is sometimes faintly acid, sometimes neutral. The poisonous properties of the venom are due to its proteid constituents, which are as follows:—(1) Globulin, which is always present, and kills by causing asphyxia. (2) Syntonin, which is precipitated with magnesium sulphate with the globulin. It dialyses through parchment paper to some extent. The poisonous property of the acid dialysates is due to this proteid, not to cobric acid. Its action is similar to that of the globulin, but less intense. (3) Serum albumen; this is also toxic, producing paralysis. (4) Traces in some specimens of hemialbumose, and questionable traces of peptone are regarded as accidental.

The venom of the Indian viper (*Daboia Russellii*) has the same reaction as that of the cobra; but here again there is no toxic acid, alkaloid, or living organism, but the proteids are the poisonous constituents; these are three in number:—(1) Globulin, which greatly preponderates, as in cobra venom; (2) Serum albumen in small amount; (3) A proteid which possesses many of the properties of an albumose. True peptones do not occur, and it is probable that the substances described by Weir, Mitchell, and Reichart in crotalus, copperhead, and mocassin venoms as peptones, are in reality albumoses.

Snake Poison. C. J. H. Warden. (*Chemical News*, liv. 197–199; 209–211.) Two samples of air-dried snake-venom contained respectively 16·26 and 15·43 per cent. of water. Fresh venom yields 25–50 per cent. of solid residue. For the author's experiments, the solution of the dried venom in distilled water was injected under the skin of the back of white or piebald China mice. A dose of 0·012 gram of anhydrous venom was fatal in four minutes, and the rapidity of action decreases as the quantity of poison administered is diminished; with 0·000016 gram, the animal may live three hours, whilst 0·000008 gram is not fatal. Very large and very small doses cause convulsions, intermediate ones do not. In the case of white mice, the fatal ratio of poison to body weight appears to be about 1 : 10,000,000. Heating the solution of the venom soon produces marked coagulation, but it is only after heating for some time that the toxic activity is reduced, hence prolonged heating at a moderate temperature is more effective for such a purpose than short periods at higher temperatures.

Similar remarks apply to the action of picric acid, which causes an abundant precipitate in solution of the poison, and in some experiments a marked reduction in the toxic action when the filtered solution was employed.

The Poison of the Stinging Nettle. G. Haberlandt. (*Pharm. Journ.*, 3rd series, xvii. 625.) The author disposes of the theory that the presence of formic acid is the cause of the irritating effect produced by the sting of nettles, showing that formic acid has no such virulent properties in the minute quantities in which alone it could be present in the stinging glands of the nettle; and that the irritation must be produced by a fixed substance, since the dried contents of the gland will cause the ordinary effects of a nettle-sting if introduced beneath the skin; while formic acid is, of course, volatile. The author finds, on the other hand, invariably in the fluid a substance which possesses all the properties of an albuminoid; it is destroyed by boiling water. The substance which produces the irritation is probably, he considers, of the nature of an unformed ferment.

Vegetable Ferments. A. Hansen. (*Bot. Zeit.*, 1886, 137; *Journ. Chem. Soc.*, 1886, 1059.) The author has examined the latex of different species of plants for the presence of ferments. He finds none in the Euphorbiaceæ, in *Ficus elastica*, *Scorzonera*, *Taraxacum*, or the juice of the opium poppy. The latex of *Ficus Carica*, on the other hand, contains principles capable of effecting four fermentative changes; they peptonize albuminoids in the presence of either alkalies or acids, act like diastase on starch, and coagulate the casein of milk. 20–100 grams of fibrin previously caused to swell by immersion in hydrochloric acid of 0·2 per cent. strength, are completely dissolved in ten to thirty minutes when treated at 40° with 2–3 c.c. of this latex. The products of this digestion are the same as with pepsin, yet the two ferments are not identical, since the ficus latex peptonizes in the presence of alkalies as well as acids, although more slowly. Probably there are two peptic ferments present—one acting in acid, the other in alkaline solutions. By digestion with hydrochloric acid, the latex entirely loses its peptonizing properties; digested with sodium carbonate (which destroys the activity of pepsin), it retains them intact. If a few drops of the latex be added to milk, which is then raised to the boiling temperature, the casein is at once precipitated. Incipient ebullition therefore does not destroy the curdling power of this latex, although prolonged ebullition does, and even a temperature of 65° if continued for two hours. The diastatic

action of this latex is demonstrated by the partial transformation of starch-paste and glycogen into sugar. When the latex is precipitated by alcohol, and the precipitate taken up with water, the action on milk and on starch is found to persist, whilst that on fibrin disappears.

The latex of *Carica papaya* peptonizes, precipitates casein, and transforms starch into sugar.

The author does not consider that these vegetable ferments play any rôle in the nutrition of the plant.

Prevention of Secondary Fermentations. U. Gayon and G. Dupetit. (*Comptes Rendus*, ciii. 883–885.) Salts of bismuth, even in small quantities, completely prevent secondary fermentations. Tannin, in quantities of 0·5–1·0 gram per litre gives good results, but does not prevent the development of *Mycoderma aceti*. The addition of 0·1 gram of subnitrate of bismuth per litre of distiller's wort almost entirely prevents any increase in the acidity of the latter, and indirectly produces an appreciable increase in the yield of alcohol.

Acetous Fermentation. A. Romegialli. (*Gazzetta chim. Ital.*, xvi. 73–101.) This fermentation is favoured by the presence of glycerin, and of succinic and malic acids. It is more effectually prevented by sulphurous than by salicylic acid.

Lactic Fermentation. G. Marpmann. (*Archiv der Pharm.* [3], xxiv. 243–256.) The author remarks on the very contradictory views still prevailing as to the nature of lactic fermentation. During the summer of 1885 he has investigated the micro-organisms of cow's milk in the neighbourhood of Göttingen, and has detected five seemingly new and different species, which more or less strongly induce lactic fermentation in cane-sugar as well as in milk. Coagulated milk filtered, mixed with 10 per cent. of pure gelatin, and carefully sterilised by means of heat, was employed for the cultivation, and the solution to be tested was brought into contact with it on glass plates. As the different organisms developed, they were employed to commence fresh growths, and by this process of selection pure cultivations were at length obtained. The action of these organisms on milk was then investigated quantitatively, but the results are not given. The author is still engaged on the subject.

A Diastatic Ferment in Leaves. L. Brasse. (*Ann. Agronom.*, xii. 200–203.) A diastatic ferment can be extracted from green leaves in the following way:—The leaves are bruised in a mortar and covered with cold water; after twenty-four hours they are

pressed, and $1\frac{1}{2}$ volumes of 90° alcohol added to the juice, which is then filtered. The same quantity of alcohol is again added to the filtrate, and after a few minutes the clear liquid is siphoned off, and the precipitate thrown on a filter, and rapidly washed once or twice with alcohol of 65° G.L. The diastase is obtained in solution by dissolving the washed precipitate in water, and filtering; 10 c.c. of such a solution is added to 0·5 gram of starch made into paste, and kept at 63°, and the formation of sugar is shown by comparison with a similar flask to which a few drops of chloroform have been added. The leaves of the potato, dahlia, artichoke, maize, beet, castor-oil plant, and the unripe seeds of the opium poppy, sunflower, and castor-oil plant have all yielded positive results. Microbes have not been found in the solution, and the starch was in all cases transformed into a mixture of reducing sugar and dextrin. To connect this with the formation of sugar in the growing plant, the author shows by a series of experiments that although diastase will only act on *starch-paste* and not on crude starch at 60°, 57°, and 50°, yet at 42° and at 34° it always transforms a little crude starch into sugar. The quantity of sugar produced reaches a limit in twenty-four or thirty-six hours; but if it be dialysed out of the solution as fast as it is formed, the formation is rendered continuous. The same result is produced by diluting the solution, so that it seems to be the accumulation of sugar which puts an end to the diastatic action. Cuboni's experiment, therefore, in which the disappearance of starch from a vine leaf placed in the dark was prevented by an annular incision in the stem above and below the leaf, does not negative the idea that starch is transformed into sugar by a diastatic ferment in the leaf; arrest of sugar formation would under these circumstances be brought about by accumulation of sugar in the isolated leaf.

Diastase. O. Loew. (*Ber. der deutsch. chem. Ges.*, xx. 58.) In reply to adverse criticism, the author reaffirms the utility of the method of purifying ferments with lead salts, provided due precautions are taken.

The Physiology of Digestion. C. A. Ewald and J. Boas. (*Biol. Centr.*, 1886, 354; *Journ. Chem. Soc.*, 1886, 727.) The authors found on examination of the contents of the stomach of a person subject to vomiting, that after a mixed meal of meat and carbohydrates, lactic acid was found for the first 10 to 100 minutes, but that when pure boiled albumen was eaten, no lactic acid was found. Then followed a period when both lactic and

hydrochloric acids were present; afterwards a third period in which the latter only was observed.

The lactic acid is either a product of the fermentation of the carbohydrates, or is dissolved out of the meat. The hydrochloric acid can only be considered as a product of the secretions of the glands of the stomach.

The peptonising commences immediately after taking food, and appears to be commenced by the lactic acid when the diet is a mixed one; the curves of the peptone and hydrochloric acid are identical, and reach their highest point about the middle of the digestive process, and a considerable time previous to the disappearance of the contents of the stomach.

The Physiology of Digestion. F. Hofmeister. (*Biol. Centr.*, 1886, 354.) The author's experiments on digestion have led him to the conclusion that the mucous membrane of the stomach and intestines contains larger quantities of peptone than the blood, it having been found after four hours' digestion; the lining of the intestinal canal has not only the power of secreting peptone, but of decomposing it, so that it no longer responds to the usual reactions. The part so changed passes at once into the tissues of the body, the unaltered portion passes into the blood, where it does not exist in a free state, but in combination with the cells.

Pancreatic Digestion. A. Hirschler. (*Zeit. physiol. Chem.*, x. 302–305.) The author finds that in addition to the known products of the digestion of fibrin, a small quantity of ammonia is formed, which may be detected and estimated in the distillate, provided no putrefaction has yet occurred.

A Study of Peptonization. R. G. Eccles. (*Amer. Journ. Pharm.*, October, 1886; from *Proc. Amer. Pharm. Assoc.*, 1886.) This is a lengthy inquiry into the nature of peptones, and the conditions of digestion in the presence of various acids and other compounds, and at different temperatures. While many salts throw down a portion of the peptones, the best precipitants are the sodiohydric and disodic molybdates, causing white precipitates which are partly soluble in ammonia with a light blue colour; but in the presence of potassium citrate or acetate, which salts throw down a portion of the peptone, the molybdate fails to produce a precipitate. Many samples of pepsin yield similar precipitates with the molybdate, but it has not yet been ascertained whether pure pepsin is thus affected. True peptone is the product of true digestion, and is soluble in alkaline, acid, and neutral liquids; while parapeptone, an injurious product of semi-

digestion, is precipitated by salts in neutral solutions, and in some cases also from acid liquids. The best results for the peptonization of ground albumen at a temperature of 38–40° C., were obtained with ·3 and ·2 per cent. of H Cl in ninety minutes, and with 2 per cent. in thirty minutes, while the peptonizing power decreased if less than 1 per cent. of phosphoric, citric, or tartaric acid was used. The effects of other acids differed from these. For the purpose of testing the peptonizing power, the temperature of 55° C. (130° F.), applied for thirty minutes, was found to be the best. Pills containing pepsin and reduced iron, had been found to have no digestive power, and it was ascertained to be due to the disappearance of the free acid. Alcohol scarcely interferes with artificial digestion until the strength of the mixture exceeds 8 or 10 per cent. The cinchona alkaloids have a retarding effect, but less in the presence of excess of acid. Marked retarding effects were also observed with all salicylates, bismuth citrate, alkalies, alkaline salts, oils of cinnamon and cloves, excess of glycerin, etc.

Preparation of Peptone. E. Merck. (*Dingl. polyt. Journ.*, celxi. 316.) The author calls "nucleo-proteids" substances which, when boiled with water under pressure or treated with acids, alkalies, or ferments, are resolved into nuclein and albumen; for instance, the vitellin of the yolk of eggs or the casein of milk. To prepare peptone from these substances, 100 grams of casein are treated with 1 litre of distilled water at 150–170° for about ten hours. The mixture is then filtered, and the solution containing the peptone again heated with water in order to separate additional quantities of unaltered albumen remaining in the solution. The final filtrate contains casein-peptone, which is separated in the usual manner. Another process consists in treating the nucleo-proteids with a 0·1 per cent. solution of sodium hydrate at 80–90° for about eight hours, neutralizing with acid, filtering, and separating the peptone.

Peptones. W. Kühne and R. H. Chittenden. (*Zeit. Biol.*, xxii. 423–458.) Ammonium sulphate precipitates from a solution all proteids but peptones. Peptones can in this way be obtained free from albumoses, with which they have in previous researches always been mixed. It was therefore necessary to repeat many previous experiments concerning the composition and properties of peptones. Amphopeptone (the mixture of peptones obtained in gastric digestion) and antipeptone (from tryptic digestion) were thus examined. The result of digestion was acidified with acetic

acid, saturated with ammonium sulphate, filtered, the filtrate evaporated to a small bulk, and filtered from the crystals of the salt which separated; the remainder of the salt was removed by aqueous baryta, and the last traces by barium carbonate; dilute sulphuric acid was added to remove the baryta, and the barium sulphate filtered off. From the filtrate the peptones were precipitated by alcohol, redissolved, again precipitated by phosphotungstic acid, and dried. In the case of amphopeptone, the first analyses were invalidated by adherent pepsin and a substance designated mucin-peptone, apparently derived from the mucous membrane of the stomach; it forms a sticky, elastic precipitate with alcohol, but was not further investigated. The error due to these admixtures was obviated by saturating concentrated artificial gastric juice with ammonium sulphate; this precipitates the mucin and pepsin, of which the latter alone redissolves in dilute hydrochloric acid; this solution was used as a digestive fluid; from it no mucinpeptone was obtained. The remains of the pepsin were subsequently removed by the ammonium sulphate with the albumoses.

Antipeptone was prepared both from fibrin and by the pancreas being allowed to digest itself.

The following table gives some of the results obtained in the analyses of those substances. In each case the samples had been purified by means of phosphotungstic acid. I. Amphopeptone from fibrin; II. Antipeptone from fibrin; III. Antipeptone from the pancreas :—

	C.	H.	N.	S.	O.	Ash.
I. . . .	48·75	7·21	16·26	0·77	27·01	3·22
II. . . .	46·59	6·69	18·28	0·67	27·77	3·67
III. . . .	44·47	7·15	17·94	0·57	29·87	2·07

Contrasted with previous analyses, the numbers obtained show about 1 per cent. less carbon, 1 per cent. more nitrogen, and 0·3 to 0·4 per cent. less sulphur. The percentage of nitrogen is greater in antipeptone, especially in that obtained from the gland, than in amphopeptone.

The following are the chief properties of pure peptone: When dissolved in water, it hisses and froths in the same way that phosphoric anhydride does; heat is at the same time evolved. Its solution in water is brown, which prevents its lævorotary power being estimated. Its taste is somewhat cheesy, but not un-

pleasant. The bitter taste of artificially digested food must therefore be due to some product not yet separated, native proteids and albumoses being almost tasteless. Peptones are not precipitated by sodium chloride in acid solutions, nor by ammonium sulphate; they are completely precipitated by tannin, iodo-mercuric iodide, phosphomolybdic acid, phosphotungstic acid, and picric acid. A 5 per cent. solution rendered faintly alkaline by soda shows the following additional reactions:—

Reagent.	Fibrin-antipeptone.	Fibrin-amphopeptone.
Acetic acid and ferrocyanide of potassium	At first clear; later a trace of opalescence.	
Normal lead acetate .	First drop nothing; more, well-marked opalescence.	Opalescence less marked.
Basic lead acetate . .	Dense opalescence.	Opalescence less dense.
Mercuric chloride . .	First drop nothing; more, dense opalescence.	Opalescence denser.
Copper sulphate (5 per cent.)	At first clear; later, a feeble opalescence, disappearing with excess of reagent.	Nothing.
Platinic chloride (5 per cent.)	Feeble opalescence with excess.	Nothing.
Chromic acid . . .	Nothing.	Nothing.
Ferric chloride . . .	Opalescence disappearing on small excess.	Nothing.
Ferric acetate and concentrated H_2SO_4 .	Brown-red colour.	Brown-red colour.
Nitric acid	Yellow colour.	Yellow colour.
Boiling with concentrated HCl . . .	Colour darkens a little.	Colour darkens a little.
Millon's reagent . .	A white precipitate turning to a dirty yellow on heating.	A white precipitate turning to bright red on heating.
Biuret reaction . .	Well marked.	Well marked.

The most noteworthy difference in the above table is the behaviour to Millon's reagent; antipeptone never forms leucine and tyrosine in pancreatic digestion; whilst amphopeptone, which contains hemipeptone, does. Antipeptone, moreover, after being subjected to the action of trypsin, yields no products which are coloured red or violet by bromine or chlorine water, as hemipeptone does. Moreover, when treated with sulphuric acid, antipeptone did not yield crystals of tyrosine; and no proof could be obtained of its presence by Hoffmann's nor by Piria's reaction. From antialbumid, similarly, no tyrosine could be obtained; whether this will prove to be a general rule for the anti-group of digestion-products, the authors intend to investigate.

Casein-peptone. H. Thierfelder. (*Zeit. physiol. Chem.*, x. 577–588; *Journ. Chem. Soc.*, 1886, 1051.) Casein prepared from milk by the author, and pure casein prepared by Merck, were subjected to gastric digestion. The ultimate product, peptone, and the intermediate products, were submitted to elementary analysis. The intermediate products, two in number, are designated propeptone I. and II. Propeptone I., precipitated by sodium chloride from the neutralized products of digestion, contains three substances, which correspond with the proto-, hetero-, and dysalbumose of Kühne and Chittenden. From the filtrate, propeptone II. is precipitated by hydrochloric acid; this appears to be a single substance, its solution is rendered cloudy by acetic acid and ferrocyanide of potassium, is not coloured by nitric acid, and gives the biuret reaction. After the separation of the propeptones, peptone remains in solution and can be precipitated therefrom by phosphotungstic acid.

Wheat Gluten as an Article of Diet. A. Constantinidi. (*Zeit. Biol.*, xxiii. 433–455.) The author quotes a number of experiments proving the gluten of wheat to be exceedingly valuable as a food.

Albuminoids of Wheat Flour. S. H. C. Martin. (*Brit. Med. Journ.*, 1886, ii. 104, 105.) Gluten does not exist in flour as such, but is formed by the action of water (perhaps also by a ferment action) on the proteids pre-existent in the flour. The doctrine of ferment action is supported by the fact that washing flour with water at a low temperature (2°) does not lead to the formation of gluten. Flour itself contains two proteids: (1) globulin of the myosin type, coagulating between 55° and 60°, precipitated by sodium chloride and magnesium sulphate; (2) soluble albumose. Both these proteids can be extracted from flour by means of a 10 to 15 per cent. sodium chloride solution.

Free Hydrochloric Acid of the Gastric Juice. H. A. Landwehr. (*Chem. Centr.*, 1886, 484; *Journ. Chem. Soc.*, 1887, 287.) The author has previously shown, in conjunction with Fick, that the action of this acid on diastase is inverted in the presence of peptones, in the sense that its activity is increased rather than suspended; the cause probably lying in its combination with amido-acid groups of the peptones. Calm has recently shown (*Deutsch. Arch. f. klin. Med.*, xxiii.) that in certain pathological conditions the gastric juice has the reactions rather of an organic acid than of dilute hydrochloric acid.

It is well known that lactic acid decomposes sodium chloride

That this takes place in cold dilute solution is readily seen by comparative observations of the acidity (methyl-violet being used as indicator) of a lactic acid solution before and after addition of sodium chloride. The author applies these observations to a discussion of the origin and nature of the acidity of gastric juice, arriving at the following hypothesis:—Lactic acid is formed by fermentation from the mucus of the stomach, and acting on alkaline chlorides, liberates hydrochloric acid, which is forthwith taken up in combination by the albuminoids of the food. The sodium lactate is simultaneously assimilated. With the gradual peptonising of the albuminoids, the hydrochloric acid is liberated.

Physiological Note on Digitalin. P. Lafon. (*Archives de Pharm.*, 1887, 32.) The author states that digitalin is not altered by diastase, pepsin, gastric juice, pancreatic juice, bile, yeast, emulsin, or in contact with putrefying substances, and therefore cannot be altered in the digestive canal; but after it has entered the circulation it appears to be oxidized. Alkalies and mineral acids, with the exception of nitric acid, do not interfere with the detection of digitalin; but it is destroyed by nitric acid.

Bacteria in Drinking Water. M. Bolton. (*Pharm. Journ.*, 3rd series, xvii. 593.) The author has contributed an important paper on this subject to Koch and Pflüger's *Zeitschrift für Hygiene*. He finds that in ordinary spring water certain bacteria are always present and are capable of multiplying in it. Among these may be specially mentioned *Micrococcus aquatilis*, occurring as cocci collected into small irregular heaps, and *Bacillus erythrosporus*, distinguished by its spores having a reddish brown sheen, and the presence of a greenish pigment without any deliquescence of the gelatin in which it was cultivated. Both these bacteria multiply with extraordinary rapidity in water, the quality of the water and the amount of organic and inorganic substances contained in it appearing to have no effect on the reproduction of microbes, which is, however, materially promoted by a rise of temperature. It took place considerably quicker at 35° than at 20°. These bacteria are not pathogenic.

On the other hand, the author found that pathogenic bacteria, when introduced into spring water, never multiply, but disappear after a time varying in length according to the species and the temperature, and according as to whether the species produces resting-spores or not. The spores of *Bacillus anthracis* had not lost their vitality after the lapse of a year; those of typhus fever

were still active after a month, but not after ten and a half months. The quality of the water appears to have no influence in prolonging the life of pathogenic bacteria.

The general conclusions drawn by the author are that the quantity of bacteria present in spring water is no guide whatever in determining the wholesomeness or otherwise of the water for drinking purposes, since most of them are entirely harmless; and that it is impossible by chemical analysis to determine the presence of bacteria in larger or smaller numbers. The presence of the specific pathogenic bacteria can only be determined by direct micro-chemical observation.

Changes Introduced in Water by the Development of Bacteria. T. Leone. (*Gazzetta Chim. Ital.*, xvi. 505–511; *Journ. Chem. Soc.*, 1887, 615.) The author has already demonstrated that the number of micro-organisms, in a typically pure water, such as the Maugfall near Munich, although at first small, yet on standing gradually increase to a maximum, and afterwards rapidly decrease. The development of bacteria induce certain chemical changes in the water; thus the quantity of oxidizable organic matter gradually decreases, whilst the proportion of ammonia increases to a maximum, and then decreases owing to its oxidation into nitrites and nitrates; on this account, the time which elapses between the taking of a sample and its analysis is an important factor. The consequent changes are divisible roughly into two distinct periods: the first, in which the organic matter is decomposed with production of ammonia; and the second, in which this is subsequently oxidized. It is further shown, on the other hand, that certain micro-organisms seem to act as reducing agents, reconverting the nitrates into ammonia, and even the same organisms, according to the conditions, may have either an oxidizing or a reducing function. In the first phase, when the nutritive matter is readily oxidizable and assimilated, the micro-organisms thrive at its expense, the process of nitrification being materially assisted by atmospheric oxygen: in the second phase, on the other hand, the necessary oxygen is derived from the nitrates; thus a change, seemingly of reduction, is induced.

Effect of Carbon Dioxide on Micro-organisms in Water. J. Sohnke. (*Chem. Centr.*, 1886, 699.) The author confirms the observation that water impregnated with carbonic acid gas suffers a constant diminution of living organisms, as may be readily seen from the examination of artificial mineral waters. In spring waters containing a number of organisms more than half were

rendered incapable of reproduction after the water had been charged with the gas.

Bacterial Life in Relation to Oxygen. P. Liborius. (*Chem. Centr.*, 1886, 579; *Journ. Chem. Soc.*, 1887, 291.) The author classifies bacteria as follows:—

(1) Exclusively anaerobic: amongst these there are many which multiply without attendant fermentation.

(2) Exclusively aerobic: reduced to inactivity by deprivation of oxygen. This class includes:—*B. fluorescens liquifaciens*, *B. aerophilus*, *B. cyanogenus*, *B. fuscus*, *B. aquatilis fuscus*, *B. subtilis*. With exception of the first-named, which appears to determine a special fermentation of albuminoïds with formation of volatile fatty acids, the bacteria of this group have not been closely studied in relation to fermentation.

(3) Optionally anaerobic: activity lowered, but not suspended, by deprivation of oxygen. This class includes all the pathogenic organisms: *B. anthracis*, *B. typhi abdom.* From this general view of the conditions of bacterial life, and from his own special investigations, the author concludes that an attendant fermentation is not an essential condition of anaerobic activity in the sense in which it has been so stated by Pasteur and Nägeli.

Note on the Cellulose formed by Bacterium Xylinum. A. J. Brown. (*Proc. Chem. Soc.*, June 2, 1887.) The author showed in a previous paper (*Chem. Soc. Trans.*, 1886, 432), that the acetic ferment, *B. xylinum*, is able to convert lævulose into cellulose. On treating this cellulose with strong sulphuric acid, it is found to be converted into a dextrorotary sugar, and in this respect to resemble ordinary cellulose.

The Action of Tin on the Animal Organism. T. P. White. (*Pharm. Journ.*, 3rd series, xvii. 166–168.) The author describes a number of experiments which lead to the conclusion that tin, though possessing decidedly toxic properties when introduced into the blood, is entirely devoid of danger when taken internally in any form that could arise from being in contact with fruit or vegetables. He does not believe that the metal would at all be influenced by long contact; but even if it were, it would not be absorbed, but pass off with the excretions without producing an effect. The cases of accidental poisoning reported he attributes to the solder employed in closing the can, or to impurities—arsenic, copper, and lead—used in the composition of the metal, and not to tin itself.

Presence of Iron in the Liver. S. S. Zaleski. (*Zeitschr. für physiol. Chem.*, x. 453–502.) The iron found in the liver is not to be attributed to the blood present in that organ, but is proved to be a constant constituent of the organ itself after all the blood has been removed from it by thoroughly washing it out from the vessels by means of a $2\frac{1}{2}$ per cent. solution of cane-sugar. The quantity of the iron, however, varies within wide limits.

Presence of Diastatic Ferment in Urine. E. Holovotschiner. (*Chem. Centr.*, 1886, 327.) The author has observed the presence of ptyalin and similar ferments in urine. The proportion reaches a maximum four to six hours after eating.

Occurrence of Pepsin and Trypsin in Normal Urine. Dr. Sahli. (*Amer. Journ. Pharm.*, August, 1886.) The investigation of the amount of pepsin in urine is based on the facts given by V. Wittich, that blood fibrin, both in neutral and acid solutions, absorbs pepsin with great eagerness, and that the amount which a flake of fibrin absorbs depends on the proportion of fibrin present in the fluid. To compare the amount present in two perfectly fresh urines, equal quantities of well-washed fibrin are introduced into them, and left in them for equal periods. The urine is poured off, and the flakes washed with distilled water, after which they are placed in equal quantities of ·1 solution of hydrochloric acid. The time required to effect the disappearance of the fibrin allows an estimate of the amount of ferment present. In this way the author found that human urine invariably contains pepsin, and that the amount present undergoes very great variations in the course of twenty-four hours. The morning urine contains the greatest proportion; next in order comes the urine before dinner, and then that directly before supper. The first minimum occurs two hours after breakfast; the second, more marked, one and a half to two and a half hours after the midday maximum. A comparison of the curve exhibiting these variations with that which shows the secretion of the fundus of the stomach, leads to the conclusion that the pepsin in the urine is derived, not from the pepsinogenic substance of the gastric glands, but that it is the completed secretion of the stomach, resorbed along the digestive tract, and carried by the blood current to the kidneys, by which it is partially eliminated.

Urine also contains trypsin, which, however, cannot be isolated by fibrin. Still, the author convinced himself that the amount of this ferment also varies, being regularly diminished after dinner, and greatest after breakfast.

Notes on the Fermentation of Urine. A. Müller. (*Biedermann's Centralb.*, xv. Part 5.) The author has investigated the influence of certain chemicals on the spontaneous fermentation of urine. Potassium permanganate appears to accelerate this fermentation, while potassium chlorate delays it.

Influence of Glycerin, Sugar, and Fat on the Secretion of Uric Acid in Man. J. Horbaczewski and F. Kanera. (*Monatsh. Chem.*, vii. 105–120.) A series of experiments were conducted on one of the authors during a period of seventy days, when the daily rations and mode of living were the same, with the exception of periods during which varying daily amounts of glycerin, sugar, and fat respectively were taken in addition to the normal food. For particulars as to the quality and quantity of food consumed and detailed analyses of the excreta, the original paper must be consulted. The general results were as follows:—

When glycerin is taken with the daily food, a marked increase in the amount of uric acid secreted takes place; this, however, is only the case when free glycerin is taken; if it is taken combined with the fatty acids as neutral fats, it exerts no influence on the formation of uric acid.

Cane-sugar, and probably other carbohydrates, exert no direct influence on the formation of uric acid; it causes, however, a marked decrease of the secreted uric acid, due to the "albumen-retarding" action of the carbohydrates, and proportional to it. This lowered secretion only continues as long as cane-sugar is taken.

The neutral fats have a similar influence on the formation of uric acid to that of carbohydrates, but the after effects are different. The decrease in the amount of acid is proportional to the "albumen-retarding" action of the fat, but when the addition of fat to the diet is stopped, the secretion of uric acid returns at once to the normal amount.

Glycerin causes an increase in the amount of albumen formed in man, as it was known to do in the dog.

A New Crystalline Acid in Urine. J. Marshall. (*Amer. Journ. Pharm.*, 1887, 131; *Med. News*, 1887, p. 35.) The author has isolated from urine a new crystalline acid possessing more powerful reducing properties than glucose. Pending further investigations of this substance, he proposes for it, provisionally, the name glycocosuric acid.

Behaviour of Quinol with Urine. A. N. Anraeff. (*Vrach*, 1887, 230–232.) The author finds that quinol prevents the

fermentation of urine, an addition of 2 per cent. keeping urine without apparent change either to the eye or to test-paper for twenty-five days.

The Precipitate produced by Picric Acid in Normal Urine. M. Jaffe. (*Zeit. Physiol. Chem.*, x. 391–400; *Journ. Chem. Soc.*, 1886. 1056.) With human urine, the addition of a concentrated solution of picric acid produces in the course of an hour a small amount of crystalline sediment. On treating this precipitate with hot water, two substances can be separated from it: one insoluble in hot water, uric acid; the other, comprising the greater part of the sediment, soluble in hot water; the latter is a double salt of creatinine picrate with potassium picrate, having the formula $C_4H_7N_3O, C_6H_3O(NO_2)_3 + KC_6H_2O(NO_2)_3$. It crystallizes in lemon-coloured needles or thin prisms, is readily soluble in hot alcohol, sparingly in cold alcohol, and almost insoluble in ether. It contains no water of crystallization, and detonates when heated. Besides these two substances, there are others present in smaller quantities which have not yet been investigated. With dog's urine, the precipitate obtained with picric acid contains little or no uric acid. The kynurenic acid of dog's urine is not precipitated.

Creatinine picrate, $C_4H_7N_3O, C_6H_3O(NO_2)_3$, is formed when solutions of picric acid and creatinine are mixed; after being recrystallized from hot water, it forms thin, yellow, lustrous needles; it is free from water of crystallization, and detonates on heating. It is more easily soluble in water than the double salt above mentioned. *Creatinine kynurenate*, formed by adding powdered kynurenic acid to a hot dilute solution of pure creatinine, crystallizes in bundles of colourless thin prisms, which are easily soluble in water, but decompose when the water is heated, with formation of kynurenic acid.

When a solution of picric acid is added to a solution of creatinine with a drop of dilute potash or soda, a deep red colour is produced even when the dilution of the creatinine is 1:5000. This is a delicate test, and by it the presence of creatinine can be shown in the urine of man, dog, and rabbit. Acetone gives a similar but not so intense a colour in the cold; dextrose gives the colour only after heating.

Distinction between the Colorations of Urine by Chrysophanic Acid and by Santonin. M. Hoppe-Seyler. (*Journ. de Pharm. et de Chim.*, xv. No. 1.) These colorations may be distinguished by adding to the urine caustic soda, and then agitating with amylic

alcohol. If the coloration is due to santonin, the colouring-matter passes almost entirely into the solvent, and the urine is decolorized. If it is derived from chrysophanic acid, the amylic alcohol takes up mere traces, and the urine remains red. But if the urine is acidulated, the chrysophanic acid may be removed by amylic alcohol, and if the solvent is then shaken up with ammonia, the aqueous stratum is reddened. Under the same circumstances the colouring-matter of santonin is not removed. The absorption spectrum of the two colours likewise differs.

Detection of Albumen in Urine. H. Prunier. (*Journ. de Pharm.* [5], xiii. 501, 502.) The author criticises the nitric acid test for albumen, and shows that it cannot be relied on in cases where the other well-known tests fail to indicate the presence of this substance. The method in question should always be controlled by boiling another sample of the urine with sodium sulphate and a few drops of acetic acid, as otherwise peptone may be mistaken for albumen.

Detection of Blood in Urine. C. Rosenthal. (*Chem. Centr.*, 1886, 251. From *Journ. Chem. Soc.*) The author has investigated Heller's and Struve's tests for the presence of the blood colouring matter in urine; the former consists in warming with aqueous soda, when the precipitate shows a red coloration. This test gave definite results with a dilution of 1 c.c. of blood in 1000 c.c. of normal urine; with a dilution twice as great the test failed. Struve's test, consisting in the isolation of hæmin from the precipitate occasioned in urine by tannin, is uncertain in its results: the presence of iron, however, in the ash from the ignition of this precipitate is satisfactory evidence of the presence of hæmoglobin in the urine.

Detection of Mercury in Urine. A. Almén. (*Archiv der Pharm.* [3], xxiv. 1031.) The urine to be tested is mixed with about $\frac{1}{10}$ of its weight of hydrochloric acid, and heated gently for one and a half hours with a coil of brass wire. The wire is then dried on paper and placed in a small glass tube, which is sealed off a few m.m. above the wire. The coil is now carefully heated and the sublimate examined with a lens. A reddish brown non-volatile incrustation will be found close to the wire; beyond this beads of mercury, then yellow oil drops, and finally some moisture. It is generally useful to heat a large quantity of the urine with solution of caustic soda and glucose, then allowing to settle, and submitting the sediment to the test.

A New Method for the Determination of Uric Acid in Urine. J. B. Haycraft. (*Zeitschr. für Analyt. Chem.*, xxv. 165–169.) The urine, after being freed from any albumen present, is mixed with sodium bicarbonate and then with ammonia and ammonia-nitrate of silver. A gelatinous precipitate of silver urate is thus obtained which is very insoluble in ammoniacal liquids. This precipitate is collected and thoroughly washed, then dissolved in nitric acid, and the silver determined in the solution by Volhard's sulphocyanide method (abstract, *Year-Book of Pharmacy*, 1874, 253). Each c. c. of centinormal sulphocyanide solution used corresponds to 0·00168 gram of uric acid.

Quantitative Estimation of Oxalic Acid in Urine. O. Nickel. (*Zeitschr. für physiol. Chem.*, xi. 186–200.) The methods proposed by Neubauer and Schultzen are criticised by the author, who finds both processes open to the objection of giving variable results, owing to the appreciable solubility of calcium oxalate in the liquid in presence of acetic acid, and to its imperfect separation from calcium phosphate.

Phenylhydrazine as a Test for Sugar in Urine. R. v. Jaksch. (*Zeits. Klin. Med.*, xi. 20–25; *Journ. Chem. Soc.*, 1886, 744.) The compound of phenylhydrazine and sugar described by Fischer (*Ber. der deutsch. chem. Ges.*, xvii. 579) furnishes a delicate test for dextrose in clinical work. When a solution of phenylhydrazine hydrochloride, containing also sodium acetate, is added to a solution of sugar, a yellow precipitate of needles of phenylglucazone, occurring both singly and in bundles, forms in a few minutes. The formation of crystals takes longer in a dilute solution of dextrose: the sediment should be examined microscopically, and for certainty its melting-point (204–205°) ascertained. By this test, sugar is never found in normal urine; it can be detected in the urine of diabetic patients when it is present in too small a quantity to give the ordinary tests; it possesses an advantage over the copper test, as it is not affected by other reducing substances occurring in urine besides sugar. In the urine of persons poisoned by arsenic, sulphuric acid, or by potash, there are reducing substances present, and no sugar is indicated by this test; but in that of persons poisoned by carbonic oxide or by other irrespirable gases, the occurrence of sugar seems constant. When the urine is strongly albuminous, the proteid must be first separated by heat. A small quantity of albumen, however, does not interfere with the test. In blood and dropsical fluids, sugar can

always be detected by this test: it is necessary to precipitate and filter off the proteids before applying the test.

Two New Tests for Sugar. H. Molisch. (*Amer. Journ. Pharm.*, September, 1886.) The two reactions described are common to cane-sugar, milk-sugar, glucose, levulose, and maltose, and to the carbo-hydrates and glucosides capable of yielding glucose by the action of sulphuric acid. They do not, however, produce any result with inosite, mannite, or quercite.

1. From one-half to two cubic centimetres of the suspected liquid are treated with two drops of a 15 or 20 per cent. alcoholic solution of alpha-naphthol, and the mixture is shaken. A slight turbidity results from the precipitation of a little naphthol; sulphuric acid is then added in quantity equal to or even double the volume of the fluid, and the whole is briskly shaken. In the presence of sugar a deep violet colour is developed, and dilution with water throws down a violet-blue precipitate, soluble in alcohol and ether with a yellow colour, or in caustic potash with a golden-yellow colour. In order that the reaction may occur as described, the test must be performed exactly as stated.

This test will permit the detection of 0·00001 per cent. of sugar, and, with the exception of vanillin, anethol, methyl salicylate, and a few similar substances, gives no reaction when sugar is not present. These substances, however, either produce the colour with sulphuric acid alone, or the precipitate formed when the violet solution is diluted with water, differs totally in character from that produced in saccharine liquids. The limit of sensibility of Fehling's test is 0·0008 per cent., and that of Trommer's test is 0·0025 per cent.

2. If, instead of the alpha-naphthol in the preceding test, an alcoholic solution of thymol of similar concentration be employed, the remaining manipulations being the same as before, a deep red, varying from cinnabar to carmine, is produced; dilution with water brings the colour to carmine, and after a time there separates a flocculent precipitate, which dissolves with a pale yellow colour in alcohol, ether, and caustic potash, but with a bright yellow in ammonia.

The delicacy of this reaction is about the same as of that with alpha-naphthol.

After many experiments had shown the trustworthiness of the results given by these tests, they were applied to the solution of the disputed question whether normal human urine does or does not contain sugar. The results of the first attempts were so

decided that the urine examined appeared to be diabetic. The urine of a number of perfectly healthy individuals was therefore examined, but with precisely the same results. The tests were made with alcoholic solutions of alpha-naphthol and thymol, exactly as has been described, and the extraordinary delicacy of the reactions can be better understood by the statement that normal urine diluted to from one hundred to three hundred times its volume with water still gives a recognisable reaction. When the urine is diluted to four hundred times its volume, the test shows no result.

In order that there might be no question as to sugar being the actual cause of the reaction, the following substances were examined and gave negative results with both alpha-naphthol and thymol: urea, creatine, xanthine, uric acid, allantoine, hippuric acid, succinic acid, phenol, pyrocatechin, and indican.

These results confirm the opinion advanced by Brücke, and supported by many other observers, that normal urine constantly contains sugar.

A New Test for Picric Acid. K. Fleck. (*Analyst*, 1887, 16.) If a solution of picric acid is concentrated in a small porcelain dish, and mixed with a few c. c. of 10 per cent. hydrochloric acid, the colour is at once destroyed. Binitrocresol is also decolorized after a few minutes. If now a piece of zinc is introduced, and allowed to act for one or two hours, the picric acid turns a fine blue; but binitrocresol turns blood red. To apply the reaction to foods, they must be powdered and extracted with alcohol. The residue obtained after evaporating the spirit must be carefully tasted for bitterness, and then treated with hydrochloric acid and zinc as described.

Estimation of Boric Acid. T. Rosenbladt. (*Zeitschr. für analyt. Chem.*, xxvi. 18–23). The author's process is based on the observation that boric acid can be completely volatilised by repeated distillation with dry methyl alcohol. In the case of a borate, sulphuric acid is to be used along with the alcohol in order to liberate the acid. The distillate is mixed with ammonium carbonate and evaporated in a platinum basin, in which about 3 parts of magnesia for 1 of boric acid have been strongly ignited and weighed. The increase of weight gives the amount of B_2O_3. Insoluble borates require to be fused with alkaline carbonates. Any chlorides present must be removed with silver sulphate before the distillation.

Separation and Estimation of Boric Acid. F. A. Gooch. (*Chemical News*, lv. 7–10.) The author confirms the practical value of methyl alcohol as a means of volatilising boric acid, and finds it superior in this respect to ethyl alcohol and water. He recommends the following *modus operandi* for the separation and estimation of this acid:—The substance, dissolved in water and nitric acid, or acetic acid, or in the acids alone, is run into a retort connected with a condenser and receiver and heated by means of a paraffin bath, and distilled to dryness. The residue is treated six times successively with 10 c.c. of methyl alcohol, being evaporated to dryness after each addition; when nitric acid is used, a little water is added from time to time to break up the cake of nitrate; when acetic acid has been used, a few drops of acetic acid are added with the fourth portion of methyl alcohol. In all cases the receiver contains a quantity of lime ignited and weighed before and after the distillation; any increase in the latter weighing is due to boric acid. Chlorides, if present in the original substance, must be removed from the nitric acid solution by silver nitrate before distillation.

Characteristic Reaction of Citric Acid. M. Mean. (*Journ. de Pharm. et de Chim.*, xiii. 477.) The author cautiously heats 1 gram of citric acid and 0·7 gram of glycerin in a porcelain capsule. The mass begins to bubble up and emit vapours of acrolein. On adding a small quantity of ammonia and about 2 drops of fuming nitric acid, or a 10 per cent. solution of hydrogen peroxide, a bright green coloration is produced, which gradually turns blue if the heat is continued.

Detection of Atropine. E. Beckmann. (*Archiv der Pharm.* [3], xxiv. 481–484; *Journ. Chem. Soc.*, 1886, 955.) Vitali's reaction for atropine depends on its oxidation with concentrated nitric acid, and subsequent formation of an intense violet coloration on the addition of alcoholic potash solution, followed by a cherry-red, and final disappearance of the coloration. Veratrine under the same conditions gives similar colour changes. These reactions do not take place with aqueous potash. To distinguish between the two alkaloids, the following reactions may be employed: With nitrous acid instead of nitric acid, and an aqueous potash solution instead of an alcoholic solution, atropine gives a reddish violet coloration, whilst veratrine gives a yellow one. Atropine when boiled for a short time with a mixture of equal volumes of glacial acetic and sulphuric acids gives a brownish green fluorescent liquid; the solution remains colourless until

the brown colour appears. Veratrine gives the same brown-coloured liquid finally, but during the heating passes from colourless through an intense cherry-red colour to the final brown. The fragrant odour produced on heating atropine with sulphuric acid, or with sulphuric acid and potassium dichromate, is not produced by veratrine; but on the addition of the dichromate, the latter gives an odour of acid caoutchouc gum. The new atropine reactions depending on its stronger basic nature, as compared with most of the other alkaloids, are not shared by veratrine. Atropine when heated with hydrochloric acid does not give the red solution yielded by veratrine: and a mixture of atropine and sugar gives yellow and brown, whilst veratrine gives green and blue colours.

Reactions of Pilocarpine. E. Hardy and G. Calmels. (*Comptes Rendus.*, ciii. 277–280.) If the barium-derivative of pilocarpine or pilocarpidine is distilled, it yields a liquid which has a peculiar odour, and forms a very deliquescent crystalline hydrochloride and nitrate. When gold chloride and platinum chloride are added to the aqueous solution of this liquid, they yield respectively the compounds $Au\,Cl_3$, $C_9\,H_{14}\,N_2$: $Au\,Cl_3$, $H\,Cl$, $C_9\,H_{14}\,N_2$; $Pt\,Cl_4$, $(C_9\,H_{14}\,N_2)_2$, and $H_2\,Pt\,Cl_6$, $(C_9\,H_{14}\,N_2)_2$, amorphous precipitates which aggolomerate in warm water or aqueous alcohol, and are very soluble in alcohol.

New Test for Morphine. G. Vulpius. (*Analyst*, 1887, 142.) The author substitutes sodium phosphate for potassium arseniate. If a little morphine, not less than ·00025 gram., is first moistened with six drops of sulphuric acid, then mixed with a few centigrammes of sodium phosphate, and now heated, until white fumes appear, the colour first becomes violet, afterwards brown. If after cooling a few drops of water are added, the colour turns a fine red, but the addition of about 5 c.c. of water makes it dirty green. If the liquid is now put into a test tube, and shaken with an equal volume of chloroform, the latter will, after subsiding, be found to be of a fine blue colour. The blue colour obtained in the well known test with morphine and neutral ferric chloride is not soluble in chloroform.

Reactions of Morphine and Pseudomorphine (Dehydromorphine). J. Donath. (*Journ. prakt. Chem.* xxxiii. 559–562 and 563, 564.) When an intimate mixture of morphine, potassium arsenate, and sulphuric acid is heated, a blue-violet coloration is produced, turning a dark brown-red on further warming. On moderate dilution with water, a red colour is formed, but if chloroform is

added it gives a violet dye. Pseudomorphine (oxydimorphine), for which the author prefers the name dehydromorphine, under the same conditions gives a green coloration, but no dye with chloroform. Morphine heated with potassium chlorate and concentrated sulphuric acid gives a grass-green coloration.

A good test for dehydromorphine (pseudomorphine) consists in heating it with sulphuric acid (two parts of acid to one of water) until the vapours of sulphuric anhydride are evolved; the liquid is of a blue-green colour, turning rose-red on moderate dilution, and a deep violet on addition of an oxidizing agent.

Dehydromorphine resembles morphine in its reactions with ferric chloride, concentrated nitric acid, Fröhde's reagent, and iodic acid; but it is more sparingly soluble in most solvents than morphine. It is not reduced to morphine by sodium amalgam or by hydrochloric acid with zinc or tin.

Characteristic Reaction of Pseudomorphine. O. Hesse. (*Liebig's Annalen*, ccxxxiv. 253–256.) If pseudomorphine be mixed with an equal weight of cane-sugar, and dissolved in pure sulphuric acid, a dark green coloration is produced, which gradually turns brown. If the acid contains a minute quantity of a ferric salt, a blue coloration turning dark green is produced. The reaction is shared by diacetopseudomorphine. Morphine, under the same conditions, gives a violet-red coloration.

The Thalleioquin Test for Quinine. E. Mylius. (*Chem. Centr.*, 1886, 602, 603.) This delicate and well known test is worked by the author in the following manner:—About 0·01 gram of the salt to be tested for quinine is treated on a watch-glass with about the same volume of potassium chlorate and a drop of strong sulphuric acid; ammonia is then added in excess, and the whole stirred, when the solution assumes a dark green colour. Less than a milligram of quinine can be easily detected by this reaction.

New Test for Coniferin. H. Molisch. (*Chem. Centr.*, 1887, 366.) An alcoholic 20 per cent. solution of thymol is diluted with water as long as it remains clear; an excess of solid potassium chlorate is added, and after some hours the mixture is filtered. Coniferin, treated with a drop of this solution and two drops of strong sulphuric acid, acquires a fine blue colour when evaporated in direct sunlight. A wood section, or wood-pulp paper moistened with this solution, and a drop of hydrochloric acid, rapidly becomes blue even in the dark. Since coniferin is only present in lignefied cell-walls, thymol may probably be of use in the microscopic detection of wood-fibre.

Reaction of Alkaloids with Mercuric Chloride. M. Schweissinger. (*Zeitschr. für Analyt. Chem.*, xxv. Part 3.) The author has applied Gerrard's test for atropine (abstract, *Year-Book of Pharmacy*, 1884, 158), to a number of different alkaloids. Arbutine, condurangine, and sparteine, when gently heated with alcoholic solution of mercuric chloride, gave no precipitates: cocaine yielded a white precipitate, but only in very concentrated solutions. Scoparine gave a yellow precipitate. The behaviour of hyoscyamine and homatropine is particularly interesting. If 1 mg. of the former is covered with 2 c.c. of the 5 per cent. alcoholic solution of mercuric chloride, no precipitate appears; but if only 2 drops of the solution are used, the precipitate comes up on gently warming, just as with atropine, and does not disappear on the addition of more of the mercuric solution. Homatropine, which with sulphuric acid and sodium nitrite behaves exactly like atropine, yields with alcoholic mercuric chloride no precipitate at all, is produced if the solution is dilute, but in a concentrated solution a white precipitate, which disappears on the addition of a further quantity of mercuric chloride; no red precipitate appears. The reaction is suitable for quantitative determinations; it applies only to the alkaloid itself, and not to its salts. The caution is given that inorganic basic bodies, such as calcium and magnesium hydroxides, produce the very same precipitates.

Colour Tests for Strychnine and other Alkaloids. C. L. Bloxam. (*Chemical News*, April 7, 1887.) The author recommends the following as a characteristic and delicate test for strychnine:—

The alkaloid, on a glass slide or a porcelain crucible lid, is dissolved in a drop of dilute nitric acid, and gently heated; to the warm solution a very minute quantity of powdered potassium chlorate is added, which will produce an intense scarlet colour; one or two drops of ammonia will change this to a brownish colour, giving a brownish precipitate; the mixture is then evaporated to dryness, when it leaves a dark green residue, dissolved by a drop of water to a green solution, changed to orange-brown by potash, and becoming green again with nitric acid; these last changes of colour may be repeated any number of times.

The green colouring-matter is evidently a product of the action of ammonia upon the scarlet body, for if this be bleached by heating or by excess of chlorate, before the ammonia is added, the residue on evaporation is light brown, and yields with potash a bright yellow solution which is nearly bleached by nitric acid.

No other of the commonly occurring alkaloids tried by the author could be mistaken for strychnine by the above test, but each of them exhibits some peculiarity when treated in the same way, which would give a clue to its identity. This will be seen in the subjoined table, in which the tests are supposed to be applied to the same portion of the alkaloid, as described above:—

	HNO_3.		$KClO_4$.	NH_3.	Residue.	KHO.	HNO_2.
	Cold.	Heated.					
Strychnine .	—	Pink.	Scarlet.	Brownish precipitate.	Green.	Orange.	Green.
Brucine . .	Violet; scarlet.	Yellow.	Yellow.	Bright yellow.	Green.	Dark brown.	Green; brown.
Narcotine . .	—	Bright yellow.	Yellow.	Dark brown.	Dark brown.	Dark brown.	Reddish yellow.
Morphine . .	Orange-red.	Yellow.	Yellow.	Red-brown.	Light brown.	Light brown.	Light brown.
Quinine . .	—	—	—	Green precipitate.	Light brown.	Light brown.	Light brown.
Cinchonine .	—	—	—	White precipitate.	Light brown.	—	—
Caffeine . .	—	—	Pale yellow.	Bleached.	Red; yellow.	—	—

Some time ago the author drew attention to the use of bromine-water in the detection of alkaloids. He finds that a more convenient reagent can be made by mixing a weak solution of potassium chlorate with enough strong hydrochloric acid to turn it bright yellow, and enough water to make it very pale yellow. This *euchlorine* solution is added by degrees to the solution of the alkaloid in H Cl, which is boiled after each addition.

Strychnine gives a fine red colour, bleached by excess and by returning when boiled.

Brucine produces a violet colour in the cold, which is bleached by excess and restored by boiling.

Narcotine gives a bright yellow colour in the cold, which becomes pink on boiling and adding more of the euchlorine solution.

Quinine gives a faint yellowish pink on boiling.

After cooling the solution, weak ammonia is gradually added.

Strychnine gives a yellow colour unchanged by boiling.

Brucine gives the same.

Narcotine produces a dingy green, becoming brown on boiling.

Quinine yields a bright green, becoming yellow on boiling.

Morphine gives no reaction; but if, after boiling with the euchlorine solution, the liquid be cooled and allowed to remain in contact with zinc for a minute or two, it will give the characteristic pink reaction with ammonia.

Separation of Strychnine and Morphine from Fatty Matters. M. Focke. (*Journ. de Pharm. et de Chim.*, October 15, 1886.) The suspected matter is exhausted by heating with alcohol acidified with tartaric acid. The liquid when cold is filtered, and evaporated on the water-bath. The residue is taken up with ten times its weight of water, and the solution mixed with an excess of baryta water. After the lapse of some hours a slight excess of sulphuric acid is added; the mixture is allowed to settle for some time, filtered, and the acid precipitated with barium chloride. It is filtered afresh, and evaporated on the water-bath until the hydrochloric acid of the barium salt is completely eliminated. The residue is taken up in absolute alcohol, and the solution is evaporated to dryness on the water-bath. The new residue, which is slightly acid, is dissolved in water, and exhausted with ether, which takes up the fatty matters still contained in the liquid. The aqueous solution is rendered alkaline, again taken up with ether, and, after the evaporation of this solvent, the residue is treated with water acidulated with hydrochloric acid, which dissolves merely the alkaloids.

Reactions of Kairine, Antipyrine, and Antifebrine. C. A. Kohn. (*Journ. de Pharm. et de Chim.*, April 1, 1887. From *Chemical News.*) In a dilute aqueous solution of kairine, a drop of ferric chloride gives immediately a violet colour, which quickly changes to brown. An excess of ferric chloride produces in a strong solution of kairine a blackish brown precipitate. Potassium dichromate gives, in a neutral solution of kairine, an intense coloration, and a violet precipitate is shortly deposited. Antipyrine yields a red colour with ferric chloride, even in very dilute solutions; with nitrous acid a greenish blue colour is produced. Antifebrine gives no reactions with the above-named reagents.

Determination of Small Quantities of Cinchonidine in Quinine Sulphate. L. Schäfer. (*Archiv der Pharm.* [3], xxv. 64–72.) 2 grams of quinine sulphate are dissolved in a small tared flask in 55 c.c. of boiling water, and 0·5 gram of neutral, crystallized potassium oxalate in 5 c.c. of water is added. The liquid is made up to 62·5 grams, and cooled for half an hour in water at 20°, with occasional agitation, and then filtered. If on the addition of one drop of officinal aqueous soda to the filtrate no turbidity appears, the quinine sulphate contains less than 1 per cent. of cinchonidine sulphate. In the presence of 1 per cent. of the latter salt, a turbidity or a precipitate of cinchonidine appears. For quantitative estimations, 5 grams of quinine sulphate are taken, and an aliquot

part of the filtrate is treated with aqueous soda; the precipitated cinchonidine is collected and weighed. Since a certain amount of cinchonidine remains in solution, and a little also goes down with the quinine oxalate, it is necessary to apply a slight correction to the amount found. This correction should be 0·04 gram cinchonidine for each 100 c.c. of solution originally taken. If more than 4 per cent. of cinchonidine is present, a more dilute solution should be employed, as the process is expressly intended for small quantities only. The test also indicates small quantities of quinidine and cinchonine sulphate when present; indeed, the conditions are more favourable in the case of these compounds, as they are not carried down by the oxalate precipitate.

Assay of Quinine Sulphate by Means of Neutral Potassium Chromate. J. E. de Vrij. (*Arch. Pharm.* [3], xxiv. 1073.) In order to estimate the proportion of pure quinine in the sulphate, 2 grams of the sample are dissolved in 200 c.c. of boiling water; the solution is mixed with 0·5 gram of potassium chromate previously dissolved in a small quantity of water, the mixture well stirred and allowed to stand in a cool place for twelve hours. The whole of the quinine will then be found to have separated as chromate in the form of anhydrous crystals of the composition $(C_{20}H_{24}N_2O_2)_2, H_2CrO_4$. The precipitated chromate is weighed, and its weight increased by ·05 gram for every 100 c.c. of mother-liquor and wash water, to allow for the slight solubility of the salt. From the total thus obtained the percentage of pure quinine is readily calculated.

The amount of cinchonidine in a sample of quinine sulphate may be estimated by dissolving 5 grams of the sulphate in 500 c.c. of boiling water, adding a strong solution of 1·2 grams of potassium chromate, and allowing the mixture to remain in a cool place for twelve hours, after which the quinine chromate is collected on a filter and washed. The mother-liquor and washings are heated with soda on a water-bath for some time, whereby the cinchonidine separates out in a crystalline form, and is collected, dried at 160°, and weighed. The author found in 5 grams each of three commercial samples, 0·197, 0·205, and 0·244 gram of cinchonidine respectively.

Assay of Quinine Sulphate by Means of Neutral Potassium Chromate. O. Hesse. (*Pharm. Journ.*, 3rd series, xvii. 585 and 665.) The author criticises De Vrij's method of assaying quinine sulphate by means of potassium chromate (preceding abstract), showing that the precipitated and air-dried chromate is not anhy-

drous but contains 2 molecules of water, which it loses at 80° C. and absorbs again on exposure. Cinchonidine and hydroquinine, when present in quinine sulphate, cannot be correctly determined by De Vrij's chromate method, for although the neutral chromates of these two substances are more readily soluble than quinine chromate, they cannot be separated from the latter by crystallization, as they crystallize out with the chromate. In fact, where quinine sulphate contains 8 per cent. or less of hydroquinine, the latter behaves exactly like quinine; whilst in the presence of 0·3 per cent. of cinchonidine, the mother-liquor from the quinine chromate yields a precipitate consisting not wholly of cinchonidine, as is supposed by De Vrij, but for the most part of a compound of seven molecules of cinchonidine with one molecule of quinine; also when the percentage of cinchonidine exceeds 0·3, the mother-liquor not only behaves in the same way, but a varying quantity of cinchonidine chromate crystallizes with the quinine chromate. The mixture of chromates obtained on treatment with ammonia and ether yields the compound $C_{20}H_{24}N_2O_2, 2C_{19}H_{22}N_2O$, which by crystallization from hot dilute alcohol can be converted into large, brilliant, rhombohedrons of the formula,

$$C_{20}H_{24}N_2O_2, 7C_{19}H_{22}N_2O.$$

The Chromate Test for Quinine. B. H. Paul. (*Pharm. Journ.*, 3rd series, xvii. 585.) In a note appended to Hesse's paper on this process of quinine testing (see preceding abstract), the author points out that the consequence of taking the chromate to be an anhydrous salt in the calculation of the results of analysis would be to bring the amount of quinine sulphate as between 4 and 5 per cent. higher than it would be if the correct formula of the chromate were made the basis of the calculation. He also shows that the addition recommended to be made for quinine chromate dissolved, amounts to no less than 5 per cent. of the total quantity of quinine sulphate operated upon, and is equal to the average amount of impurity to be tested for.

The Testing of Quinine Sulphate. O. Schlickum. (*Archiv der Pharm.* [3], xxv. 128.) Employing De Vrij's chromate method (p. 116), the author finds that not only quinine but also cinchonine forms a chromate soluble in 2,000 parts of water at moderate temperatures, whilst quinidine and cinchonidine chromates are much more soluble in water. On precipitating a quinine solution by means of normal potassium chromate, and allowing it to remain four or more hours, the filtrate remains unchanged on

the addition of soda if the quinine salt is pure. If the quinine salt contains cinchonine, quinidine, or cinchonidine in not too minute traces, the soda produces a turbidity either at once or after some time. The method is capable of detecting $\frac{1}{2}$ per cent. of cinchonine sulphate, and 1 per cent. of cinchonidine or quinidine sulphate. In testing other neutral quinine salts it is not necessary to convert them into sulphates. Acid quinine salts require conversion into neutral ones by evaporation to dryness with ammonia.

The Tests for the Purity of Quinine Sulphate. B. H. Paul. (*Pharm. Journ.*, 3rd series, xvii. 645.) This paper furnishes an interesting review of the literature of this subject, the perusal of which, and also of a leading article on the same subject in the same paper, pp. 554 and 555, we strongly recommend to the reader. Dealing with the official tests of different pharmacopœias, he considers that of the British Pharmacopœia, as it now stands, to be decidedly in advance of the others. He deems it unfortunate, however, that the addition of acid should have been directed in making the solution, for except in so far as perfect neutralization is concerned, every drop of acid added proportionately invalidates the result by introducing into the mother liquor so much the more quinine, and thus reducing the delicacy of the test for cinchonidine. As another objectionable feature, he considers the treatment of such a large volume of liquid with ether and ammonia. Five ounces of the solution will dissolve at least half an ounce of ether before there is any separation of ether to dissolve the alkaloid, and in that way a liquid will be produced which is itself a solvent of cinchonidine to such an extent as to interfere with the indications of its presence. The proper mode of operating would be to evaporate the mother liquor of the crystallization to a small bulk before treating it with ether and ammonia, and then the result of the test would be much more distinct and accurate.

Quinine Testing. O. Hesse. (*Pharm. Journ.*, 3rd series, xvii. 974–977.) The author shows that Schäfer's oxalate test (p. 115) is not less defective than the optical test in giving too high an indication of the amount of cinchonidine.

The bisulphate test recommended by De Vrij is stated to give very good results when it is carried out with the modifications suggested by the author. In order to conduct that method of testing most successfully, it is desirable to operate with 5 grams of the sulphate in question, to dissolve this quantity in 12 c.c. of normal sulphuric acid in a small porcelain basin with the aid of

heat, then to pour the solution into a funnel closed at the bottom, and rinsing the basin out with a few drops of water. The crystallization of the bisulphate soon commences, and is complete after two hours. By then removing the stopper of the funnel the mother liquor may be drained away, and any residue removed by a suction pump. The upper portion of the crystals should be pressed down with a glass rod and washed with 3 c.c. of cold water, added drop by drop, while the suction is kept up. The whole solution is mixed with 16 c.c. of ether from 0·721 to 0·728 specific gravity, and shaken up, then 3 c.c. of ammonia solution of 0·960 specific gravity added, and the whole well shaken again. After standing for one day the ether is removed with a pipette, the crystals which have separated are collected upon a filter and washed with water saturated with ether. After this the filter is placed on an absorbent surface and the crystals again washed with some ether before being dried at 100° C. These crystals have a composition represented by the formula, $C_{20}H_{24}N_2O_2, 2\,C_{19}H_{22}N_2O$, but there is generally some quinine adhering to them, especially when the amount of cinchonidine in the quinine sulphate tested is very small. In order to ascertain from the weight of the crystalline mass the amount of cinchonidine with the greatest accuracy, it is necessary, for the reason above stated, not to multiply by 0·645 in accordance with the formula of the compound, but with 0·62, this number being the mean result of all determinations the author has made in reference to this mode of testing.

This paper also contains a critical review of other well-known methods of quinine testing, for which we refer the reader to the original source.

New Reaction of Sparteine. A. Grandval and M. Valser. (*Journ. de Pharm. et de Chim.*, July 15, 1886.) When a drop of ammonium sulphydrate is placed on a watch glass, and a trace of sparteine or one of its salts is added to it, a permanent orange-red coloration is produced immediately.

Reaction of Strophanthin. H. Helbing. (*Pharm. Journ.*, 3rd series, xvii. 924.) The author proposes the following characteristic reaction:—A trace of strophanthin is dissolved in a drop of water, and a minute quantity of solution of ferric chloride added, followed by a little concentrated sulphuric acid. A reddish brown precipitate is thus formed, which, after a while, sometimes not before one or two hours, turns to an emerald-green, and

then remains unchanged for a long time. Very minute traces of strophanthin may be detected in this manner.

Detection of Thalline and Antipyrine. M. Blumenbach. (*Amer. Journ. Pharm.*, December, 1886, from *Pharm. Zeitschr. für Russland.*) The author found that thalline is not, or only in traces, taken up by agitating acidulated aqueous solutions with benzin, benzol, chloroform, or ether, but is dissolved from ammoniacal liquids, by these solvents, though only sparingly by petroleum benzin. Distinct reactions could be obtained by this treatment with 0·001 gm. of thalline in 100 ccm. of urine; from a similar amount of blood or food mixture the reactions were faint, but with 0·005 gm. they were distinct. The green colour produced by ferric chloride is unmistakable in solutions, 1 : 10,000, and still recognisable in dilutions, 1 : 100,000. A green colour is also produced by gold chloride, silver nitrate, chromic acid, chlorine water, and mercuric nitrate, and in acid solutions also by chlorinated lime and potassium ferrocyanide. Iodine colours dark brown, then dingy green; platinic chloride yellowish green; and a red colour is produced by warm fuming nitric acid, by sulphuric and nitric acids, and by sugar and sulphuric acid. The solutions of thalline, if not too dilute, yield precipitates with the usual reagents for alkaloids.

Given to animals by the stomach or subcutaneously, thalline caused a dark coloration of the urine, which contained very little unaltered thalline, but after acidulation yielded to benzin, benzol, etc., a derivative coloured green by ferric chloride; after precipitating the phosphoric acid with a few drops of ferric chloride, the filtrate yielded with more ferric chloride the red colour observed by Jaksch.

Detection of Antipyrine.—The author recommends treating the aqueous solutions with petroleum benzin, and, after the addition of ammonia, with benzol, chloroform, or amylic alcohol, when very distinct reactions will be obtained with 0·001 or 0·005 gm., and faint reactions with 0·001 gm. of antipyrine in 100 ccm. of organic mixtures.

The alkaloidal reagents produce precipitates in not too diluted solutions of antipyrine, and ferric chloride gives in neutral solution, 1 : 1,000, a dark brown colour; with 1 : 10,000 a light brown, and with 1 : 50,000 a light yellow colour. Fuming nitric acid colours dry antipyrine dark red, and in liquids green, recognisable in solutions containing 1 : 10,000. The solution, mixed with concentrated sulphuric acid, and warmed with a little fuming nitric acid, becomes deep red.

Observations with animals prove that antipyrine is rapidly resorbed, and for the next eighteen or twenty hours may be detected in the urine; but only for a few hours in the different organs. On the other hand, antipyrine was found, after putrefaction had proceeded for a fortnight, in all organs of animals killed about two hours after swallowing the chemical or receiving it by hypodermic injection.

A Study of the Use of Mayer's Reagent in the Estimations of Alkaloids. A. B. Lyons. (From a paper read before the Michigan State Pharmaceutical Association, October, 1886, and printed in the *Amer. Pharm. Journ.*, Dec., 1886, 579–587, and January, 1887, 1–7.) The author's researches respecting the volumetric estimation of alkaloids by Mayer's reagent lead to the following inferences:—

1. Results of titrations with this reagent are influenced by various conditions to such an extent that their indications have at best only an approximate value.

2. In dilute solutions the results of titration are always high. Either a stated correction must be made, or a second experiment carried out, in which the solution is brought to a standard strength, say of 1 : 200 or 1 : 300.

3. The influence of alcohol and of iodides (the same is true to a certain extent also of bromides and chlorides) is to interfere with the precipitation, and yet the effect of their presence may be beneficial rather than otherwise, the end of the reaction being more sharply defined with them than without. This is especially true where a modified reagent is employed, containing an excess of potassium iodide. Such a reagent gives more uniform results with certain alkaloids than the usual solution, but with many alkaloids is not to be preferred, and is not to be recommended for general use.

The author also deals with the question whether or not Mayer's reagent may be depended upon for the purpose of gravimetric estimations. He finds that a few only of the precipitates produced by it approximate in composition corresponding with the formulæ assigned to them by Prof. Mayer, but that the inconstancy in composition is not such as to render the process unfit for use in cases where approximate results only are contemplated. The following table gives the results of experiments made with reference to the composition of the precipitates:—

Name of Alkaloid.	Weight of Prec. containing 100 alkaloid.	Average weight of alkaloid in 100 of prec. approx.	Weight of prec. analyzed.	Hg. in prec. analyzed.	Atoms Hg.	I. in prec. analyzed.	Atoms I.	Molecular weight of prec.
Aconitine	179–188	54·8	182·5	27·5	0·73	55	2·35	954–1002
Atropine	216–245	54·4	220	51	0·73	69	1·06	624–708
Berberine	200	55·0	—	25	0·42	75	2·06	670
Brucine	190–214	48·9	205	30	0·59	75	2·33	749–843
Cinchonidine	348–370	28·5	352	60	0·92	102	4·65	1·72–1110
Cinchonine	321·318	30·0	339	62·5	0·96	176·5	4·28	988–1072
Cocaine	240–270	40·7	246	50	0·76	94	2·25	—
Colchicine	155–180	—	159	34	0·58	25?	?	491–571
Emetine	240·256	40·8	245	44	1·09	105	4·10	1190–1270
Gelsemine	185–200	52·4	—	50	1·02	50	1·61	816
Hydrastine	200–210	47·6	210	37	0·73	73	2·28	834
Hyoscyamine	222–250	13·5	228	46	0·66	82	1·87	642–703?
Morphine	190–204	48·6	202	42	0·60	69	1·35	541–582?
Pilocarpine	295·310	—	308	81	0·81	127?	2·08	614–707
Quinine	310–335	30·8	325	64	1·31	161	4·11	1004–1085
Strychnine	258–274	37·9	264	57	0·95	107	2·81	860–913

Further experiments are needed to determine the conditions under which the best results can be obtained.

Detection of Arsenic by means of Brass. H. Hager. (*Chem. Centr.*, 1886, 680, 681.) The liquid to be tested is mixed with $\frac{1}{4}$–$\frac{1}{2}$ its volume of pure hydrochloric acid, and allowed to act upon a plate of brass for one and a half hour; if the brass remains bright, arsenic is absent. In the presence of arsenic, a grey film is formed on the brass. The larger the quantity of arsenic present, the quicker is the deposit produced. Heavy metals, including iron, must be absent. If antimony is suspected, the liquid should either be warmed with the strip of brass, or set aside for some hours at ordinary temperatures. Arsenic gives a steel-grey to black film, antimony a light grey. Held in a spirit-lamp flame, an arsenic film becomes steel-blue and volatilises; antimony remains unchanged. If the deposit can be scraped off into a dry test-tube, add to it two drops of water and then 10 of nitric acid (30 per cent.). Arsenic will dissolve, antimony remain undissolved.

Note on Reinsch's Test for Arsenic. H. Hager. (*Chem. Centr.*, 1886, 772, 773.) According to the author, the presence of traces of arsenic in the copper employed does not interfere with its use for this test, since the impurity consists in the form of an alloy, which is not attacked by hydrochloric acid. Copper foil may safely be used if it stands the following test:—A piece of perfectly bright foil is immersed in perfectly pure hydrochloric acid of 10 to 12·5 per cent., and allowed to remain for two hours; if at the end

of that time it is still quite bright, it may be used for the detection of arsenic; if the surface has become dimmed, the foil is of course rejected. The foil may contain traces of arsenic and still give no coloration with acid; in that case, it can be used both for the dearsenification of acid and for the qualitative detection of arsenic.

Determination of Arsenic. F. Reich and T. Richter. (*Zeitschr. für analyt. Chem.*, xxv. 411, 412.) One part of the substance under examination is warmed with strong nitric acid until the greater part of the latter is evaporated: the residue is mixed with 8 parts of sodium carbonate and 8 parts of potassium nitrate, the dried mass fused for ten minutes, then dissolved in water, the solution slightly acidified with pure nitric acid, and mixed with solution of silver nitrate (equal to 2 parts of metallic silver), and finally with sufficient ammonia to insure perfect neutrality. The precipitate is collected, washed, and dried, and the silver determined in it in the usual way. The quantity of silver thus found corresponds to 23·15 per cent. of its weight of arsenic.

Separation of Arsenic and Antimony. MM. Zambelli and Luzzato. (*Archiv der Pharm.* [3], xxiv. 772.) These metals may be readily separated by treating the freshly precipitated sulphides, while still moist, with hydrogen peroxide at 40° C. for some hours, then raising the temperature gradually to near the boiling point, and filtering. The sulphide of arsenic is thus converted into arsenic acid, and passes into the filtrate, whereas the antimony is left on the filter as an insoluble oxide. The results are stated to be very satisfactory.

Detection of Phosphorus by Mitscherlich's Method. M. Mankiewicz. (*Archiv der Pharm.* [3], xxv. 32.) The test was found to fail with one and also with two milligrams of phosphorus in 200 c.c. of water containing 3 per cent. of carbolic acid; but it succeeded with five milligrams of phosphorus under the same conditions.

Note on the Separation and Detection of Phosphorus by Mitscherlich's Method. K. Polstorff and J. Mensching. (*Ber. der deutsch. chem. Ges.*, xix. 1763, 1764.) The authors find that the disturbing effect produced by mercuric chloride in this test, observed by Lecco (*Ber. der deutsch. chem. Ges.*, xix. 1175), is also shared by other salts of mercury. Cupric salts do not produce this effect.

Detection of Phenol in Poisoning Cases. G. Dragendorff. (*Amer. Journ. Pharm.*, December, 1886, from *Pharm. Zeitschr. für Russland.*) Experiments were made by Dr. Woldemar Jacobson

for the purpose of isolating and recognizing phenol. The organic mixtures, 100 ccm., were macerated for a day with 400 ccm. of alcohol, the filtrate was freed from alcohol by distillation at a low temperature and under reduced pressure, the aqueous residue filtered, agitated with a little petroleum benzin for the separation of fat, and then repeatedly shaken with benzol, which solvent was evaporated in watch-glasses. The following reactions were employed:—

The author's method: The residue was left in contact at ordinary temperatures with solution of mercuric nitrate, containing a little nitrous acid; the red colour appears in half an hour with 1 phenol in 100,000 mixture.

Jacquemin's method: Dissolve 3 drops of colourless aniline in 50 ccm. of water. Dilute 5 or 10 drops of this solution with 5 ccm. of water, and add sufficient solution of sodium hypochlorite (1 sodium carbonate; 1 chlorinated lime; 10 water; filter), until a distinct violet or brown colour is produced. Add of this freshly prepared mixture to the phenol, previously mixed with ammonia, until the liquid is coloured violet or brownish, when in a short time in the presence of phenol (1 : 50,000) the colour will change to blue, or with less phenol (1 : 100,000) to green.

Landolt's reaction: Cloëtta and Schaer have shown that the crystalline precipitate with bromine is still obtained in solutions of phenol diluted to the proportion 1 : 100,000. In separating small quantities of phenol from animal matter, Jacobson obtained amorphous precipitates with bromine, which, after drying, dissolving in alcohol, and evaporating slowly, yielded the characteristic groups of needles. Minute quantities of phenol are best dissolved in little water, and then exposed to bromine vapours.

Detection of Traces of Hydrocyanic Acid. G. Vortmann. (*Monatsh. Chem.*, vii. 416, 417.) The liquid to be examined is mixed with a few drops of potassium nitrite, three drops of ferric chloride, and so much dilute sulphuric acid as will suffice to dissolve the yellowish brown basic ferrous salt at first formed to a yellowish solution. The mixture is heated to boiling, cooled, the excess of iron removed by a few drops of ammonia, filtered, and the filtrate tested with a few drops of very dilute colourless ammonium sulphide solution. The formation of a violet coloration, turning successively blue, green, and violet, indicates the presence of a cyanide. The test is based on the formation of nitroprussides.

The Post-Mortem Detection of Chloroform. C. Ludeking. (*Chemical News*, April 1, 1887.) The manner of experimenting adopted was as follows:—Dogs of from fifteen to twenty pounds weight were destroyed gradually by the administration of chloroform through the lungs in from five to ten minutes. Then the carcases were allowed to stand in summer's heat or the temperature of the room for different periods of time, and finally the lungs removed and tested for chloroform, by the Ragsky method. (*Erdmann's Journ.*, xlvi. 170.) The lungs, after having been finely minced and rendered *slightly* alkaline by means of sodium carbonate, were heated over a water-bath in a flask through which a current of air was slowly passing. The escaping gases were sent through a Bohemian glass tube, which was heated to bright redness over a space of two inches. The iodised starch paper was five inches distant from this heated portion of the tube, and throughout the experiment remained perfectly cool.

A very strong blueing of the paper was observed, and the nitrate of silver solution was strongly precipitated.

Numerous similar experiments are described, from which the following conclusions are drawn:—

1. By the process of decomposition no substances are generated which could vitiate the tests for chloroform by the Ragsky method.

2. Chloroform, when it has caused death by inhalation, can with certainty be detected in the body four weeks after death, and, notwithstanding its volatility, it is certainly retained in the viscera in large amount during this time.

Detection of Chloral in Forensic Investigations. G. Dragendorff. (*Amer. Journ. Pharm.*, December, 1886, from *Pharm. Zeitschr. für Russland.*) Having previously shown that chloral hydrate may be abstracted from aqueous solutions by agitation with ether and acetic ether, the author recommends, based upon the researches of Tiesenhausen (see next abstract), the treatment of urine first with petroleum benzin, then with ether, when, on evaporation of the latter solvent, the chloral hydrate is left behind. Other organic mixtures, such as the contents of the stomach, require to be acidulated with diluted sulphuric acid, and macerated for a day with three volumes of strong alcohol; the filtrate is evaporated spontaneously until the alcohol has been volatilized, when the aqueous residue will yield fat, etc., to petroleum benzin, and subsequently chloral hydrate to ether. Blood, and organs containing much blood, retain the chloral within the coagulum, in which it is best recognised by the production of

chloroform on distilling with sodium hydrate. 0·005 gm. chloral hydrate may, by these processes, be readily recognised in from 75 to 100 ccm. of mixture.

The most suitable reactions for the recognition of chloral hydrate are the following:—

The dry chloral hydrate is warmed with alcoholic soda solution and a little pure aniline; the odour of isonitril is still distinct, though faint, with $\frac{1}{60000}$ gm. of chloral hydrate.

Heat to 50° C. the hydrate, with one or two drops of concentrated aqueous potash solution, and a little naphthol; the blue colour, produced also with chloroform, is recognised with $\frac{1}{21000}$ gm. of chloral hydrate.

Experiments with animals show that chloral hydrate is rapidly resorbed and transformed into products which, like urochloralic acid, do not show the reactions of chloral hydrate.

Detection of Chloral Hydrate in Animal Fluids. H. Tiesenhausen. (*Zeitschr. für Analyt. Chem.*, xxv. Part 4.) The author applies the "shaking out" method used in searching for alkaloids. Absolute ether is the best agent, acetic ether is almost as good, whilst petroleum ether, chloroform, and benzene are not applicable.

Test for the Purity of Chloral Hydrate. A. Kremel. (*Pharm. Post*, 1886, 738.) A weighed quantity of the chloral to be examined is dissolved in water and treated with an excess of standard solution of sodium hydrate. After a few minutes, the excess of soda left is determined with normal hydrochloric acid, litmus being used as an indicator. One gram of chloral hydrate requires for decomposition into chloroform and sodium formate 6·04 c.c. of normal soda solution, whilst chloral alcoholate requires only 5·17 c.c.

The Pharmacopœial Test for the Purity of Ether. W. R. Dunstan and T. S. Dymond. (*Pharm. Journ.*, 3rd series, xvii. 841.) The present British Pharmacopœia directs that ether shaken with solution of potassium iodide and starch paste should produce little or no blue colour. The authors have investigated this test and found that ether prepared from sodium ethoxide and ethyl iodide does not liberate iodine from potassium iodide until after about three hours, and then only traces of it are set free; but hydriodic acid at once causes the liberation of iodine. Ether prepared from sulphuric acid and alcohol liberates iodine from strong solutions of potassium iodide, and very slowly from dilute solutions, the reaction being accelerated by the presence of acid.

The reaction is not due to ozone, for on agitating the ether with mercury or silver, the filtrate showed the same behaviour as before. On warming the ether with solution of sodium carbonate, neither the escaping gas nor the remaining ether had any effect upon potassium iodide. The presence of *hydrogen peroxide*, thus indicated, was shown by shaking the ether with a very dilute solution of potassium chromate acidulated with sulphuric acid, when the ether separated with a deep blue colour, due to perchromic acid. Some commercial ethers, particularly if made from methylated spirit, contain an impurity which forms H_2O_2 after a short time, and this may then be detected by the perchromate test. The quantity of H_2O_2, determined from the iodine liberated, amounted to only ·04 per cent. The impurity may be removed by treating the ether with excess of lime and washing the distillate with alkaline water.

The Purity of Ether. G. Vulpius. (*Dingl. polyt. Journ.*, ccl.xi. 96.) The author calls attention to the fact that a specific gravity of less than 0·735 affords no proof that a sample of ether is free from heavy oil of wine. He detected over 1 per cent. of this impurity in a sample of 0·722 sp. gr., by allowing the ether to evaporate. The residue consisted of the oil, with mere traces of acetic acid and water.

A New Test for Tannic Acid. J. E. Saul. (*Pharm. Journ.*, 3rd series, xvii. 387.) Agitate about 0·01 gm. of the sample with 3 c.c. of H_2O; add three drops of 20 per cent. alcoholic thymol solution, and then 3 c.c. of strong H_2SO_4. Tannin under these conditions yields a turbid *rose-coloured* solution. Gallic acid, on the other hand, remains untinted; or only develops the faintest possible pink coloration, visible chiefly in the sulphuric acid layer at the bottom of the test-tube. This cannot, however, be mistaken for the deep rose tint produced with tannic acid.

Pyrogallol, similarly treated, yields a dull violet solution.

Estimation of Tannin. (*Zeitschr. für analyt. Chem.*, xxv. 527, 528.) The author employs a solution containing 48·2 grams of iron alum, 25 grams of sodium acetate, and 40 c.c. of acetic acid (of 50 per cent. strength) per litre. Of this he adds an excess to the tannin solution, and then determines the excess of iron in the filtrate with permanganate in the usual way.

Determination of Tannin in Sumach. J. Macagno. (*Chem. Centr.*, 1887, 125.). The author has compared Löwenthal's method for the determination of tannin with those of Davy and Gerland.

He finds that Davy's method, which consists in precipitating the tannin with gelatin, drying, and weighing the precipitate, and multiplying the weight by the factor 0·4, gives results, both with pure tannin and also with sumach, which stand in the ratio to results obtained by Löwenthal's method as 53·34 : 100; whilst Gerland's method (precipitation of the tannin with tartar emetic solution in the presence of ammonium chloride; the reagent is prepared by dissolving 2·611 grams dry tartar emetic in a litre of water, 1 c.c. equals 0·005 gram tannin) gives results which, when compared with Löwenthal's method, stand in the ratio of 2 : 3.

Process for the Determination of Tannin. M. Villon. (*Bull. de la Soc. Chim.*, xlvii. 97; *Chemical News*, April 15, 168.) Liebig and Strecker first remarked that a solution of lead acetate gives a yellow precipitate with tannic acid. Stein, in 1857, devised a method for determining tannin by precipitation with a boiling solution of lead acetate in excess. The precipitate was collected and ignited, and the lead oxide weighed, which formed 64 per cent., whence the tannin was readily calculated.

The author states that the precipitate of lead tannate varies in its composition according to the temperature and the concentration of the solutions. He finds, however, that in a liquid containing a weight of lead acetate equal to three to five times that of the tannin, the precipitate formed has a constant composition. The addition of a small quantity of sodium acetate promotes the formation of the precipitate, which is of a constant composition and is not dissociated by water. Upon these facts he founds the following process:—

Prepare the tannin liquor so that 100 c.c. may contain about 2 grams of tannin. Prepare a lead liquor by dissolving in heat 100 grams neutral lead acetate and 20 grams sodium acetate in 500 grams water, and making up the solution to exactly 1 litre. Mix in a precipitating glass 100 c.c. of the tannin liquid, 100 c.c. of the lead solution, leave them in contact for five minutes, and filter. Take the sp. gr. D of the lead acetate, the sp. gr. D′ of the tannin liquor, and the sp. gr. δ of the filtered mixture, all at the same temperature. The proportion of tannin in the liquid under examination is then calculated as follows:—If the two liquids mixed without precipitation or alteration in volume, the sp. gr. of the mixture would be—

$$\frac{D + D'}{2};$$

but as the lead tannate disappears from the liquid, the sp. gr. is diminished, and we find a difference—

$$\frac{D+D'}{2}-\delta.$$

Let Σ be the difference of sp. gr. produced in an aqueous solution, of a volume equal to 100 c.c. by the disappearance of the same weight of tannin as that precipitated as lead tannate; probably—

$$\frac{D+D'}{2}-\delta$$

will be proportional to Σ, whence—

$$\left(\frac{D+D'}{2}-\delta\right)A=\Sigma.$$

This equation permits us to calculate Σ, if A is determined once for all, and from Σ to deduce p, the weight of tannin in grams contained in 100 c.c. of the solution in question, by means of Hammer's table. This table may be summed up in the following formula:—

$$p=\frac{\Sigma}{0{\cdot}00405}.$$

The constant A is not the same for all the tannins: for gallotannic acid it is 50 per cent.; for quercitannic acid, 45·3; castaneotannic acid, 44·8; aspidospertannic acid, 42·5; abietannic acid, 40; and catechutannic acid, 52 per cent.

Detection of Tannin in Vegetable Tissues. J. M. Moll. (*Journ. de Pharm. et de Chim.*, Dec. 15, 1886.) Sections of the vegetable tissues are steeped in a saturated solution of copper acetate for about a week, and are then transferred to a dilute solution of ferrous acetate and kept in contact with it for several minutes, after which they are washed in water. The presence of even traces of tannin will thus manifest itself.

Estimation of Cellulose. W. Hoffmeister. (*Landw. Versuchs-Stat.*, xxxiii. 153–159.) The author recommends the following modification of Schultze's method as applicable in cases where large quantities of materials can be operated upon:—The fat and resins are first removed by any suitable means, the sample is then reduced to the finest possible state of division, a portion treated in a flask with hydrochloric acid of 1·05 sp. gr., and as much potassium chlorate added as is dissolved at 17·5–20°; the flask is then closed and well shaken from time to time. At the end of about twenty-four hours the reaction is complete, and the substance has become

yellow throughout. It s then diluted with water, and carefully washed on a filter with hot water; again transferred to a flask, digested for one to two hours on a water-bath, again filtered, and washed successively with water, alcohol, and ether. The residue is nearly pure cellulose.

Application of Sodium Hyposulphite in place of Sulphuretted Hydrogen in Qualitative Analysis. G. Vortmann. (*Monatsh. Chem.*, vii. 418–428.) After precipitation of the hydrochloric acid group of metals, and subsequent precipitation of lead, barium, strontium, and calcium in part as sulphates, copper, mercuric, bismuth, arsenic, antimony and tin salts can be removed from the filtrate by boiling with a strong solution (one part in five) of sodium hyposulphite, which should be added in small quantities at a time and not in excess. Before its addition, the liquid should not contain too much free acid and not any nitric acid. The reagent answers as well as sulphuretted hydrogen, and is less offensive.

Simplification of the Molybdate Method for Determining Phosphoric Acid. M. A. v. Reis. (*Chem. Centr.*, 1886, 437.) The process recommended by the author consists in the reduction of the molybdic acid contained in the precipitate by means of zinc in the presence of sulphuric acid, and subsequent titration of the resulting liquid with potassium permanganate. 0·8381 gram of MoO_3 has the same reducing power as 1 gram of oxalic acid.

Effect of Ammonium Citrate on Phosphoric Acid Estimations by means of Magnesia Mixture. C. Mohr. (*Chem. Zeit.*, x. 675.) In the presence of ammonium citrate the result of determinations of phosphoric acid as ammonio-magnesium phosphate are invariably too low, owing to the appreciable solubility of the precipitate in the citrate.

Estimation of Manganese. R. W. Atkinson. (*Journ. Soc. Chem. Ind.*, v. 365–367, and 467, 468.) Owing to the length of time occupied in the gravimetric method of estimating manganese, the use of Pattinson's volumetric process is strongly recommended by the author, although it is said to give results which are slightly below the truth, the difference being attributed to the incomplete oxidation of the manganese. Where accuracy is required, the gravimetric method, in which the manganese is twice precipitated by bromine and ammonia, however tedious, is the only practical process.

Direct Separation of Manganese from Iron. L. Blum. (*Zeitschr. für analyt. Chem.*, xxv. 519.) The author's process is based upon

the precipitation of manganese from ammoniacal solutions by potassium ferrocyanide and the non-precipitation of iron under the same conditions. The separation is carried out as follows:—A hydrochloric acid solution containing ferric chloride and manganous chloride is mixed with tartaric acid in excess, and is then rendered strongly alkaline by ammonia. From the clear ammoniacal solution the whole of the manganese is precipitated as $Mn_2 Fe Cy_6$ on the addition of potassium ferrocyanide, while the iron remains in solution. Nickel, cobalt, and zinc, if present, would also be precipitated along with the manganese. A clear filtrate can be obtained after boiling; but since the precipitate cannot be washed, this method of separation is only applicable for qualitative purposes.

Volumetric Estimation of Nitrous Acid. A. G. Green and F. Evershed. (*Journ. Soc. Chem. Ind.*, v. 633, 634.) The authors confirm the accuracy of the method of estimating nitrous acid by means of aniline published by Green and Rideal about three years ago, but propose as a modification the substitution of normal for decinormal solutions, which simplifies and accelerates the process. The method has the advantage of being applicable in the presence of other oxidizable substances.

A Simple Nitrometer. T. P. Blunt. (*Pharm. Journ.*, 3rd series, xvii. 763.) Two glass syringe tubes, of $\frac{1}{2}$ oz. and 1 oz. capacity respectively, have their points connected by a piece of black india-rubber tube, on which is placed a pinch-cock, such as is used for burettes. This is the nitrometer. It is graduated by pouring into the shorter tube half a drachm of water, the upper surface of which is then marked with an india-rubber band, or better by a file mark; another drachm of water is then poured in, and the surface similarly marked. The longer tube is now graduated in the same way, by pouring in successive drachms of water, up to eleven drachms.

To use the instrument the longer tube is placed in a vessel of brine deep enough to reach the neck; the form of the vessel, beaker, measure, or pot, is of little importance. The clip is relaxed, and the lower tube completely filled by sucking the upper one, any drops drawn into the latter being turned out, after again clipping tight. The upper tube is now filled to the $1\frac{1}{2}$ drachm mark with the spirit of nitre to be tested, the clip is released, and the whole lifted out of the vessel of brine until the spirit of nitre has reached the lower mark, which means that the lower tube now contains one drachm of it. The excess is poured away, the tube rinsed.

and the solution of potassium iodide and the dilute sulphuric acid introduced in the same way, the half drachm being rejected in each case, the object of this being to insure the absence of air. After moving the lower tube gently up and down once or twice, it is raised until the level of the fluid within and without it is equal, and the volume of gas is read off.

Estimation of Chromate in the Presence of Bichromate. N. McCulloch. (*Chemical News*, lv. 2, 3.) The substance, dissolved in a little water, is mixed with a few c.c. of hydrogen peroxide solution and covered with a layer of ether, standard sulphuric acid is run in gradually until, after agitation, the ether assumes a blue colour. From the quantity of acid used the amount of chromate present is easily calculated, since the blue colour is not produced until acid has been added in excess of that required to convert the chromate into bichromate.

Volumetric Estimation of Sulphides. C. Friedheim. (*Ber. der deutsch. chem. Ges.*, xx. 59–62.) The author has critically examined Weil's method, which he finds to be untrustworthy and liable to error from two sources. The copper sulphide precipitated from ammoniacal solutions always carries down copper oxide, and has a tendency, moreover, to oxidize and redissolve.

Detection of Hyposulphite in Sodium Bicarbonate. M. Brenstein and T. Salzer. (*Archiv der Pharm.* [3], xxiv. 761.) On adding to a 5 per cent. solution of sodium bicarbonate a few drops of silver nitrate solution, then excess of nitric acid, and heating to the boiling point, even minute traces of hyposulphite give an immediate dark precipitate of silver sulphide. The absence of hyposulphite is easily ascertained by adding a few drops of iodine solution to about 20 c.c. of a saturated solution of sodium bicarbonate; the solution must have a yellowish tint. Decolorization of the iodine solution does not necessarily imply the presence of hyposulphite, since normal carbonate, the most commonly occurring impurity, produces this effect.

Assay of Chlorinated Lime by Means of Hydrogen Peroxide. G. Lunge. (*Ber. der deutsch. chem. Ges.*, xix 868–871.) 5 c.c. of a turbid solution of chloride of lime (10 grams in 250 c.c. of water) are put into the decomposing flask of a nitrometer. An excess of hydrogen peroxide (about 2 c.c. of the commercial product) is put into the inner tube; the flask is then fitted on to the indiarubber stopper, and the tap turned so that the flask communicates with the measuring tube, the mercury being at zero. The flask is inclined so that the liquids mix; in one to two minutes the reaction

is complete, and the oxygen is measured according to Winkler's method (*Ber.*, xviii. 2533). The volume of oxygen corresponds with that of the active chlorine in the bleaching powder.

This method has the advantage of being independent of any normal solution, and also of being quicker than any other. It gives as sharp results as Penot's method.

Volumetric Estimation of Sulphates. H. Wilsing. (*Zeit. analyt. Chem.*, xxv. 560, 561.) A measured excess of barium chloride is added to the neutral solution, and the excess is then determined by titration with sodium carbonate, using phenolphthaleïn as indicator. The liquid is to be boiled while titrating. Substances precipitated by soda must first be removed.

Estimation of Tartaric Acid in Tartar. A. Bornträger. (*Zeit. für analyt. Chem.*, xxv. 327–359; *Journ. Chem. Soc.*, 1886, 1082.) The author has submitted every detail of the methods of Warington and of Grosjean to an exhaustive experimental investigation.

1. *Solubility of Hydrogen Potassium Tartrate.*—Pure water at 29° dissolves 0·8536 per cent.; at 12·5°, 0·498 per cent. A 10 per cent. solution of potassium chloride at 29° dissolves 0·0583 gram; at 12·5°, 0·0376 gram in 100 c.c. (Grosjean at 12° found 0·0227). The solubility in potassium chloride is therefore not only much lower, but varies less with varying temperature. Both in potassium citrate and in citric acid solutions, it is more soluble than in water, but in a mixture of the two it is less soluble than in water. In a dilute solution (2·7 per cent.) of potassium oxalate, it is less soluble than in water, but on increasing the strength of the oxalate solution the solubility rises, so that with 9 per cent. it is greater than in water. A mixture of citric acid and of potassium oxalate dissolves less than either separately; but here also the solubility rises with increase in the strength of the oxalate solution.

2. *Warington's Process.*—The quantity of material prescribed by Warington (2–2·5 grams of tartaric acid) is not sufficiently precise. For 2·5 grams of tartaric acid 2 grams of citric acid is insufficient; 2·5 grams of citric acid gave better results, but the percentage obtained varied with the amount of tartaric acid present, and this variation became still greater when 3 grams of citric acid were used. The best result (99·02 per cent.), was obtained by using 3 grams of citric acid when 3·5 grams of hydrogen potassium tartrate (2·7926 of tartaric acid) were present; but working in the same way, only 97·76 per cent. was obtained

from 2·5 grams of tartrate (1·9947 grams of tartaric acid). The preliminary approximate determination cannot be dispensed with.

3. *Grosjean's Method.*—The addition of 5 grams of potassium chloride (to 50 c.c.) at once raises the results 2–2·5 per cent., and reduces the effect of variations of temperature (10°) to an insignificant amount (0·2 per cent). Although, in the absence of potassium citrate and citric acid, oxalate greatly increases the solubility of the tartrate in potassium chloride, yet when precipitating with citric acid from a neutral solution of the tartrate in 10 per cent. potassium chloride, the presence of 1·5 to 3·0 grams of oxalate is beneficial, raising the yield to 99·5 per cent. of the tartaric acid employed. A larger quantity of oxalate again depresses it. But the greatest advantage of the presence of potassium chloride is that when the quantity of citric acid used is increased to 3 grams, widely varying amounts of tartrate (1·5 to 4·0 grams) can be employed with practically identical percentage results (99·3 to 99·7 per cent.) The preliminary approximate determination therefore becomes unnecessary, since by using 7·5 grams of lees, or 3·75 grams of tartar, the amount of tartrate present will in almost all cases fall within the above limits. Using these quantities, the number of cubic centimetres of normal alkali required by the precipitate gives at once (when multiplied by 2 for 7·5 grams, or by 4 for 3·75 grams) the percentage of tartaric acid present. For washing, it is better to use Klein's 10 per cent. solution of potassium chloride saturated with acid tartrate than Grosjean's 5 per cent. solution, and it is convenient after heating with oxalate (for half an hour) to dilute with 100 c.c. of hot water before neutralising, and to concentrate to 50 c.c. after filtering.

Application of the Ferric Chloride Test to Organic Substances. W. H. Ince. (*Pharm. Journ.*, 3rd series, xvii. 461.) The author's method of applying this test depends on the change of a ferrous salt to a ferric salt by the addition of bromine. The substance to be analysed is placed in a test tube, and a perfectly neutral solution of ferrous chloride added, then bromine vapour is carefully poured in, and the characteristic action of the substance analysed is observed. The ferrous salt should be slightly in excess at the end of the operation, as excess of bromine often leads to further decomposition. The value of this reagent consists in the fact that both the ferrous and ferric reactions can be shown on the same portion of the substance to be analysed.

A few reactions are shown in the following table :—

Substance to be Analysed.	No. 1. Reaction with Ferrous Chloride.	No. 2. Addition of Bromine.	Excess of Bromine.
Trihydroxybenzoic Acid (Gallic Acid)	Faint blue.	Indigo.	Bleached.
Gallo-tannic Acid . . .	Colourless or faint blue-violet.	Blue-black.	Green to red.
Trihydroxybenzene (Pyrogallol)	Faint blue.	Ruby.	Ruby.
Benzoic Acid (Ammonium Salt)	Colourless.	Reddish precipitate.	No change.
Hydroxybenzoic Acid (Ammonium Salt)	Rose.	Violet.	Brown-red.
Cinnamic Acid	Colourless.	Yellow-orange precipitate.	No change.
Acetic Acid (Na salt) . .	Colourless.	Ruby.	No change.
Morphine	Colourless.	Dirty blue.	Yellow-white precipitate.
Phenol	Colourless.	White ppt.	No change.

Apparatus for the Examination of Water by Dr. Koch's Process. C. W. Folkard. (*Chemical News*, March 18, 1887.) Test-tubes, about 7 inches long and $\frac{7}{8}$ inch in diameter, are used to receive the nutrient jelly. They are closed by a plug of cotton-wool, which is tied by thread round a piece of glass tube bent at right angles and drawn off at one end. The bent tube has a capacity of 1 c.c., and serves for the introduction of the measured quantity of water for experiment. The whole is sterilised in the usual way.

The water, of which a sample is required to be examined, is allowed to run through a piece of $\frac{3}{8}$-inch india-rubber tube (pierced with a small hole in the middle, and furnished with a glass jet at the end) till all germs in the tube have been washed away.

The capillary end is passed through the hole in the india-rubber tube, and sufficient time allowed for any germs on it to be washed away. The capillary end is then broken off by the fingers, or by a pair of pliers, while it is inside the india-rubber tube.

The water (which is running all the time) fills the bent tube, being assisted if necessary by partially stopping the glass jet for an instant. The bent tube is then withdrawn, the capillary end sealed in the flame, and the 1 c.c. of water transferred to the test-tube by shaking.

By allowing the gelatin to set when the test-tube is in a horizontal position, the "centres" can be easily counted and examined, being spread over an area of 4 or 5 square inches.

The above is merely a simplified form of the well-known Aitken's test-tube, modified so as to enable the operator to dispense with all but the ordinary laboratory apparatus. The transfer of the solution from the test-tube to a glass plate, with the attendant risk of aërial contamination, is also avoided.

The advantage of taking the tube to the water supply, instead of bringing a sample of water to the laboratory, is obvious.

Volumetric Determination of the Total Organic Carbon and Nitrogen in Waters. C. A. Burghardt. (*Chem. News*, March, 18th, 1887.)

1st. *Preparation of the Standard Solutions.*—1st. Ordinary decinormal permanganate of potassium solution (3·16 grms. to 1 litre).

2nd. A solution of pure chromic acid in pure distilled water (about 25 grms. to the litre).

3rd. A solution of ferrous sulphate in pure distilled water (about 25 grms. to the litre).

The author titrates the ferrous sulphate solution by means of the decinormal permanganate solution, and finds in this way how much permanganate is equal to the ferrous sulphate solution; and, knowing the "oxygen value" of the permanganate solution, it at once furnishes him with the "oxygen value" of the ferrous sulphate solution.

He next takes a known volume of the chromic acid solution, and titrates it with the standard solution of ferrous sulphate, until all the chromic acid is reduced—a point easily seen with a little practice, as the slightly yellowish green colour at the final stage of the titration changes sharply to a bluish green on the addition of *one* drop in excess; at this point, using a solution of ferricyanide of potassium as an indicator, it is seen that there is a very slight indication of excess of ferrous sulphate present, whereas, before the addition of this drop, there was no such indication. This operation furnishes the value of the chromic acid solution *expressed as ferrous sulphate solution*. The chromic acid solution will keep a very long time, but it is advisable to prepare the ferrous sulphate solution freshly at least once a week.

Having prepared the standard solutions, the process of analysis is as follows; viz.—

Determination of the Organic Carbon.—Place 250 c.c. of the water sample in the "boiling flask," of 16 oz. capacity, add 100 c.c. of the chromic acid solution, and 10 c.c. of strong sulphuric acid, and boil for about thirty minutes, when the oxidation of the organic matter is complete, the water in the "boiling flask" having be-

come perfectly clear. The contents of the flask are then diluted to 1 litre, and 100 c.c. of this solution are tritrated with the standard ferrous sulphate solution until there is a very slight excess of the latter. By calculation it is found how much *carbon* the *oxygen* thus indicated is equal to.

Determination of the Organic Nitrogen.—Contrary to expectation, the author found that the nitrogen in organic compounds is converted into ammonia, and not into nitric acid or nitrous acid, by the action of chromic acid. A similar fact was discovered by Kjeldahl (*Zeits. Anal. Chem.*, xxii. 366), who describes the conversion into ammonia of nitrogenous matter, by boiling it with strong sulphuric acid, phosphorus pentoxide, and powdered manganate of potassium.

Märker tested this method thoroughly (*Zeits. Anal. Chem.*, xxiii. 553–557) against the well-known method of Varrentrapp and Will, and found the results by Kjeldahl's method sufficiently correct.

To determine the organic nitrogen in the water, the author takes 250 c.c. or more of the solution obtained by the previous organic carbon process (the solution made up to 1 litre), places it in the "boiling flask," pours down the funnel tube a perfectly ammonia-free caustic soda solution *in excess*, and attaches the exit tube of the "boiling flask" to the Liebig's condenser and flask as used in the organic carbon determination, placing however, in this case, about 50 c.c. of ammonia-free water and a few drops of pure hydrochloric acid into the "receiving flask." It is better to take the necessary precautions to prevent the sucking of the water from the "receiving flask" back into the "boiling flask." The author boils the contents of the flask for about thirty minutes (keeping the condenser cool); then makes up the condensed water in the "receiving flask" to one litre, takes out 100 c.c., and determines the amount of ammonia present in it in the usual way with Nessler's reagent, and calculates how much nitrogen it corresponds to.

No nitrogen is lost by this method, because all the ammonia evolved from the "boiling flask" is passed into cold, acidulated water; whereas by the old "ammonia-method," the violent bumping in the retort often drives steam and ammonia through the long condensers used in that process, consequently there must be a loss of ammonia.

Assay of Carbolic Soap. A. H. Allen. (*Analyst*, xi. 103–106.) In the method recommended, the hydrocarbons are removed by

agitating the soap, dissolved in soda and water, with ether, and the fatty acids are precipitated by means of brine. An aliquot part of the resulting solution is acidified with sulphuric acid, and titrated with bromine-water until the solution is permanently tinged of a faint yellow colour; the bromine-water is standardised immediately before or after use by a solution of phenol or cresol. The remainder of the solution may be used for preparing a larger quantity of the bromine-derivative for qualitative purposes.

Estimation of Colophony in Soaps. A. Grittner and J. Szilasi. (*Chem. Zeit.*, x. 325.) About a gram or two of soap is dissolved by warming with 80 per cent. alcohol, and when necessary the solution is neutralized with ammonia; it is then treated with a 10 per cent. alcoholic solution of calcium nitrate, by which stearic, palmetic, and part of the oleic acids are precipitated and removed by filtration. The clear filtrate is treated with excess of silver nitrate and diluted; silver resinate and oleate are precipitated. The precipitate is washed, dried at 70–80°, and extracted with ether, which dissolves the resinate readily, but the oleate only sparingly. The ethereal solution is run into a graduated vessel, the silver salt decomposed with hydrochloric acid, an aliquot part of the clear solution evaporated, and the residue (the resin) weighed. A deduction of 0·0016 gram per 10 c.c. of ether solution must be allowed for oleic acid.

Report on Bechi's Test for Cotton-Seed Oil in Olive Oil. Abridged from the Report of the Commission of Florence appointed to examine Bechi's Test. (*L'Orosi*, Feb., 1887, 37. From *Amer. Journ. Pharm.*) To examine olive oil for admixed cotton oil, with Bechi's method, the Commission recommend the division of the suspected sample into three parts, as follows:

No. 1. Tube of the suspected oil and reagents.

No. 2. Tube of the suspected oil and 20 per cent. of cotton oil, and the reagents.

No. 3. Tube of the suspected oil and reagents.

Now expose tubes No. 1 and No. 2 to the heat of boiling water for five or ten minutes, but do not heat tube No. 3; use it simply as a guide to see if No. 1 remains unaffected by heat or becomes coloured. If the sample is pure, the oil will remain unchanged, that is the same in appearance as No. 3, while No. 2 acquires the characteristic colour. If the oil in tube No. 1 has been sophisticated with cotton oil the brownish coloration will soon appear, while tube No. 2 will be a much deeper brown; evidently showing that the brownish colour is due, in part, to the quantity of cotton-

seed oil present, as well as the proportion of silver nitrate and oil of rape.

Estimation of Glycerin in Fats. O. Hehner. (*Analyst*, 1887, 44.) Saponify about 3 grms. of the fat with alcoholic potash; do not drive off all the alcohol, lest glycerin should volatilize from the concentrated solution, but dilute to about 200 c.c.; decompose the soap with dilute sulphuric acid, filter off, and estimate insoluble fatty acids as usual. Vigorously boil the filtrate and washings (amounting to about 500 c.c.) in a covered beaker or basin, down to one-half, add 25 c.c. strong sulphuric acid (suitably diluted), and 50 c.c. standard bichromate. Heat to near boiling for two hours, and titrate back the excess of bichromate with excess of ferrous sulphate, and ultimately the latter with decinormal chromate, using ferricyanide as indicator. Calculate from the chromate consumed the amount and percentage of glycerin.

The standard solution is made by dissolving 80 grams of bichromate of potash, and 150 c.c. of strong sulphuric acid in a sufficient quantity of water to make one litre. The exact value of the solution should be ascertained by titration with solutions of known weights of iron wire.

Butter Testing. H. Hager. (*Chem. Centr.*, 1886, 495; *Journ. Chem. Soc.*, 1887, 309.) The author recommends the Reichert-Meissl method of examining butter, the chief feature of which is a determination of the volatile fatty acids. The method is simpler and more expeditious than Hehner's. The butter is filtered and 5 grams are saponified with pure sodium hydroxide (2 grams) in presence of alcohol (80 per cent.). The volatile fatty acids are separated by decomposition with sulphuric acid and distillation, and estimated by titrating the distillate with decinormal alkali. The following table gives the number of c.c. of the latter required to neutralize the distillate in the case of certain typical fats:

Normal Butter	26 to 31 c.c.
Oleomargarine	1·9 ,,
Cocoa Butter	7·4 ,,
Pig's Fat	0·6 ,,

Rancid Butter. E. Duclaux. (*Comptes rendus*, cii. 1022–1024, 1077–1079; *Journ. Chem. Soc.*, 1886, 685.) It is generally supposed that the rancidity of butter is due to a butyric fermentation resulting from the action of microbes derived from the air on the albuminoids present in the butter. Some very old and salt butters imported from Brazil were found, however, to contain casein in

its original condition, and when the butter was washed the water was free from microbes. The free acid in the butter had, however, increased to ten or twenty times its original amount. It follows that the rancidity of butter is not due to microbes, but is the result of a spontaneous decomposition of the glycerides analogous to that which Berthelot has observed in the case of other ethereal salts. This decomposition is accelerated by the presence of water and free acid, but is more or less retarded by salt and borax. Of the different ethereal salts present in butter, butyrin is the least stable, caproin more stable, and the glycerides of the non-volatile acids still more stable.

This spontaneous decomposition is complicated by the action of air, microbes, and light. The action of air and light results in an absorption of oxygen with formation of carbonic anhydride, the quantity of which is always less than that which corresponds with the amount of oxygen absorbed. The products of oxidation are various, but the most important is formic acid. Oxidation, however feeble, first attacks those substances to which the butter owes its flavour and odour. As oxidation progresses, an odour of tallow is developed, this action being especially rapid in direct sunlight.

In addition to the action of air and light, there is the action of microbes, and especially of cryptogamic vegetations, which cover the mass of the butter with their loose, almost invisible mycelia. This action accelerates the decomposition of the glycerides, and at the same time brings about the alteration of the nitrogenous compounds present in the butter. If the albuminoids are present in small quantity, butyric acid is formed, and its presence accelerates the decomposition of the glycerides, more free acid being liberated up to a certain point, beyond which the acid is only set free in quantity equal to that which is oxidised or evaporates. The butter remains colourless, except where it is in contact with mycelial tubes. When the quantity of albuminoids is large, the mass becomes alkaline, and the fatty matter darkens in colour, owing to its gradual conversion into a black resin, completely soluble in alcohol and in alkaline solutions. The resin is also formed in sunlight in presence of an alkali. These facts explain the grey or black colour of old cheese.

Nitrites and Nitrates in Milk as an Indication of Adulteration. M. Schrodt. (*Bied. Centr.*, 1886, 629.) Nitrites or nitrates never occur in normal milk, not even if the cows be fed with fodder to which these salts have been added. Their presence in milk, which may be readily detected by Soxhlet's diphenylamine

test, may therefore be regarded as a proof of adulteration with water.

Detection of Saccharine as an Admixture in Sugar. H. Reischauer. (*Biedermann's Centralb.*, xv. part 7; *Chemical News*, Jan. 7, 1887.) One hundred grams of sugar are allowed to stand for some hours in a closed vessel with 150 to 200 c.c. of ether, shaking frequently. If a sample of sugar has an alkaline reaction a strong aqueous solution is used instead of solid sugar; it is slightly acidified with phosphoric acid, and then shaken out with ether. The ethereal solution is then drawn off with a syphon and filtered. In both cases the ether takes up a large part of the saccharine, which is obtained in the residue, after distilling off the ether, almost free from sugar. The presence of saccharine is best demonstrated by cautiously heating the residue in a platinum crucible with a mixture of six parts of pure sodium carbonate and nitre, and finally igniting, not too strongly. Saccharine contains sulphur, which is thus completely converted into sulphuric acid.

Detection of Alum in Flour by the Logwood Test. J. Herz. (*Dingl. polyt. Journ.*, cclxii. 96.) A glass cylinder is filled one-fourth with the flour under examination, the latter then moistened with water and a few cubic centimetres of alcohol and a few drops of a five per cent. tincture of logwood. The mixture is now well agitated, and the cylinder then filled up with a saturated solution of sodium chloride. An equal quantity of flour known to be pure is treated in exactly the same manner side by side with the other. If alum was present in the sample, the salt solution will be violet-red to blue, according to the proportion of alum. 0·01 per cent. of alum may thus be detected.

An Improved Method for Detecting Quassia in Beer. A. H. Allen. (*Analyst*, 1887, 107.) The presence of quassia could be readily detected by the author as follows: The liquid was concentrated, precipitated with neutral lead acetate, the filtrate treated with sulphuretted hydrogen, and the refiltered liquid further concentrated and agitated with chloroform. On evaporating the chloroform a residue was obtained, which had an intensely bitter taste, and yielded a solution which gave a white precipitate with tannin, but did not reduce ammonio-nitrate of silver. The residue gave no colour on warming with concentrated sulphuric acid, but gave a well-developed mahogany-brown colour with ferric chloride. By the bromine and ammonia test it gave a strong yellow coloration.

The author also deals in the same paper with the detection of

other hop substitutes. For particulars as regards these processes the reader is referred to the original article.

Detection of Liquorice in Beer. H. Hager. (*Journ. Soc. Chem. Ind.*, 1886, 508.) The constituents of liquorice extract are partly precipitated from their solution by organic acids, such as acetic, succinic, benzoic, salicylic, etc., acids. A small quantity of liquorice added to beer during the process of brewing therefore escapes detection after fermentation, as by the acids invariably formed during the latter process it is converted into an insoluble form, and collects at the bottom of the fermenting vat. Beer to which salicylic acid has been added, or which has turned sour, would likewise appear free from liquorice. The presence of this substance might, however, be proved in the sediment formed in the cask. In order to detect glycyrrhizin, the chief constituent of liquorice juice, in beer, the latter is evaporated to one-fourth its original volume, and the sediment formed mixed with plaster of paris, and after drying extracted with 90 per cent. alcohol. The hop constituents may be separated by mixing this extract with calcium hydroxide, evaporating to dryness, and again extracting with alcohol. Calcium glycyrrhizinate is left undissolved, from which, by means of acetic acid, the glycyrrhizin is separated.

Detection of Adulteration in Wines. M. Samuelson. (*Chem. Zeit.*, x. 998.) When mixed with an aqueous solution of sodium nitrate, white wine remains clear, but the colour becomes darker. In genuine red wines, a precipitate forms and the supernatant liquid becomes yellow, sometimes only after some time. This is not the case with artificially coloured wines. In a mixture of red and white wines, the amount of precipitate formed is inversely proportional to the quantity of white wine present. White wines coloured red with bilberry, mallow, red poppy, or orseille colouring matter do not give any precipitate. Red wines mixed with coloured white wines yield, in addition to the precipitate, the following reactions: with *bilberry* or *mallow* colours, a violet liquid; with *orseille*, a cherry-red liquid; with *red poppy*, a bright red liquid. The addition of cider to white wine can be detected by sodium nitrate, as cider is coloured dark-brown by this reagent, and after some time gives a slight precipitate.

Method for Distinguishing the Natural Colouring Matters of Wine from added Coal-tar Colours. C. Blarez and G. Denigés. (*Bull. de la Soc. Chim.*, xlvi. 148–151; *Journ. Chem. Soc.*, 1886, 1084.) 10 c.c. of the wine is treated with 10 drops of glacial acetic acid, heated to 100, and 0·2 gram of powdered mercuric

acetate added, the mixture shaken rapidly, cooled, and filtered; any coal-tar colouring matters then pass through into the filtrate, whilst all the natural wine colouring matters remain on the filter as a lake. When only a mere trace of the artificial colouring matter is present, it may not be readily seen in the filtrate and may be partly held by the precipitate. In this case the precipitate is drained, and then washed by pouring 5 or 6 c.c. of alcohol, containing some drops of acetic acid, through the filter several times, by which means any coal-tar colours are extracted; the artificial colouring matters in the solutions may then be examined, the reactions of about 20 being described in the paper.

Determination of Fusel Oil in Alcoholic Liquors. J. Traube. (*Biedermann's Centralbl.*, vol. xv. part 8.) The author rejects the methods now in use, and describes a new capillarimetric process, by which fusel oil can be determined to about 1-50 per cent. It depends on the fact that the rise of the aqueous solutions of organic bodies of a homologous series at the same percentage often decreases very considerably with an increasing molecular weight of the dissolved body. Hence, especially on proper dilution, a very small proportion of fusel oil in brandy, etc., may be recognised by the decrease in the capillary ascent. The compounds present in fusel oil, the propylic and butylic alcohols, and the various aldehyds, including furfurol, reduce the ascent more than ethylic alcohol, but less than amylic alcohol. The author's apparatus consists essentially of a very thin capillary tube, as narrow as possible, secured to a very fine scale, graduated in half millimetres. It terminates at its zero in two points, which may be fixed exactly at the level of the liquid by means of screws. The capillary tube may easily be kept clean if it is rinsed after every experiment with water, and alcohol, and a current of dry air, free from dust, is drawn through it. The liquid is sucked up in the capillary two or three times, and the position of the lower meniscus is read off a few hours after the liquid has come to rest. This can be done to 1-10th of a m.m., even without a lens. Liqueurs, in which the specific gravity of the distillate differs considerably from that of the original liquid, are first distilled and then diluted with water to a specific gravity corresponding to a 20 per cent. (by volume) dilution of alcohol. The capillary rise, compared with that of a pure 20 per cent. alcohol, shows the proportion of fusel oil. Differences of temperature require a very small correction.

Effect of Sulphocyanides on Vegetation. E. Meusel. (*Bied. Centr.*, 1887, 66–69.) The experiments described by the author

tend to confirm the observation that ammonium sulphocyanide, which often occurs as an impurity in commercial ammonium sulphate, is injurious to vegetation, owing to its physical and chemical action on the seeds and some of their constituents.

Chili Saltpetre as Manure. A. Stutzer. (*Bied. Centr.*, 1886, 585–597; *Journ. Chem. Soc.*, 1887, 77.) The author was awarded the first prize offered by the union of nitrate firms on the western coasts of South America for his essay on the value of Chili saltpetre as a manure. Wagner has condensed the contents of this essay and that of Damseaux, which obtained the second prize, into a compact form of questions and answers, which are of value in agricultural science. Some of the answers follow: Plants cannot grow under normal conditions unless a supply of nitrogen is available for their roots, and a satisfactory crop cannot be obtained without the use of nitrogenous manures. Stable manure, in the quantities produced on a farm, does not provide sufficient nitrogen to produce good results; high farming requires that nitrogen be procured as artificial manure. Manures containing nitrogen in the form of animal matter take a long time to alter into nitrates, whilst the Chili saltpetre is at once available.

The increase in weight of various crops tried was greater when the saltpetre was used than when ammonium sulphate was the manure. The application of phosphates and potassium salts increase materially the activity of the saltpetre. This manure does not unduly exhaust the soil; it renders the mineral plant foods more assimilable, but no more of them is removed than is accounted for in the increase of the crop. The crops which are most benefited by Chili saltpetre are all straw-growing plants; next rape, mustard, etc.; fodder, sugar-beets, and potatoes come in the second rank, meadow grasses in the third; the least effect is produced on pease, vetches, lupines, clover, and linseed. Chili saltpetre should be applied as top-dressing only on sandy or porous soils, just before vegetation begins; the time of application should be in early spring.

MATERIA MEDICA AND PHARMACY.

PART II.

MATERIA MEDICA AND PHARMACY.

Melon Root. (*Pharm. Journ.*, 3rd series, xvii. 687.) The root of the melon is said by Dr. Heberger to possess emetic and purgative properties, and Dr. Torosicviez has obtained from the roots a crude emetic principle by treating the aqueous extract with alcohol. It has a slightly acrid and bitter taste, and is precipitated by acetate of lead and infusion of nut galls. It is easily soluble in caustic potash, and is precipitated again by acids as a greyish brown precipitate difficultly soluble in water. From experiments made with this substance in the military hospital of Lemberg, it would seem that a solution of nine centigrams of it is sufficient to cause vomiting. The powdered root of the wild plant acts, according to Dr. Langewicz, as an emetic in doses of 50 to 75 centigrams.

Sumbul Root. E. Schmidt. (*Archiv der Pharm.*, 1886, 528.) The author shows that angelic acid does not pre-exist in this root, since it is not extracted by boiling with a weak solution of sodium carbonate. But on treating the balsam obtained with hot petroleum-benzin, with an alcoholic solution of potash, angelic acid is formed, together with the isomeric methylcrotonic acid, probably by the decomposition of one of the constituents of the root.

Bryony Root. C. F. Heller. (*Amer. Journ. Pharm.*, February, 1887.) The author made the following determinations with a specimen of the root containing 7·5 per cent. of moisture. It yielded 5·5 per cent. of ash, consisting of sulphate, chloride, and carbonate of potassium, sodium, calcium, magnesium, and aluminium. The benzol extract amounted to 0·746 per cent., and consisted of fixed oil, waxy substance, and colouring matter. The alcoholic extract weighed 15·494 per cent., and from it the glucoside bryonin was prepared by the process of Walz. The aqueous extraction contained 9·360 per cent. of solid matter, consisting mainly of sugar, gum, and albumen. On continued boiling with diluted sulphuric acid, starch was the chief principle taken up,

the extract weighing 4·9024 per cent. Caustic soda now dissolved 6·1 per cent., and the residuary cellulose, after bleaching and drying, weighed 6·596 per cent.

Veratrum Viride and Veratrum Album. H. C. Schrenk. (*Pharm. Journ.*, 3rd series, xvii. 609.) The rhizome of *Veratrum viride* is so like that of *V. album* that Flückiger states that it is quite impossible to distinguish the root-stocks of the two species. The author remarks that those of *V. viride* have often a decidedly loose and spongy structure, but he is not certain whether this is characteristic of this species or depends upon the time at which the rhizomes were collected. The only structural difference he has noticed is that the cells of the endoderm, when cut transversely, present a lumen (or empty space), which has the form of a U in *V. viride* and of a V in *Veratrum album*.

Constituents of the Root of Hydrastis Canadensis. M. Freund and W. Will. (*Ber. der deutsch. chem. Ges.*, xix. 2797–2803.) Perrins (*Pharm. Journ.*, 2nd series, iii. 546) obtained from the root of *Hydrastis*, berberine and another alkaloid, to which he ascribed the name hydrastine. The authors found that the latter is best obtained by extracting the finely powdered roots with ether. Their analyses confirm the formula $C_{22}H_{23}NO_6$ ascribed to it by Mahla. When hydrastine is dissolved in hydrochloric acid and treated with potassium permanganate, it is converted into opianic acid. Nitric acid acts on hydrastine, yielding a base melting at 115°, very readily soluble in chloroform, alcohol, and ether. Hydrastine is not changed when fused with potash. These experiments show that great analogy exists between hydrastine and narcotine.

The root also yielded a crystalline non-nitrogenous constituent, possessing the properties of a lactone.

A New Adulteration of Senega. C. Patrouillard. (*Journ. de Pharm.*, April, 1887, 364.) The adulterant described by the author consists of the rootlets of *Ruscus aculeatus*. These differ from senega root in the paler colour of their external surface, and in being cylindrical and of nearly uniform thickness throughout. The transverse section also has a nearly uniform white colour, whilst in senega the cortical portion is darker than the meditullium, especially in the layer immediately surrounding the latter. The senega root examined by the author contained about a quarter of its weight of the adulterant.

The Active Principle of Calumba Root. H. Duquesnel. (*Chemist and Druggist*, April 23, 1887.) The author proposes a new method for the preparation of calumbin, the peculiar principle

of calumba root. The powdered root is exhausted with 95 per cent. alcohol; the tincture is evaporated to a syrupy consistence, and treated with chloroform; the chloroform solution filtered, evaporated, and treated with 60 per cent. alcohol, which dissolves most of the colouring matter. The residue (which contains the calumbin) is dissolved in strong alcohol, finally decolorised with animal charcoal, and crystallized. The yield of the principle is from 0·35 to 0·4 per cent.

Remijia Ferruginea. MM. Pinet and Duprat. (*Brit. Med. Journ.*, June 4, 1887, 1236.) The authors state that this drug acts chiefly on the medulla oblongata, and that it causes a considerable increase of respiratory movements and of cardiac pulsation. The preparations used were an aqueous and a spirituous extract of the root, the aqueous being the most active. Both extracts were acid to litmus paper.

Echinacea Angustifolia, a Remedy for Snake-Bite. (*Pharm. Journ.*, 3rd series, xvii. 803.) This plant is used under the name of "black Samson," as a remedy for snake-bite by the Sioux Indians. The fresh root is used, being scraped and administered to the person bitten. It produces an excessive flow of saliva and perspiration. The pungency of the root is said to resemble that of prickly ash bark, and it therefore probably may be classed among the active sialogogues.

The Active Principle of Anacyclus Pyrethrum. C. J. G. Thompson. (*Pharm. Journ.*, 3rd series, xvii. 567). The root of the *Anacyclus pyrethrum*, or pellitory of Spain, has long been used in medicine for its well-known properties as a sialogogue and local irritant. Its fusiform root, that breaks with a resinous fracture, with its radiated structure and black spots, cannot easily be mistaken.

In earlier times it was officinal in the majority of the pharmacopœias of Europe, in which it formed an active ingredient, in numerous stimulating powders, tinctures, and gargles.

The root owes its irritating properties to its active principle pyrethrin, or pyrethric acid, a very acrid, resinous substance, which resides mostly in the cortical portion. A good sample of pellitory will yield about 5 per cent. of pyrethrin. On analysis, the root is found to contain, besides pyrethrin, an acrid resin, volatile oil, yellow colouring matter, tannin, gum, and inulin. Pyrethrin is a soft, dark brown, resinous, substance, having an unpleasant odour, and extremely hot and pungent to the taste. A very minute quantity placed on the tongue causes a strong burning sensation,

which shortly increases, and remains for a considerable time, inducing a copious flow of saliva. A strong solution painted on the skin causes a sharp, prickling sensation, and reddens the part where it has been applied. If the part is kept covered, a blister will be produced. Pyrethrin may be obtained by evaporating a washed ethereal extract, or the following more satisfactory method may be employed. Reduce the root to a coarse powder, and exhaust it by means of percolation with alcohol. Acidulate the percolated powder with acetic acid, boil with a further quantity of alcohol, and filter; mix the liquids and evaporate.

It is soluble in ether and alcohol, and readily soluble in oils or acetic acid. Pyrethrin is composed of an acrid, brown, resinous substance, which is soluble in alcohol, but insoluble in water and strong alkaline solutions; and a dark yellow oil, which is soluble in alkaline solutions. This oil is not nearly so acrid as the brown resinous matter, and it is probable that what burning taste it possesses is due to a small quantity of the resin being mixed with it.

Active Constituents of Asclepias Curassavica, A. Incarnata, and Vincetoxicum Officinale. C. Gram. (*Chem. Centr.*, 1886, 735; *Journ. Chem. Soc.*, 1887, 377.) These three asclepiadeæ contain a glucoside which the author calls *asclepiadin*. In the aërial parts of *Asclepias curassavica* the easily decomposed asclepiadin of Harnack was found; this appears to be identical with the asclepin of Feneulle. The asclepiadin isolated by the author is easily soluble in water, sparingly soluble in alcohol; it is easily converted into the less active asclepin. Only asclepidin, and no asclepin, could be obtained from the root of *Vincetoxicum officinale*. The asclepin which is prepared from *Asclepias tuberosa* by Keith & Co., consists of a mixture of asclepiadin, asclepin, and asclepion; the latter has the composition $C_{20}H_{34}O_3$; it melts at 104°, and is contained in *Asclepias syriaca* and in *Vincetoxicum*. The asclepiadin which is prepared by Parke, Davis & Co., from *Asclepias tuberosa*, contains asclepin and a small quantity of a substance which has a tetanic action.

Leptandra Virginica. G. Steinmann. (*Amer. Journ. Pharm.*, May, 1887.) To obtain the bitter principle, the author poured the concentrated tincture into water, and agitated the acidulated aqueous solution with petroleum benzin, benzol, and chloroform; only the benzol liquid yielded a residue which was crystalline. 500 gm. of the drug yielded only 0·5 gm. of the crystals, which after recrystallizing from ether, were of a pale

lemon-yellow colour, of a peculiar agreeable odour, and of a very bitter taste. They were found to be insoluble in petroleum benzin, soluble in alcohol, ether, and benzol, less freely soluble in cold water, not precipitated by Mayer's solution or by tannin, and not yielding glucose on being boiled with dilute sulphuric acid. The resinous matter precipitated by water from the alcoholic extract loses the bitter taste almost completely by repeated solution and precipitation.

Aletris Farinosa. (*Pharm. Journ.*, 3rd series, xvii. 122, 123.) The rhizome and rootlets of this South American plant have recently been brought before the medical profession of this country. Amongst the other names by which the drug is known may be mentioned true unicorn, cordial, colic root, star grass, blazing star, mealy star-wort, etc. It belongs to the natural order Hæmodoraceæ, although it has been ascribed by others to the order Liliaceæ (the former order has, however, an inferior ovary, while the ovary of the latter is superior). It was formerly placed in the secondary list of the U.S. P. (1870).

General Characters of the Plant.—A perennial, with radical leaves arranged in a star-like manner, which contributes to one or more of its many names. Being a monocotyledonous plant the leaves have parallel venation, with margins entire, a non-articulated stalk, and are about four inches long. The flower stalk is about eighteen to twenty-four inches high, and is, except for a few scales, naked. The inflorescence is a spiked raceme, composed of mealy white flowers, each having a six-partite perianth. Flowers appear in June and July.

The rhizome and rootlets are chiefly used.

Characters.—A horizontal rhizome one to two or three inches long, and about one-eighth to two-fifths of an inch thick, being flattish or concave on the upper surface, and densely tufted with light-grey fibrous or scaly remnants of leaves. From the under surface, which is convex, there are given off numerous simple rootlets from two to three inches long, some (the older) being wiry, and of a glossy black colour externally, and if more recent, brown or whitish and soft. Internally the rhizome is white, and has a mealy fracture with scattered wood bundles protruding. It has no odour, and the taste is amylaceous, followed by much bitterness.

Chemistry.—The bitter principle is not very soluble in water, (a decoction is therefore not very bitter), but is removed by proof or stronger spirit. Tannin is not indicated in this tincture by the

usual tests, such as persalts of iron, etc. There is much starch present, hence its specific name.

Uses.—This drug is described as a "tonic bitter" and is also highly recommended in "uterine disorders."

Dose and Mode of Administration.—A decoction 1 oz. to 1 pint prepared, *secundum artem*, dose $\frac{1}{2}$ an ounce; a tincture $2\frac{1}{2}$ ozs. to 1 pint, S. V. T., dose 1–2 fluid drachms; in powder, 10 grains. A cordial is also sold.

Anchieta Salutaris. (*Chem. Zeitung*, 1886, 619. From *Pharm. Journ.*) The root of *Anchieta salutaris*, a violaceous plant, having a popular reputation in Brazil as a remedy in skin diseases, has been recommended as useful in syphilis. The dose is 0·1 to 0·35 gram of the powdered root daily, and the drug is also administered in the form of a syrup prepared from a tincture of the root. The root is met with in pieces 0·3 to 2·0 centimetres thick, the outer bark being greyish-white, with flushes of brown, in which occur white points, whilst the inner bark is brown, and the wood light yellow, with large vessels. In consequence of the drug being used for syphilis and provoking a flow of saliva, it shares with some other substances the name of "vegetable mercury." Some years since Dr. Peckholt called attention to the usefulness of the drug in skin affections. He administered the powdered root, commencing with 0·35 to 0·70 gram three times a day, and gradually increasing the dose. The first effects are drastic, but these pass off after a day or two. Dr. Peckholt isolated from the root bark an alkaloid, which he considered to be the active principle, and named "ancheitine."

Ginseng. M. Foulk. (*Pharm. Journ.*, 3rd series, xvii. 163.) This contribution to the literature of this drug is from the pen of the United States consul in the Corea, from which country the most valued varieties are derived. The author says that the plant is cultivated in the Corea, and that the ginseng is of two kinds, the red ginseng (*hong-hum*) and white ginseng (*pak-hum*). Both kinds, however, are from the same plant, the white ginseng being the root simply washed and dried, and the red the root after having been submitted to a process of curing. This process consists in prolonged steaming and dyeing, cold water being dashed over it at the end of the operation, which solidifies the root, the fracture becoming glossy and brittle, while its colour is changed to a fleshy pink. The curing is a monopoly of the government, red ginseng not being an article of ordinary trade. White ginseng is used enormously in the Corea as a strengthening

and blood-purifying medicine, the natives preferring it to the red, which they say loses strength in the curing. The most esteemed ginseng should consist of the roots of wild plants at least thirty years old, and commands fabulous prices. The author says that from personal experience and observation he is satisfied that ginseng is an active, strongly heating medicine, but caution is required in its use, as sometimes it causes boils and eruptions, sleeplessness, and flushing of the body. It is most commonly taken in the form of a concentrated infusion, but sometimes the sliced fresh root is eaten with honey. Notwithstanding the general impression among western nations that the virtues attributed to this drug are imaginary, the author thinks the evidence is in favour of the mystic value having been attached to it after its virtues had been practically ascertained. Some yellowish specimens that are met with occasionally appear to be imperfectly cured red ginseng.

Astringent Properties of Heuchera and Mitella. F. W. Anderson. (*Botanical Gazette*, 1887, 65.) The author reports that the roots of *Heuchera hispida*, *H. cylindrica*, and *H. parrifolia*, are much used in the west by hunters, prospectors, and others as astringents, particularly in cases of troublesome diarrhœa caused by the drinking of water in alkali regions. *H. parrifolia* is the commonest species in northern Montana. Of milder and somewhat slower action is the root of *Mitella pentandra*, which contains also a bitter principle, and is not likely to cause sudden constipation like the heucheras.

Pastinaca Sativa. J. T. Bennett. (Contrib. *Dep. Pharm. Univ. Wis.*, 1886, from *Amer. Journ. Pharm.*) The fresh and dried root were analysed by the author, who found them to contain volatile oil, traces of tannin, colouring matter, sugar, hard tasteless resin, soft resin (having a somewhat burning taste and soluble in petroleum benzin), and gum, but no starch; an alkaloid could not be detected. Several of the products administered to cats produced no symptoms of poisoning.

Prof. Power considers the wild-grown parsnip root to be not poisonous, and refers to communications from Dr. J. J. Brown, of Sheboygarn, Wis., and Dr. Vasey, of Washington, D.C., in confirmation of this view. The popular belief that wild parsnip root is poisonous may have originated from mistaking for it the roots of the cow-parsnip (*Heracleum lanatum*, *Mich.*), water-parsnip (*Sium*), and other tall, umbelliferous plants.

Analysis of the Underground Portion of Phlox Carolina. H. Trimble. (*Amer. Journ. Pharm.*, October, 1886.) The results of the author's examination are summarised in the following table:

	Per Cent.	
Moisture	7·82	
Ash	16·70	
Camphor with red colouring	1·00	Sol. in petroleum spirit.
Resin	·44	,, ,, stronger ether.
Tannin	1·82	
Glucose	·27	Soluble in absolute alcohol, 9·96 per cent.
Saccharose	·78	
Undetermined	7·09	
Gum	2·34	
Glucose	·33	
Allied Sugars	1·49	Soluble in water, 8·68 per cent.
Albuminoids	4·52	
Albuminoids sol. in dilute Alkali	·99	
Calcium Oxalate	2·90	Sol. in dilute hydrochloric acid, 10·86 per cent.
Gum	·36	
Undetermined	7·60	
Volatile Acid, Butyric	trace.	
Lignin	5·53	
Cellulose and allied substances	36·65	
Total	98·63	
Less Calcium Oxide in Calcium Oxalate	1·19	
	97·44	
Loss	2·56	
Total	100·00	

The most interesting of these constituents is the camphor extracted by petroleum spirit, a full description of which, with woodcut illustration, is given in the paper.

Smilax Rotundifolia. A. H. Cohn. (*Amer. Journ. Pharm.*, September, 1886.) This plant has a creeping pale yellowish rhizome many feet long, about $\frac{1}{4}$ inch thick, with internodes 4 to 6 inches in length, the nodes considerably thickened, and each marked by a prominent brownish triangular leaf scale, and beset with some fine light-coloured rootlets. The rootlets are more numerous near the growing end and are of a brown colour. The dried rhizome is brittle, has little or no odour, and has a somewhat bitter and slightly acrid taste. The author collected the rhizome for investigation, and obtained from the air-dry powder 2·3 per cent. of ash, and by treatment with benzin ·05 per cent. of wax;

with ether ·5 per cent. of resin, and with alcohol 2·8 per cent. of extract, the latter probably containing a glucoside, as indicated by the reactions. More of this principle was shown to be in the aqueous infusion, but it was not isolated. The presence of gummy matter, sugar, pectin, starch, etc., was ascertained; also the absence of calcium oxalate.

Valeriana Hardwickii. J. Lindenberg. (*Pharm. Zeitschr. für Russland*, 1886.) An analysis has been made of the rhizome of this East Indian plant by the author, and the results compared with those obtained with *Val. officinalis*. They are summarised in the following table:

	V. Hardw.	V. Officin.
Moisture	10·46	11·57
Ash	4·04	4·31
Fat and Resin, soluble in Petroleum-Benzin	0·56	0 36
Volatile Oil and Valeric Acid, sol. in Benzin	1·005	0·90
Volatile Acid, soluble in Ether	0·335	0 31
Resin and Wax, soluble in Ether	0·56	0·85
Resin, soluble in Alcohol	1·05	0 975
Tannin	3·13	1·64
Citric, Tartaric, and other Acids	0·335	0·565
Glucose	6·03	5 32
Other substances, sol. in Water, insol. in Alcohol	14·96	14·39
Mucilage and Albumen, soluble in Water	4·16	2·97
Albuminoids extracted by Soda	9·72	7·83
Metarabic Acid, Phlobaphene, and Albuminoids	19·10	16·70
Starch	14·05	12·87
Cellulose	10·36	11·65
Lignin and other Compounds	10·015	16·80

Inula Helenium. G. Marpmann. (*Pharm. Centralhalle*, March 10, 1887, 123. From *Pharm. Journ.*) Helenin, the stearoptene obtained from elecampane root (*Inula helenium*), has been recommended in the treatment of tuberculosis and diphtheria and credited with being a powerful antiseptic (*Pharm. Journ.* [3], xv. 890; xvi. 919). But according to the author the root yields two other compounds, both of which are more powerful antiseptics than helenin; these he has named alantol and alantic acid, apparently from the German popular name of the root, "Alantwurzel." They are obtained by the distillation of the root, which yields a mixture of helenin, alantic anhydride, and alantol. Alantic acid ($C_{15}H_{22}O_3$) is described as crystallizing from alcohol in white crystals, melting at 91° C., and subliming as the anhydride ($C_{15}H_{20}O_2$). Both the acid and the anhydride are insoluble in water, soluble in alcohol and fixed oils, and form

with alkalies readily soluble salts. Alantol ($C_{20}H_{32}O$) is an aromatic lævogyre liquid which boils at 200° C., combines after a time with water, and possesses "ozonising" properties. It is probably formed during the distillation from some other constituent of the root. Alantic acid and alantol were always obtained as a mixture, and this mixture is said to have given better results than helenin in the treatment of tuberculosis, whilst its use can be continued a long time without inconvenience. The author states that only fresh roots should be used for distillation, as the roots appear to lose their active constituents with age. Dr. Dono reports (*Nouv. Rém.*, 1887, p. 142) that he has employed helenin with favourable results in three cases of chorea, in doses of 2 centigrams three or four times a day. It is also reported to have been given with success in bronchitis and spasmodic cough.

Spiræa Filipendula. J. M. Maisch. (*Amer. Journ. Pharm.*, February, 1887.) This drug is a perennial herb, the tuberous roots of which were formerly used in excessive secretion of mucous glands, and over fifty years ago were recommended in hydrophobia. Recently a Polish physician, Dr. F. I. Jagell, stated that he had successfully used the *bark* of this plant in the form of infusion, in 88 cases where persons had been bitten by rabid dogs or wolves, 26 of the patients having already exhibited the early symptoms of hydrophobia.

The root has not been fully analysed, but is known to contain tannin, sugar, and starch, and in the fresh state also a volatile oil, probably identical with that of the stem and leaves, which consists of salicylic aldehyde.

The Mineral Constituents of Ipecacuanha Root. H. E. Munns. (*Pharm. Journ.*, 3rd series, xvii. 898, 899.) The author found this root to yield 3·22 per cent. of ash, which had the following composition:

	Per cent.
Silica	31·98
Iron and Alumina	3·53
Lime	15·98
Magnesia	4·57
Phosphoric anhydride	6·19
Alkalies	13·80
Sulphuric anhydride	4·84
Chlorine	1·56
Carbonic anhydride	15·25
Undetermined, including trace of Manganese	2·30
	100·00

Magnolia Bark. J. U. and C. G. Lloyd. (*Pharm. Rundschau*, iv. 266.) Commercial *Cortex magnoliæ* comes from the mountains of North Carolina, and is collected from *Magnolia glauca*, *umbrella* and *macrophylla*. The bark was extracted with alcohol, the latter evaporated, resinous matters being left behind, which apparently were a mixture of three different resins. The residue was taken up with water, which after a few days gave colourless crystals, which were recrystallized from alcohol. They were then dissolved and boiled with dilute sulphuric acid, the solution neutralized with barium carbonate, and filtered. The filtrate reduced Fehling's solution, and it is therefore very likely that the crystals represented the magnolia glucoside. Experiments for obtaining an alkaloid from the resinous residue were unsuccessful, although the usual reagents for alkaloids pointed to the presence of an alkaloid.

Ash of Cinchona Bark. D. Hooper. (*Pharm. Journ.*, 3rd series, xvii. 545.) The author's experience with regard to cultivated barks is that they yield over 3 per cent. of ash, the average of three hundred estimations being 3·42 per cent. Renewed and old natural barks are the poorer in mineral constituents, but they never fall below 2 per cent. On the other hand, young and branch bark gives as much as 4 per cent., and it is interresting to notice that the leaves afford as much as five and sometimes six per cent. With regard to the species of cinchona, there is a marked difference in the amount of ash yielded by each, provided that natural bark is operated upon. The crown bark is richer in ash than that of the red, and the red richer than that of the Ledger; and knowing that crown bark grows at an elevation of 7,000 to 8,000 ft., the red at 5,000 to 6,000 ft., and the Ledger at 3,000 to 5,000 ft., the altitude may have something to do with this gradation of ash in the different species.

When gently incinerated at a low red heat, cinchona bark should always leave a greyish white ash. If it is at all reddish, it points to the presence of dust or dirt adhering mechanically to the sample: if weighed, it will be found much in excess of that obtained from clean bark.

A complete analysis was made of the ashes of the two species of cinchona grown on the Nilgiris, the *C. officinalis* growing in the Dodabetta plantation, and the *C. succirubra* from the lower elevation at Naduvatam. Notwithstanding the barks were from different species and localities, the result of the examination shows that there is a great similarity in the composition of the ash.

	C. Officinalis.	C. Succirubra.
Soluble in Water . . .	27·33	24·46
Soluble in Acid . . .	66·92	69·94
Residue	5·75	5·60
	100·00	100·00

	C. Officinalis.	C. Succirubra.
Insoluble Silica . . .	5·75	5·60
Soluble Silica . . .	1·42	4·40
Alumina	2·70	4·24
Iron Oxide	2·85	3·21
Manganese	trace	—
Lime	32·70	32·80
Magnesia	2·07	2·52
Potash	16·35	12·49
Soda	3·40	2·28
Carbonic Acid . . .	27·22	27·77
Sulphuric Acid . . .	1·16	1·08
Phosphoric Acid . . .	3·93	3·19
Chlorine	·45	·42
	100·00	100·00

The chief constituent is the lime, which forms nearly one-third of the whole, and exists in the ash in the form of carbonate. The next element of importance is the potash, which amounts to one-sixth and one-eighth of the whole ash respectively.

Root Bark of Euphorbiaceæ. E. Schmidt. (*Répert. de Pharm.*, 1887, 73 and 237.) The author describes the microscopic structure of the root barks of *Euphorbia corollata* and *E. Ipecacuanha*. He remarks concerning the species indigenous to France, that the dose of the root bark of *E. Lathyris* as a purge is $1\frac{1}{2}$ gram; that *E. Esula* is a hydragogue cathartic, and *E. Cyparissias* acts as an emeto-cathartic in doses of 0·60 to 1 gram. The bark of *E. Esula* is distinguishable from that of the nearly allied *E. Cyparissias* by the characters afforded by the woody zone. In the former it is formed of four large fibrovascular bundles separated by wide medullary rays. In *E. Cyparissias* the fibrovascular bundles are narrower and more numerous, and the number of medullary rays is consequently greater.

Cortex Adstringens Brasiliensis. V. Wilbuszewitcz. (*Pharm. Zeitschr. für Russland*, 1886; *Amer. Journ. Pharm.*, September, 1886.) This is the bark of *Stryphnodendron Barbatimas*, one of the Brazilian *Mimoseæ*. The author's analysis shows the presence of a considerable proportion of phlobaphene and a small quantity of tannin, the latter being obtained by the process of J. Löwe, by

precipitating with sodium chloride, redissolving in water, and agitating with acetic acid. By dialysis a small quantity of gallic acid was obtained. The phlobaphene is readily soluble in ammoniacal water, nearly insoluble in cold water, and is not precipitated by gelatin. Three tannins, differing in composition, one of them being slightly soluble in cold water, were obtained; their reactions were similar: brown-black with ferric salts; light brown with copper acetate; red-brown with copper sulphate; yellow with lead acetate; blue-green with ammonium vanadate; tartar emetic, no precipitate, etc., 1 gm. potassium permanganate oxidized 1·329 gm. of one tannin, and 1·305 gm. of another variety. Decomposed with potash, protocatechnic acid was obtained, but phloroglucin could not be observed. On heating with diluted sulphuric acid in a sealed tube, the tannin was decomposed, yielding phlobaphene, gallic acid, and traces of ellagic acid, but no sugar.

Condurango. Dr. Riegel. (*Munich. med. Wochenschr.*, Feb. 8, 1887.) The author states that in his hands no agent has proved a better stomachic than condurango bark, which can be administered most suitably in the form of condurango wine. The "cortex condurango" of the *Pharmacopœia Germanica* is the bark of *Gonolobus Condurango*, which acquired a temporary notoriety some years since through being recommended as a specific against cancer.

Quillaia Bark as a Substitute for Senega-Root. F. B. Power. (*Pharm. Rundschau*, September, 1886; *Pharm. Journ.*, 3rd series, xvii. 350.) At a meeting of the Society of German Naturalists, held at Strassburg about a year since, Dr. Kobert directed attention to the valuable medicinal properties of quillaia bark, and proposed it as a substitute for senega in affections for which the latter is indicated. Its advantages over the latter are stated to consist in the fact that the glucoside to which it owes its activity is present in about five times the amount of that contained in senega, and by containing a considerable amount of sugar its decoction possesses a sweet taste, while another and not unimportant consideration is its relative cheapness. The experiments of Dr. Kobert are stated, moreover, to have proved that patients bear quillaia better than senega, that it rarely produces vomiting or diarrhœa, and is readily taken by children, while its expectorant action is beyond all question.

After giving a *resumé* of the chemical literature of the subject, the author states that, from a pharmaceutical point of view, the

absence of *pectin* bodies in quillaia renders the ordinary liquid preparations of this drug permanent and elegant, and the use of ammonia, as was recommended by Kennedy (*Proc. Amer. Pharm. Assoc.*, 1879, 721) in the preparation of the fluid extract and syrup of senega, and adopted by the U.S. Pharmacopœia, becomes entirely unnecessary. The author has prepared a fluid extract of quillaia by the following process, which affords as handsome a preparation as could be desired, and appears to thoroughly represent the activity of the crude drug: 100 grams of quillaia, in No. 40 powder, were moistened with 40 grams of dilute alcohol, packed firmly in a cylindrical percolator, and enough dilute alcohol subsequently added to saturate the powder and leave a stratum above it. It was then allowed to macerate for forty-eight hours, after which period the percolation was allowed to proceed, with the use of dilute alcohol as the menstruum. The first 90 cubic centimetres of the percolate were reserved, the percolation continued with dilute alcohol until the drug was exhausted, and this second percolate evaporated to the measure of 10 cubic centimetres and mixed with the reserved portion.

The finished fluid extract is of a deep reddish brown colour, and by simple admixture with syrup, in proportions corresponding to those of the officinal syrup of senega, namely, 4 parts of fluid extract and syrup to make 25 parts, a perfectly transparent and handsome syrup of quillaia is obtained. The preparation with which experiments were instituted in Germany as reported in the *Aerztl. Int. Blatt.*, 1885, No. 48, was a decoction made from 5 parts of the bark for adults, and 3 parts for children, with 180 parts of water and the addition of 10 parts of syrup; the dose being a tablespoonful every hour.

The use of quillaia is stated to be contra-indicated in inflammation of the intestines or stomach, or in ulcerated states of the mucous membranes.

In conclusion, the author strongly recommends quillaia to the attention of medical practitioners, and also to the Committee of Revision of the Pharmacopœia, with a view to the adoption of suitable preparations of the same.

Extract of Pomegranate Bark. L. J. von Schroeder. (*Pharm. Zeit.*, Sept. 18, 556. From *Pharm. Journ.*) The official preparation of pomegranate bark is open to objection on account of its nauseousness, and some years since L. Siebold (see abstract, *Year-Book of Pharmacy*, 1883, 562), in order to obviate this, suggested a process for removing the astringent principles. With

a similar object the author has recommended the use of an extract free from tannic acid, but containing all the alkaloid of the bark. The extract is prepared by treating a decoction of the bark with milk of lime to remove the tannic acid, filtering, neutralizing the filtrate exactly with sulphuric acid, evaporating it on a water-bath almost to dryness, treating the residue with 70 per cent. alcohol, and then driving off the alcohol from the extract obtained. The product is described as nearly entirely crystalline, and soluble in water with a slight turbidity. The yield is about one gram of extract from twenty grams of bark. In order to retard as much as possible the absorption of the pelletierine, which is present in the extract as a sulphate, it is recommended to add to this quantity one or two grams of tannic acid to convert the alkaloid into the difficultly soluble tannate.

The Alleged Toxic Effects of Pelletierine, the Active Principle of Pomegranate. Dr. Méplain. (*Archives de Pharm.*, September, 1886, 409. From *Pharm. Journ.*) It has been stated occasionally, that the administration of pelletierine to adults has been followed by symptoms of poisoning, though not very serious ones, and this has caused hesitation in administering it to children. Some recently reported cases appear, however, to indicate that the physiological action of this tænifuge is relatively less energetic in infants than in adults. The author administered six centigrams of pelletierine to a child two and a half years old, and Dr. Bétencès the same quantity to a child five years old, without the least symptom of poisoning, but with the removal of the worm in both cases. In another case a dose of ten centigrams was successfully administered to a child ten years of age.

Poisoning by the Bark of Robinia Pseudacacia. Z. T. Emery. (*New York Med. Journ.*, January 22, 1887.) The author reports on the poisoning of thirty-two boys at the Brooklyn Orphan Asylum from chewing the inner bark of the locust tree, which they had obtained from the yard where fence-posts had been stripped. In the mildest cases vomiting of ropy mucus was observed, together with flushed face, dryness of throat, and dilated pupils. In the severest cases large quantities of ropy mucus mixed with blood were vomited; the other symptoms were retching, pain in the epigastrium, debility, stupor, extremities cold and pulseless, heart's action feeble and intermittent, pupils dilated, faces of a dusky pallor. These patients were given bismuth subcarbonate and brandy by the mouth, and morphine hypodermically; sinapisms were applied over the stomach, and bottles with hot water along

the extremities. The patients were discharged from the hospital in two days.

The stem bark has never been examined chemically. Asparagin has been found in the root, and the flowers contain the glucoside robinin, which yields quercetin. The bark deserves investigation in view of the fact that a number of woody leguminous plants are known to contain poisonous alkaloids, and other more or less active principles.

China Bicolor. O. Hesse. (*Liebig's Annalen*, ccxxxiv. 380–384.) The author is of opinion that the small quantities of quinine and other alkaloids which Hodgkin (*Pharm. Journ.*, 3rd series, xv. 217) found in the bark of *China bicolor*, are probably due to the presence of a small quantity of the bark of *Remijia pedunculata* in the *China bicolor* bark.

Xanthoxylum Fraxineum. E. T. Moffit. (*Amer. Journ. Pharm.*, September, 1886.) The author examined this bark, and found the air-dry powder to retain 8 per cent. of moisture, and to yield 11·08 per cent. of ash, one-fifth of which was soluble in water, and three-fourths soluble in hydrochloric acid, a little silica being left undissolved. Treatment with benzin yielded 3·2 per cent. of greenish fixed oil, mixed with a crystalline resin, the latter being doubtless identical with that previously observed by Lloyd and by Colton. Ether now extracted from the powder 4·34 per cent. of green acrid resin, and absolute alcohol gave 2·70 per cent. of extract, consisting of resin, a little sugar, tannin, colouring matter precipitated by basic lead acetate, and an alkaloid which was isolated by adding ammonia, agitating with chloroform, and evaporating the latter, when yellowish crystals were left. These were soluble in alcohol and chloroform, insoluble in benzin, ether, and benzol, had a slightly bitter taste, produced with nitric acid a yellow solution, with sulphuric acid a brown colour changing to dark red, and precipitates with the following reagents: potassio-mercuric iodide, white flocculent; auric chloride, reddish brown and red; platinic chloride, brownish yellow; picric acid, yellowish; tannic acid, greyish yellow. The alkaloid is doubtless identical with that obtained by Colton from *Xan. caroliniamum*; but this is stated to be insoluble in chloroform.

Further treatment of the powder showed the presence of sugar, gum, bitter extractive, and albuminoids, and the absence of starch.

Hamamelis Virginica. W. B. Cheney. (*Amer. Journ. Pharm.*, September, 1886.) Witch-hazel bark has been subjected to an analysis by the author, with the following results: the yield of

ash was 6·16 per cent., and it consisted of sulphate, chloride, phosphate, and carbonate of potassium, sodium, and magnesium, manganese and silica. The air-dry powder contained 9·75 per cent. of moisture, and yielded 1·15 per cent. of benzin extract, which was also soluble in ether, absolute alcohol, benzol, chloroform, and oil of turpentine, and consisted mainly of wax saponifiable by alcoholic solution of soda. The powdered bark now gave with ether 7·65 per cent. of hard greenish extract, of which nearly two-thirds was soluble in water, this portion containing tannin, but no alkaloid or glucoside; the remaining resin was soluble in alcohol. Absolute alcohol extracted from the remaining powder 6·4 per cent. of soluble matter, fully two-thirds of which was soluble in water, and the remainder in ammonia; tannin and a little sugar were found to be present, but no indication of the presence of an alkaloid or other crystalline principle was obtained. The aqueous extract amounted to 5·74 per cent., of which 1·2 per cent. was glucose, besides mucilage and other principles. Soda solution extracted 1·75 per cent., including ·25 per cent. of albuminoids, and dilute acid took up 4 per cent., leaving half its weight of ash. The bleached cellulose weighed 57·61 per cent. The total amount of sugar, determined by Fehling's solution, was 1·4 per cent., and the tannin, weighed as gelatin precipitate, was 6·75 per cent. The search for an alkaloid or glucoside gave negative results.

Hamamelis Virginica as a Styptic. R. Pollock. (*Practitioner*, 1886, 138. From *Pharm. Journ.*) The author reports favourably on the styptic action of a distilled preparation of hamamelis, stating that in several cases of hæmoptysis it speedily checked the hæmorrhagic tendency, and in a case of cystitis with profuse hæmaturia, a 25 per cent. injection of the liquid in warm water speedily checked the bleeding. He attributes the good effect to a "volatile oleo-resin combined with gallic acid." This testimony as to the value of hamamelis conflicts somewhat with previous statements by other writers (abstract, *Year-Book of Pharmacy*, 1886, 162), but tends to show that there is in it a volatile oil which probably acts like that of turpentine, *Solidago odora*, etc., as an astringent to the blood vessels.

Wistaria Chinensis. M. Ottow. (*Nieuw. Tijdschr.*, 1886, 207. From *Amer. Journ. Pharm.*) A poisonous glucoside has been isolated from the bark of this ornamental climber by the author and has been named *wistarin*. It is freely soluble in alcoholic liquids, sparingly soluble in ether, chloroform, and cold water; is coloured violet and green brown by ferric chloride, and dissolves

in alkalies and alkaline carbonates with a yellow colour, and in sulphuric acid with a yellow colour changing to cherry red. Wistarin has a bitter and astringent taste, melts at 204° C., is not precipitated by tannin, yields a white precipitate with basic lead acetate, and a green one with copper sulphate, and on being boiled with dilute sulphuric acid is decomposed into sugar, a crystalline resin, and a volatile oil having the odour of menyanthol; this oil, when treated with warm potash solution, is converted into a white compound of a coumarin-like odour.

The bark contains also a resin having apparently toxic properties.

Chemical Investigation of the Bark of Fraxinus Americana. G. W. J. Hoffman and D. W. Cahill. (*Amer. Journ. Pharm.*, August, 1886.) In 1882 H. M. Edwards reported having obtained evidence of the presence of an alkaloid in the bark of the American white ash (abstract, *Year-Book of Pharmacy*, 1882, 178). The authors have reinvestigated this subject, and give a description of their experiments, which render the existence of an alkaloid in white ash bark more than doubtful, without throwing much light upon the bitter principle. Kremer's results (*ibid.*, 372), indicate a probable relation of at least one constituent to fraxin and fraxetin; but these principles, as obtained from the barks of the European ash and of the horse-chestnut, are still very imperfectly known.

Wild Cherry Bark. R. Rother. (*Amer. Journ. Pharm.*, 1887, 286.) The author undertook the examination of this bark, with the object of obtaining some knowledge of its fluorescent constituent, which he succeeded in isolating from it in a crystalline form.

The proportional quantity of this crystalline constituent of wild cherry bark is exceedingly small. Without the fluorescing property, as a guide, it would have been practically impossible to detect and isolate it. Judging from its crystalline form, it does not appear to be mandelic acid, a decomposition product of amygdalin. It may, however, be an analogue, or a substituted derivative of it. This conjecture leads to the question, whether or not it is amygdalin as such, from which the benzoic aldehyde and hydrocyanic acid of syrup of wild cherry results.

St. Ignatius' Bark. W. E. Crow. (*Pharm. Journ.*, 3rd series, xvii. 970.) The author shows that the presence of strychnine and brucine in *Strychnos Ignatii* is not confined to the seeds but also extends to the bark. The tree does not appear to be indi-

genous to China proper, though its seeds are a well-known article of materia medica. The material examined by the author was obtained from the Philippines.

Rhamnus Purshiana. Prof. Schrenk. (*Amer. Druggist*, 1887, 61.) The author points out that the bark of *Rhamnus Purshiana* may be distinguished from that of *R. Frangula* by the presence of sclerenchymatous cells of most irregular angular shape, wedged together so as to form large compact groups, which increase in size and number toward the surface: to these the short fracture of the outer bark is due. The sclerenchymatous cells are absent from the bark of *R. Frangula*.

Constituents of Red Sandal Wood (Pterocarpus Santalinus). P. Cazeneuve. (*Comptes Rendus*, civ., 1725.) Besides "santalin," the crystallizable colouring matter described by Pelletier, and "santal," a crystalline body isomeric with piperonal isolated by Weidel, the author has previously shown that this wood contains another crystalline substance, to which he gave the name "pterocarpin." He now announces the isolation of another body, homologous to the latter, which he proposes to name "homopterocarpin." These compounds were obtained by digesting powdered sanders wood with milk of lime, drying, exhausting the cake with ether, distilling the yellow ethereal liquor to dryness, and treating the residue with boiling alcohol, which deposited on cooling a crystalline mixture of pterocarpin and homopterocarpin, separable by treatment with bisulphide of carbon, in which the latter is soluble and the former is not. Pterocarpin melts at 152° C., and has a composition agreeing with the formula $C_{10}H_8O_3$. Homopterocarpin melts at 82° C., and is represented by the formula $C_{12}H_{12}O_3$. Both compounds, when fused with potash, give off an odour resembling that of coumarin, and probably belong to that group.

Quality of Belladonna Leaves and Root. A. B Lyons. (*Proc. Amer. Pharm. Assoc.*, 1886.) In a large number of assays of the leaves, the author obtained as high as 0·87 per cent. of alkaloid, and as low as 0·23 per cent.; the average was about 0·44 Twelve assays of belladonna root yielded between 0·42 and 0·86 per cent. of alkaloid; average, 0·618 per cent. The average yield of extract with 66 per cent. alcohol was for the root 26·27, and for the leaves 22·5 per cent. The amount of alkaloid does not appear to decrease in pressed leaves kept for several years.

Examination of the Leaves of Gymnema Sylvestre. D. Hooper. (*Pharm. Journ.*, 3rd series, xvii. 867, 868.) The author's analysis of this drug gave the following results:—

Ether Extract (Chlorophyll and Resins). .	5·51
Alcoholic Extract (Gymnemic Acid, Tartaric Acid, Glucose, neutral bitter principle, etc.)	19·50
Aqueous Extract (Gum, 1·45 per cent.), Glucose, Carbohydrate and extractive . .	16·87
Alkaline Extract, by difference (albuminous and colouring matters)	8·15
Acid Solution { Calcium Oxalate . . .	7·64
Acid Solution { Pararabin	2·74
Ash (balance of)	5·69
Cellulose	27·86
Moisture	6·04
	100·00

Note on Henna Leaves. C. J. S. Thompson. (*Pharm. Journ.*, 3rd series, xvii. 845.)

Lawsonia alba, or *L. inermis*, belongs to the natural order *Lythraceæ*, and is a shrub that grows abundantly in the countries of the East. It does not appear to possess many medicinal properties beyond the astringency of the leaves due to the amount of tannin and gum they contain. It is stated that the powdered leaves, formed into a paste with oil, and applied externally, give relief to headache. The leaves are small, and somewhat leathery in texture; are oval in form, with entire margins. The dried leaf when broken has a brittle fracture, and a section examined by the microscope exhibits the cells crowded with the brown colouring matter. This colouring matter may be very easily extracted, it being almost entirely soluble in hot water.

The leaves should first be reduced to a coarse powder, then macerated for two or three hours in boiling water, and strained. Boil the residue in two or three successive quantities of water, till thoroughly exhausted, mix, and evaporate the strained liquors.

They will be found to yield from 12 to 15 per cent. of a dark brown gum.

This brown gum is readily soluble in hot water, glycerine, strong solutions of potash and ammonia, and dilute acids; but very slightly in ether, chloroform, or alcohol.

The colour of the aqueous solution is intensified by alkalies and diminished by strong acids. It turns black on addition of ferric salts. The leaves also yield 2 per cent. of an olive-green resin which is soluble in ether and alcohol.

The following rough method is employed by the Arabs in preparing henna for their use: —

The leaves and young twigs are dried and powdered, then

allowed to stand for some days moistened with water. The mass is afterwards boiled with more water some hours, and this decoction is diluted or not, according to the shade of colour it may be desired to produce.

Examination of the Leaves of Chimaphila Umbellata. E. S. Beshore. (*Amer. Journ. Pharm.*, March, 1887.)

Chimaphila umbellata, natural order *Ericaceæ*, *Pyroleæ*, is indigenous to North America, northern Asia, and northern and central Europe; it is found in dry woods, and flowers in June and July.

The leaves contain 7·83 per cent. of moisture, and yield 4·04 per cent. of ash. Petroleum spirit extracts from them a crystalline principle which, after purification, proved to have a composition corresponding to the formula $C_{10}H_{19}O$.

Examination of the Leaves of the Horse-Chestnut (Æsculus Hippocastanum. F. O. Ray. (*Amer. Journ. Pharm.*, 3rd series, xvii. 108.) The extended consideration which for some months past has been accorded to the alkaloid cocaine, and its acknowledged importance and intrinsic value, has led to the expression of the hope that in the order of *Sapindaceæ*, which is botanically so closely related to the *Erythroxylaceæ*, the same alkaloid, or at least one having analogous properties, might possibly be found.

The young leaves of the horse-chestnut were collected early in June, and were very carefully dried without the aid of artificial heat, and afterwards preserved in a dry place. Portions of the finely powdered leaves were treated according to the improved process of Dr. Squibb for the assay of coca leaves, and also according to the process recommended by Dr. A. B. Lyons, but without obtaining any decided reactions for an alkaloid. A portion of the fresh leaves was distilled with water made alkaline with caustic potash; the liquid frothed strongly upon heating, but a small amount of distillate was obtained, which was colourless and possessed a strong odour, but afforded no indication of the presence of a volatile alkaloid. Another portion of the leaves, distilled with dilute sulphuric acid, afforded a distillate possessing a peculiar odour, probably due to traces of a volatile oil, but no volatile oil was obtained. A portion of the leaves was now extracted successively by petroleum benzin and alcohol, but only oily and resinous matters containing much chlorophyll, together with tannin and sugar, were found, without establishing the presence of any special principle of further interest.

Since at least one product of the natural order *Sapindaceæ*, namely, the seeds of *Paullinia sorbilis*, is known to afford con-

siderable amounts of the alkaloid caffeine, it was considered of interest to determine whether the same or an analogous principle might not also be contained in the leaves of the horse-chestnut. For this purpose 200 grams of the leaves were digested with water, with the aid of a gentle heat. The filtrate, which was of a deep brown colour and very mucilaginous, was precipitated by a solution of lead acetate, and again filtered. The latter filtrate showed no fluorescence, indicating the total absence of *æsculin*. It was now made slightly alkaline with ammonia water, again filtered and tested with basic lead acetate, which, however, produced no further precipitate. The lead salt was now completely removed by sulphuretted hydrogen, the liquid filtered and evaporated to a small volume on a water-bath, but no crystalline product was formed. The aqueous solution was subsequently shaken with chloroform, which, upon spontaneous evaporation, left a small amount of oily residue, having a strong, peculiar, and rather unpleasant odour. This residue, when taken up with acidulated water, afforded slight reactions with alkaloidal reagents, but did not give the characteristic reaction for caffeine.

From the results of these experiments it will be seen that the leaves of the horse-chestnut contain neither cocaine, caffeine, or other principles of special interest; also that æsculin, which is so abundantly contained in the bark of the horse-chestnut, is apparently entirely wanting in the leaves.

Æsculus Hippocastanum. J. M. Maisch. (*Amer. Journ. Pharm.*, March, 1887.) In medical works, including those on medical botany, in which the horse-chestnut tree is mentioned, the discussion of the therapeutic properties is usually confined to the use of the bark as an antiperiodic, and of the fixed oil as a topical remedy in rheumatic complaints. Occasionally the sternutatory properties of the powdered seeds are mentioned, and in works from the beginning of the present century it is stated that a paste made from the seeds is useful in chilblains, and a decoction of the roasted seeds has been recommended in atonic uterine hemorrhages. In only one of the modern works consulted (*National Dispensatory*, 3rd and 4th edit., p. 765) occurs a reference to the popular use of the leaves in whooping cough, and of the seeds in hemorrhoids.

That this popular use has not been forgotten was pointed out by Geo. W. Stoeckel, at the meeting of the Pennsylvania Pharmaceutical Association in 1886. He states that the use of the leaves and seeds is not uncommon in the south-eastern counties of

Pennsylvania. A decoction of the leaves is regarded as a remedy in whooping cough, and is given in small doses frequently repeated, while the bruised fresh leaves, sometimes mixed with lard, are at the same time employed externally. The entire seed is carried in the pocket as a kind of charm against piles, and the powdered white kernel is thoroughly triturated with lard into an ointment, which is said to be successfully applied against piles.

Erythroxylon Pulchrum, a New Source of Cocaine. T. Peckolt. (*Pharm. Journ.*, 3rd series, xvii. 507.) The extensive occurrence of numerous species of the genus *Erythroxylon*, in Brazil, has induced the author to investigate the presence or absence of the alkaloid cocaine in some of the species. The first examined was the bark and leaves of *Erythroxylon pulchrum*, which grows tolerably abundantly near Rio, and is known popularly as "subrasil" or "arco de pipa." It is a tree thirty or forty feet high, with large ovate leaves, abruptly tapering at the base, shining dark green above, and dull green below. The bark gave only negative results. From the leaves cocaine was separated, but as the yield was only equal to 0·005 per cent., this species will hardly prove a profitable material for the manufacture of that alkaloid.

Constituents of the Leaves of Gaultheria Procumbens. F. W. Droelle. (Abstract of an inaugural essay. *Amer. Journ. Pharm.*, June, 1887.) A proximate analysis was made of the finely ground leaves, after they had been separated from the stems, with the following results :—

Volatile Oil	·50	per cent.
Resin and Wax	2·50	,,
Resin soluble in Ether	2·15	,,
Chlorophyll, with small amounts of Arbutin, Urson and Tannin	2·75	,,
Tannin	5·45	,,
Chlorophyll, Arbutin, and Ericolin	3·80	,,
Mucilage	2·90	,,
Glucose and Dextrin	3·56	,,
Organic Acids	3·25	,,
Albuminoids	4·54	,,
Pararabin and allied substances	2·20	,,
Loss by treatment with Chlorine	6 35	,,
Moisture	8·60	,,
Ash	4·20	,,
Lignin and Cellulose	45·53	,,
Total	98·18	,,

Constituents of the Leaves of Podophyllum Peltatum. B. F. Carter. (*Amer. Journ. Pharm.*, September, 1886.) The leaves, collected soon after flowering, have been analysed by the author, who determined the presence of acetic acid, colouring matter, probably a kind of tannin, and unerystallizable sugar. Alkaloids are absent. The resin amounted to 6 per cent., was greenish black, of an oily appearance, soluble in alkalies, and completely precipitated by acids; also freely soluble in alcohol; 90 per cent. soluble in ether, 86 per cent. in chloroform, 72 per cent. in carbon disulphide, 67 per cent. in benzol, and 40 per cent. in petroleum benzene; it also dissolves to a considerable extent in boiling water. Ether dissolves the soft resin, the hard resin remaining behind. Fused with potash, a very small amount of protocatechuic acid appears to be formed. The resin has a bitter taste and a very much milder action than that of the rhizome.

The leaves had been previously examined by T. J. Husband and by Dr. S. P. Duffield; the latter did not obtain any resin from the leaves collected in May, and only ·03 per cent. of resin from leaves collected late in autumn.

Bearberry Leaves and Arbutin. (*Med. Chronicle*, March, 1887.) Uva ursi leaves contain, in addition to tannic and gallic acids, a bitter glucoside, arbutin, which is white, crystalline, and soluble in water. During the past four years several observers have tried to determine whether arbutin might not, with advantage, be substituted for the various preparations of uva ursi now in use. Lewin, in 1883 (Virchow's *Archiv*, xcii. 517), showed that arbutin splits up, when boiled with dilute sulphuric acid, into hydroquinone, methyl hydroquinone, and sugar; and stated that when administered it is in part decomposed, so that the urine contains besides arbutin a certain amount of hydroquinone. Now hydroquinone is itself an antiseptic and antipyretic, and has been found useful by Brieger as an injection in gonorrhœa. Lewin recommended the substitution of arbutin, in 15 grain doses, for the ordinary preparations of uva ursi. Uva ursi is a reputed diuretic as well as a specific in vesical catarrh. Meneke published a paper in 1883 (*Cent. f. Kl. Med.*, xxvii. 443), on arbutin as a diuretic, and recorded some cases which served to illustrate its value in cardiac dropsy. Subsequent observations have not confirmed Meneke's views on this point. In a few cases of cardiac dropsy, in which the drug was given at the Manchester Infirmary, it proved wholly inefficacious as a diuretic.

Paschkis (*Wien. Med. Presse*, 1884, No. 13) obtained no good

results from the use of arbutin in several cases of cystitis and gonorrhœa, though he found these ailments markedly improved by uva ursi itself. Either arbutin is not the active curative principle, at least in the doses employed by Paschkis (30 grains daily), or the preparation he used was not arbutin.

Schmiz (*Cent. f. Kl. Med.*, No. 49, 1884) found arbutin very useful in some cases of bladder catarrh. He did not see good results follow its use in all cases, but recommends its use in preference to uva ursi itself. Very recently Kunkel (*Münch. med. Woch.*, December 7, 1886) published his investigations upon the absorption and excretion of arbutin, and has arrived at the conclusion that the greater part is excreted unchanged; a little is decomposed in the intestine, but it is not decomposed, as Menche thought, in its passage through the system. At the present time, then, the value of arbutin must be regarded as doubtful; and though it may be tried, in doses of 10 grains, where ordinary remedies have failed to relieve bladder catarrh, it cannot be used as a reliable remedy.

Buchu and Oil of Buchu. R. Spica. (*American Journal of Pharmacy*, October, 1886.)

Extraction of Volatile Oil.—The leaves, in a finely powdered state, were distilled until no more oil passed over. The oil was lighter than water, and left, while floating upon the surface of the liquid, prismatic crystals. The aqueous distillate contained a feeble acid, whose chemical nature, together with that of the residual, strongly acid, brown liquid remaining in the retort, will be further examined. In order to obtain a larger quantity of volatile oil, the process of extraction was modified and repeated upon more material. The powdered leaves were macerated with ether for three days, when the liquid became green in colour from dissolved chlorophyll. The larger quantity of ether was then distilled off, while the remainder was evaporated spontaneously, and the oily residue distilled with steam, until no further oil passed over. Every 1000 parts of leaves yielded about 6·5 parts of a greenish yellow oil, having a grateful odour, similar to peppermint and bergamot, and lighter than water. Separated from the water and desiccated over fused calcium chloride, a portion was fractionally distilled. The greater part passed over between from 200° to 235° C., and the last portions were manifestly decomposed, and gave a different and rather more phenol-like odour than the first. In order to ascertain if the first fractions contained substances soluble in potassium hydrate, a small quantity of the mixed fractions was agitated with K H O, in strong solu-

tion, after which separation into two parts took place. Using a second quantity, with a more dilute solution of K H O, it became evident that the K H O solution was not as sensibly coloured as in the first instance. The insoluble part (elæopten) was then separated, washed with water, and desiccated over fused calcium chloride, while the aqueous washings were added to the K H O solution, and the remaining elæopten was removed by agitation with ether. The alkaline solution was then treated with hydrochloric acid until slightly acid, when a precipitate formed which, after several minutes, assumed a crystalline aspect. The supernatant liquid was removed, and the residue agitated with ether, the ethereal solution evaporated at a low temperature, when the stearopten crystallized in the form of long flat needles, slightly impure from adhering brown oil.

Examination of the Elæopten (Diosmelæopten).—It is a greenish yellow oil of grateful odour, and constitutes about two-thirds of the volatile oil. It has a pungent, cool, aromatic, and finally sweetish taste. Desiccated over fused calcium chloride, and then distilled, it fractions very irregularly. The first fraction (*a*), very small in quantity, came over at from 180° to 200° C., the second (*b*) at from 200° to 203° C., the third (*c*), the largest in quantity, at from 203° to 206° C., the fourth (*d*) at from 206° to 209° C., the fifth (*e*) at from 209° to 211° C., leaving in the retort a small yellowish brown residue. Repeating the distillation, after having reunited the more abundant fractions, there was obtained a portion boiling at from 204° to 206° C. (not corrected). This fraction constitutes a perfectly colourless, mobile liquid, lighter than water, having the odour and taste before mentioned, and when subjected to ultimate analysis, gave H 12·00 and C 77·66; while the portion boiling at from 209° to 211° C. yielded H 12·19 and C 77·48. This points to the elementary formula $C_{10}H_{18}O$, isomeric with borneol, which, in 100 parts contains H 11·68 and C 77·92. The portion boiling at from 204° to 206° C. corresponds better, in its results, with this formula, while the higher boiling fractions probably contain compounds less carburetted, and inversely.

The vapour density was determined by Meyer's method, of the portion boiling at from 204° to 206° C., and conformed to the formula $C_{10}H_{18}O$, but the substance decomposed at the temperature at which the vapour density was taken.

The Action of Sodium upon the Elæopten (Diosmelæopten) resulted in the formation of a brownish decomposition product. The addition of sodium was continued until decomposition ceased, and

water was then added. The brown semi-solid decomposition product was separated from the liquid by filtration through wetted paper. The filtrate was agitated with ether, then treated with more sodium, and acidulated with hydrochloric acid, which separated an oil having a thymol-like odour. It was extracted with ether, and the solvent evaporated spontaneously; the residual oil distilled at from 225° to 238° C., and on fractioning the greater part boiled at from 230° to 232° C. This portion constitutes a light yellowish liquid, very dense, of the odour and taste of thymol, and the aqueous solution of which (it is slightly soluble in water) does not become coloured on the addition of ferric salts. A combustion of this substance gave H 9·62 and C 77·54, which points to the formula $C_8 H_{12} O$, having in 100 parts H 9·67 and C 77·42. The determination of the vapour density by Meyer's process led to the same formula.

The composition of this liquid, which has phenol-like qualities, would seem to indicate that it is a homologue inferior to ordinary camphor, and, until its true chemical character is better understood, it is proposed to name it dioscamphor.

Examination of Stearopten (Diosphenol of Flückiger).—The crude stearopten, as previously obtained, was depurated from adhering brown oil by compression between dry paper, and then crystallized repeatedly by dissolving in the smallest possible quantity of alcohol, then lightly heating, adding water, slowly, until a slight turbidity ensued, and cooling, when long, white, needle-shaped crystals are formed, having a camphoraceous odour. Heated at 82° C. they sublime, partially, and commence to boil at 220° C., when decomposition ensues. The diostearopten is slightly soluble in water, very soluble in alcohol or ether, and *in neutral solution* has a mint-like, camphoraceous odour. The alcoholic solution treated with ferric chloride was tinged an apple-green, and then, on addition of more of the reagent, deepened into a bottle-green colour. The hydrates of potassium and sodium dissolve it well, and from their solutions hydrochloric acid precipitates it in minute crystals. Carbonate of ammonium does not dissolve it. It acts, then, like a compound of phenol origin.

The analyses made give different results from those obtained by Flückiger, viz.:—

	Obtained.		Theory.	
			(*F.*) $C_{14} H_{22} O_3$	(*S.*) $C_5 H_8 O$.
H	9·79	9·85	9·24	9·52
C	71·65	71·44	76·58	71·44

Apparently, then, the buchu camphor is much more simple in its chemical structure than the results of Flückiger would seem to indicate; it appears to be nothing more than an oxycamphor, $C_{10}H_{16}O_2$. This product is perfectly identical in all the characteristics published concerning the diosphenol of Flückiger.

The determination of the vapour density does not tend to establish the formula, $C_{10}H_{16}O_2$, as the substance was decomposed during evaporation.

Historical Researches on Lobelia Inflata. J. U. and C. G. Lloyd. (*Druggists' Circular*, January, 1887.) The authors' conclusions are embodied in the following summary:—

1. *Lobelia inflata* was not used by the Indians as a medicine.

2. It was employed in domestic practice and by botanists in New England before Samuel Thomson's day.

3. Samuel Thomson introduced *Lobelia inflata* to the public, and there is no evidence to show that he did not discover its emetic properties independently of all other persons.

4. The assertion that Cutler and Drury discovered the medicinal uses of *Lobelia inflata*, and introduced the plant, is not supported by evidence,

Lobelia Inflata. J. U. and C. G. Lloyd. (*Pharm. Rundschau*, February, 1887, 32. From *Pharm. Journ.*) The authors confirm the statement of v. Rosen as to the presence of two alkaloids in lobelia seed (abstract, *Year-Book of Pharmacy*, 1886, 179), but they describe them somewhat differently. One of these alkaloids, for which they appropriate the name "lobeline," was obtained as a colourless and odourless amorphous substance, non-hygroscopic, and apparently not affected by air; slightly soluble in water, and readily soluble in alcohol, chloroform, ether, benzol, and carbon bisulphide. Lobeline salts, which, like the base, have hitherto resisted crystallization, are readily soluble in water, alcohol, and ether. They are described as being most powerful emetics, one drop of a tolerably strong solution being sufficient to produce immediate emesis without disagreeable after-symptoms. Upon trituration, the dust is powerfully irritant to the nose and air-passages, more so probably than veratrine. The other alkaloid, which the authors name "inflatine," has been obtained in large colourless, odourless, and tasteless crystals, insoluble in water or glycerin, but soluble in carbon bisulphide, benzol, chloroform ether, and alcohol. Therapeutically inflatine has no apparent importance. In spite of the statements of previous workers, no volatile or liquid base was met with by the authors in lobelia

seeds, and it would seem probable that the supposed liquid alkaloid previously observed was a mixture of lobeline, inflatine, and oil. All parts of the fresh plant contain an essential oil having a strong smell and little taste, and the seeds contain nearly 30 per cent. of their weight of a fat oil.

Jaborandi as a Galactagogue. M. Chéron. (*Pharm. Journ.*, 3rd series, xvii. 608.) Some careful experiments made by the author have proved that the galactagogue properties ascribed to jaborandi are well founded, and that in order to produce this action the drug must be given in smaller doses than are necessary to cause salivation and diaphoresis. The dose used with success was 5 centigrams of nitrate of pilocarpine, injected subcutaneously as soon as the milk became scanty, and repeated every day. From three to twelve injections proved successful, according to the time that the scantiness of secretion had lasted. No ill effects, either to the nurse or to the child, followed its use.

Piper Betle. (*Pharm. Journ.*, 3rd series, xvii. 268.) According to *Handelsberichte* a supply of the leaves of the *Piper Betle*, which are used in India for chewing with areca nut, has recently been imported for the first time into Germany. An essential oil, obtained from the leaves by distillation, at Samarang, by Schmitz, has been credited by him with having given good results in the treatment of catarrhal disorders and as an antiseptic, and the claim has been confirmed in the experience of Dr. Kleinstück. The oil, which seems to be of an aldehyd nature, is said to oxidize with extreme rapidity, losing at the same time its characteristic ethereal odour and therapeutic properties. Great care will therefore be required in the transit of the leaves, if the oil is to be distilled in Europe.

Cassia Alata. M. Conillebault. (*Amer. Journ. Pharm.*, May, 1887.) The leaves are recommended by the author (Thèse, Paris, 1886) for giving prompt relief in ringworm; they are moistened with water, and the affected parts are then rubbed; or an acetic extract of the leaves may be used.

In India the plant is regarded as a cure for poisonous bites and for venereal eruptions, and the leaves have long been used for curing ringworm. Lindley describes the leaves as being 2 feet long, abruptly pinnate. Leaflets opposite, from 8 to 14 pairs, the exterior largest, linear-oblong, obtuse or emarginate, with a point, smooth, entire, veined; 3 to 6 inches long, 2 to $2\frac{1}{2}$ inches broad; the lower pair somewhat distant, nearly round and reflexed back on the stem or branches. Petioles channelled, the channels large and formed by two thin, firm, yellow borders. There is a cross-bar

between each pair of leaflets, covered with small dark-coloured bristles, and there is no other gland. Stipules auriculate, rigid, pointed, persistent, appearing like prickles.

The plant is shrubby, like *Cassia Sophora*, the leaves of which are similarly employed. *Cassia Tora*, an annual of Southern Asia, is reputed to have similar antiherpetic properties; likewise *Cassia occidentalis*, which is common throughout the tropics, has been naturalized in the Southern United States as far north as Virginia, and is known in some localities as *styptic weed*.

Ilex Opaca. W. A. Smith. (*Amer. Journ. Pharm.*, May, 1887.) On treating the leaves with benzin, the author obtained 1·2 per cent. extract, of which ·088 was volatile and had an acrid mustard-like odour; the remainder consisted of fat and ·152 wax. Ether extracted 4·5 per cent., ·5 of which was soluble in water, the remainder being resin soluble in alcohol; the aqueous solution had a bitter taste, and from its behaviour to Fehling's solution appears to contain a glucoside. Tannin and chlorophyll were found in the alcoholic tincture. The leaves yielded 4·5 per cent. of ash.

Some Constituents of Yerba Santa. R. Rother. (*Amer. Journ. Pharm.*, May, 1887.) A syrup prepared from Eriodictyon leaves is extensively used for the administration of quinine in a palatable form. In order to disguise the bitterness of quinine when given in a fluid state, it has been variously exhibited in the condition of insoluble salts. The objection to this mode of procedure is that these quinine compounds remain partially insoluble, and hence inoperative, and that some of these combinations, notwithstanding their insolubility, are by no means destitute of the nauseous bitter taste.

The important advantage possessed by *Yerba Santa* consists not only in the perfect masking of the bitterness of quinine, but also in its administration in a readily assimilable state.

A certain resinous component of Eriodictyon leaves is characterised by the property of forming, in contact with some bases, very soluble combinations. These, when treated with quinine salts, generate by double decomposition an ordinarily insoluble quinine-resin salt. This compound is promptly decomposed by the stronger acids, and is peculiarly soluble in ammonia.

When coarsely ground Eriodictyon leaves are percolated with water, a moderately dark brown coloured and somewhat bitter percolate is obtained. On evaporating this to a syrupy consistence, and treating this residue with alcohol, a light brown liquor and dark brown pasty residue results. The alcoholic solution has

acquired all of the peculiar bitterness of the percolate, whilst the pasty mass is practically tasteless. On treating this residue, or the original one resulting from the percolate, with potassium carbonate, an ammoniacal odour becomes quite pronounced. The addition of an acid to the dark brown mass, separated by alcohol, yields a profuse precipitate which is wholly but slowly dissolved to a dark brown solution by a large volume of water.

When the residuary leaves in the percolator are treated with water rendered strongly alkaline with ammonia, the first portion of the new percolate is very turbid, but becomes clear as the free ammonia descends into the precipitate. A considerable proportion of alkaline menstruum is needed to extract the colour-giving substance wholly. Evaporation of the percolate to a syrupy residue, and treatment of this with alcohol, yields a brown-red, bitter solution, and a copious dark brown precipitate. The solution and precipitate are in all respects identical with those obtained in the first percolation. The alcoholic solution contains the quinine precipitant in union with ammonia as an acid salt. The addition of water causes a dense milkiness, and acidulation with a strong acid precipitates the acid resin in curdy flakes. Excess of ammonia added to the alcoholic solution causes no precipitate, but the colour is very perceptibly deepened. On exposure of this mixture the excess of ammonia and much of the alcohol is dissipated, whilst a red-brown tarry acid ammonium salt deposits.

The precipitate given by alcohol appears to be an acid ammonium salt of the tasteless and non-quinine precipitating acid component of the leaves. When treated with water an inconsiderable proportion dissolves, leaving a large residue. Addition of ammonium or potassium carbonate and much water dissolves this wholly to a deep red-brown solution. The tinctorial power of this body is its most remarkable property. In its natural condition it is very probably in great part an acid anhydride, which is dissolved by aqueous solutions of alkalies and their carbonates. Under these circumstances no perceptible effervescence occurs when carbonates are employed. With the use of monocarbonates the solution contains bicarbonate, showing that the reaction is similar to that resulting in similar cases with analogous matter from other plants. On adding ferric chloride to such a solution, no precipitate at first appears. The continued addition of it however causes an abundant brown-black precipitate, soluble to a great extent in an excess of the reagent. It is also partially soluble in ammonia with a deep

red-brown colour. The addition of ammonia to a mixture containing excess of ferric chloride gives a precipitate utterly insoluble in ammonia. These results show that the various proportions of the tinctorial body appended to basic radicles determine the degree of solubility and insolubility of the compound. As already stated strong acids occasion a precipitate when added to alkaline solutions of this substance. Boiling of the mixture with dilute sulphuric acid appears to generate a new insoluble substance, readily soluble in alcohol and in ammonia, with intense red-brown colour. The solutions are characteristically tasteless.

The tarry acid ammonium salt of the quinine precipitant is readily and perfectly soluble in a sufficiency of alcohol. It is also readily and completely soluble in excess of ammonia. When treated with ether, a portion of the acid component is dissolved. A correspondingly less acid salt, however, remains undissolved. The action of chloroform is precisely similar in this respect. The acid resin thus separated is freely soluble in these menstrua. It remains as a green-yellow transparent mass after the spontaneous volatilization of the respective solvents. It reacts with monad monocarbonates, converting them into bicarbonates. It is readily soluble in bicarbonates, evolving no carbonic anhydride except on heating. When the solution obtained with sodium bicarbonate, for instance, is evaporated, a portion of the resin separates and is readily taken up by ether or chloroform. Alcohol, however, dissolves an acid sodium salt of the resin.

Treatment of Eriodictyon leaves with alcohol, dilute or strong, wholly removes the quinine precipitant. But this method of isolating it is neither economical nor practical.

A fluid extract of *Yerba Santa* thoroughly miscible with simple syrup is a desideratum. The author has heretofore employed ammonia as a part menstruum in preparing syrup of *Yerba Santa*. In order to secure a complete extraction an excess of ammonia is essential. It is difficult, however, to adjust a proper proportion, and hence the ammonia may preponderate in the finished syrup. The author would suggest a fluid extract of *Yerba Santa* for preparing the syrup to be used in the proportion of one fluid ounce for one pint of the syrup. This fluid extract is merely an alcoholic solution of normal potassium eriodictyonate uncontaminated by the dark coloured non-quinine precipitant. The following is the process recommended :—

Yerba Santa leaves, coarsely ground	.	16 troy ounces.
Potassium Carbonate	3	,,
Ammonia Water,		
Alcohol,		
Water . .	of each sufficient to make one pint.	

Mix the ammonia water and water in the proportion of one measure of the first and seven measures of the second. Mix the *Yerba Santa* with 8 fluid ounces of this mixture, and pack it firmly into a cylindrical glass percolator. After due maceration pour on the menstruum until 3 pints of percolate has slowly passed. To this add the potassium carbonate, and evaporate it until a pasty residue is left. Stir this well with 8 fluid ounces of alcohol, gradually added; let the pasty precipitate subside, and decant the supernatant liquor. To the residue gradually add 8 fluid ounces of alcohol, as before; pour this mixture upon a strainer, and force the liquid out. Should this second extraction measure more than is needed to complete the intended volume of fluid extract, dissipate the excess of alcohol by appropriate means; unite the residue with the first extraction, set the mixture aside for twenty-four hours, and decant the clear fluid extract from the scanty crystalline deposit meanwhile formed.

Kalmia Angustifolia. T. 1. Deibert. (*Amer. Journ. Pharm.*, September, 1886.) This small shrub is known as dwarf-laurel or lambkill, and is reputed to be poisonous to sheep. The author collected several pounds of the leaves which, on drying by exposure to the air, lost 64 per cent. in weight; the loss of air-dried leaves at an elevated temperature was 10 per cent. They were coarsely powdered, boiled with water, the decoction precipitated with basic lead acetate, the filtrate treated with H_2S, again filtered and evaporated; the soft extract was treated with alcohol, and the filtrate on evaporation yielded an extract-like mass in which minute crystals could be seen with a magnifying glass, and which, dissolved in water, yielded with ammonia and phosphomolybdic acid a beautiful blue colour. The mass probably contained arbutin.

Exhausted with benzin, the leaves yielded a soft, sticky extract, containing wax, resin, and fixed oil; it did not give a blue colour with ammonia and phosphomolybdic acid. The leaves, previously treated with benzin, gave an alcoholic tincture containing a considerable amount of tannin, and subsequently yielded an infusion in which gummy matters were present. The air-dried leaves yielded $3\frac{1}{2}$ per cent. of ash.

Plantago Major. D. Rosenbaum. (*Amer. Journ. Pharm.*, September, 1886.) Petroleum benzin extracted 4 per cent. of wax and chlorophyll, the extract fusing at 83° C. Ether dissolved 4·4 per cent. of resin and chlorophyll. The alcoholic extract weighed 10 per cent., 6 per cent. being soluble in water, this portion contained a large amount of sugar; the remaining 4 parts were dissolved by ammonia. The soluble matter taken up by water weighed 13 per cent., 7·2 of which was insoluble in 66 per cent. alcohol. Soda solution dissolved 6 per cent., and diluted acid 10 per cent., the latter containing a notable quantity of calcium oxalate. The bleached lignin weighed 35·5 per cent. The powdered leaves contained 8 per cent. of moisture and yielded 12·85 per cent. of ash, 2·85 of which was soluble in water and 9·50 soluble in hydrochloric acid. Tannin, saponin, alkaloid, etc., were not found.

Damiana. F. W. Pantzer. (*Amer. Journ. Pharm.*, February, 1887.) The leaves of *Turnera aphrodisiaca, Ward*, have been subjected to a chemical analysis by the author. The air-dried leaves lost in a drying chamber 11 per cent. of moisture and volatile oil, and yielded 9·68 per cent. of ash. Petroleum benzin extracted 7 per cent. of volatile oil, fat, wax, and resinous matter. Alcohol of 80 per cent. yielded 20 per cent. of dark green extract, containing tannin, two tasteless resins, and extractive. Water dissolved 16 per cent. of mucilaginous and extractive principles, and by distillation with water, $\frac{1}{2}$ per cent. of an amber-coloured volatile oil was obtained, having an aromatic odour and a warm, camphoraceous, and bitter taste. Alkaloids and glucosides were not observed.

Orthosiphon Stamineus, s. Ocymum Grandiflorum. Dr. van Hallie. (*Pharm. Zeitung*, 1886, 376.) This plant is indigenous to India, Java, and the Nicobar and Philippine Islands. The pale green leaves have purplish petioles and veins, and on both sides of the blade prominent oil-glands. The author obtained from the dried leaves a small quantity of volatile oil and of a crystalline glucoside. This *orthosiphonin* has a bitter and afterward sweet taste, is freely soluble in absolute alcohol, less soluble in weak alcohol and in chloroform, almost insoluble in absolute ether, and is precipitated by plumbic subacetate, but not by the acetate or by tannin. It does not contain nitrogen.

Eupatorium Ayapana, and other Species. J. M. Maisch. (*Amer. Journ. Pharm.*, March, 1887.)

Eupatorium ayapana is at present met with in European commerce (*Pharm. Zeitschrift. für Russland*, 1886, 707). The drug

consists of dried leaves, about 8 cm. long and 15 mm. ($\frac{2}{3}$ inch) broad; brown, smooth, oblong-lanceolate, the margin somewhat revolute. Two prominent lateral veins branch off from the midrib near the base, and extend parallel with the margin to the apex. The odour is slight coumarin-like, and the taste mildly astringent and aromatic. The leaves are recommended against indigestion, pectoral complaints, and in cholera, and were used for similar purposes in Europe in the early part of the present century.

The shrub is indigenous to Brazil, but is now found throughout tropical America and in India. L'Heritier and Martius reported also its efficient use in Brazil against snake bites, the leaves being employed externally and internally.

Eupatorium villosum is indigenous to Jamaica and the Bahamas, where it is largely used as a tonic; also as a substitute for hops in beer. *Eup. amarissimum* is mentioned as being employed in a similar way; the Mexican Pharmacopœia mentions *Eup. collinum*.

Note on Catha Edulis. B. H. Paul. (*Pharm. Journ.*, 3rd series, xvii. 1009.) The author's attempts to detect caffeine in the leaves of this plant proved unsuccessful. The leaves contain a form of tannic acid analogous to that met with in tea, coffee, maté, and coca leaves. The author is inclined to attribute the stimulating effect produced by the leaves when chewed to ethereal oil or some other aromatic and volatile constituent; but to determine this point a larger supply of the leaves would be required.

Application of the Microscope in the Examination of Maté and Tea. E. Collin. (*Pharm. Journ.*, 3rd series, xvii. 163; from *Journ. de Pharmacie d'Anvers.*) This paper describes the means of detecting by the microscope the adulteration of tea and maté, and also points out the features by which coca leaves may be recognised under the microscope. The most frequent adulterants of tea leaves, according to the author, are the leaves of *Epilobium angustifolium*, *Fraxinus excelsior*, *Sambucus nigra*, *Laurus nobilis*, *Prunus spinosa*, *Salix alba*, and *Populus nigra*, none of which, however, present the numerous sclerenchymatous phytocysts which are present in the tea leaf. The leaves of maté are said to be often adulterated with those of *Myrcia acris*, which are easily recognised by the presence of pellucid oil-clots in the leaves.

Note on a Spurious Chiretta. W. Elborne. (*Pharm. Journ.*, 3rd series, xvii. 903.) A portion of the false chiretta examined by the author proved identical with that described by Prof. Bentley (*Ophelia angustifolia*); the remainder, however, presented a marked difference, inasmuch as it contained a well-developed

pith, similar to the official variety, although from its want of bitterness it was evidently spurious. The British Museum authorities have referred it to *Ophelia alata*.

Mutisia Viciæfolia. L. Naudin. (*Journ. d'Hygiène*, 1886.) This plant is stated by the author, on the authority of Dr. Sace, of Cochabamba, Bolivia, to enjoy the reputation of curing phthisis and pulmonary diseases in general. The plant is indigenous to the western part of South America, from Chili to Peru, and belongs to the *labiatiflorał Compositæ*, which are confined chiefly to South America, and the leaves of which are usually mucilaginous, somewhat bitter, and occasionally more or less aromatic. A number of species are locally used as expectorants.

Leucanthemum Vulgare. J. S. Howe. (*Boston Med. and Surg. Journ.*, March 10, 1887, 227. From *Pharm. Journ.*) Attention is directed by the author to the poisonous effects of the common moon daisy (*Leucanthemum vulgare*) upon certain individuals, chiefly those who suffer similarly from the poison of *Rhus Toxicodendron*. The symptoms produced are those included in the description of dermatitis venenata, and consist in the troublesome heat and itching and the formation of vesicles, followed by desquamation of the cuticle. It is curious that this action does not appear to have been noticed in this country, where the plant is so common, although *Anthemis Cotula* is known to cause somewhat similar symptoms.

Therapeutic Properties of Pulsatilla. G. Smith. (*Pharm. Journ.*, 3rd series, xvii. 606.) Pulsatilla is highly recommended by the author as a valuable remedy in acute orchitis and epididymitis, the relief given in such cases being so rapid that it is unnecessary to employ morphine to subdue the pain, the heat and swelling subsiding more rapidly than under any other drug.

Acacia Fistula. Dr. Schweinfurth. (*Pharm. Journ.*, 3rd series, xvii. 414.) According to the author the *Acacia fistula*, which grows in dense groves in Nubia, is known among the natives as the "whistling tree." It owes its name to the fact that a gall insect selects for the site of its operations the ivory-white shoots, which the development of the larva distorts and causes to swell at the base into a bladder-like gall, about one inch in diameter. The insect upon emerging leaves a circular hole, and the wind playing upon the shoot is said then to produce a flute-like sound.

The Structure and Functions of Lathræa Squamaria. G. Massee. (*Pharm. Journ.*, 3rd series, xvii. 268.) The author considers this plant to be a saprophyte rather than a parasite,

especially when old, since the discs upon which its parasitism depends are frequently very rare, their presence or absence depending upon the position in which the plant finds itself. A liquid of an acid character appears to be secreted by the stipulate glands of the scale-like leaves, and is found in the curious intercellular spaces of the leaves. By this or some other secretion, the roots of other plants with which the scales of the *Lathræa* come into contact are softened to a pulp, and evidently utilized as food by the plant. The author attributes the darkening of the plant during drying to the combination of the tannin present in the plant with iron, which also exists in the plant in the ferrous state. That it is due in some degree to oxidation appears evident from the fact that if immersed in sulphurous acid the plant retains its white appearance. According to the author, if immersed in concentrated solution of ammonia, it changes to a bright yellow.

Composition of Bokhara Clover (Melilotus leucantha.) J. M. H. Munro. (*Field*, 1886.) The plants from which the samples were cut were about five feet high and in full flower; the flowering branches and the upper portions of the leafy branches were selected for analysis:—

	Fresh Plant.		Dry Matter.	
Water.	79·18		—	
Ash	1·66		7·96	
Light Petroleum Extract (Essential Oil, Fatty Oil, and altered Chlorophyll).	0·43		2·07	
Ether Extract (Chlorophyll and Resin) . . .	0·35		1·70	
Absolute Alcohol Extract .	2·82		13·55	
True Albuminoids . .	2·85		13·67	
Digestible Cellulose . .	5·53		26·58	
Lignin and Incrusting substances	0·22	crude fibre, 5·50	1·07	crude fibre, 26·42
Indigestible Cellulose. .	5·28		25·35	
Sugar, Dextrin, and other soluble Carbohydrates; Amides, Nitrates, and other non-albuminoid nitrogenous substances .	1·68		8·05	
	100·00		100·00	
Total Nitrogen . . .	0·56		2·71	
Albuminoid Nitrogen .	0·45		2·19	
Non-albuminoid Nitrogen .	0·11		0·52	

The three extracts mentioned in the analysis were prepared by using the solvents in succession; the light petroleum extract deposited crystals, probably of coumarin.

Thuja Occidentalis. M. Houdé. (*Répertoire de Pharm.*, August, 1886, 374.) Attention is called to the properties of *Thuja occidentalis*, which has long been used by homœopaths in the treatment of syphilitic growths and warts. The author states that it is now given in France with equal success by allopaths, in doses of thirty drops of the fluid extract, night and morning.

Composition of Goat's Rue (Galega officinalis). J. M. H. Munro. (*Field*, 1886.) This leguminous plant has been recently recommended as a forage crop. A sample, cut in full flower, was analysed with the following result:—

	Dry Matter.		Fresh Plant.	
Water	—		72·48	
Ash insoluble in water	7·09		1·95	
,, containing sand	0·48			
,, ,, Calcium Carbonate	4·97	9·19		2·53
,, ,, ,, Phosphate	0·86			
Ash soluble in water	2·10		0·58	
,, containing Potash (K_2O)	0·70			
Light Petroleum Extract (Oil and altered Chlorophyll)	2·02		0·56	
Ether Extract (Resin and Chlorophyll)	3·43		0·94	
Absolute Alcohol Extract	10·94		3·01	
True Albuminoids	11·94		3·28	
Digestible Fibre	12·78		3·52	
Lignin and incrusting substances	3·76	crude fibre, 17·65	1·03	4·85
Indigestible Cellulose	13·89		3·82	
Starch, Mucilage, Dextrin, Sugar, Vegetable Acids, Gum, non-albuminoid nitrogenous substances, etc.	32·05		8·82	
	100·00		100·00	
Total Nitrogen	2·42		0·666	
Albuminoid Nitrogen	1·91		0·526	
Non-albuminoid Nitrogen	0·51		0·140	

Treated with various solvents in succession, the dried rue yielded the following percentages of extracts: light petroleum, 2·02; ether, 3·43; absolute alcohol, 10·94; water, 21·56; sodium hydrate, of 0·1 per cent., followed by hydrochloric acid of 1 per cent., 30·43, undissolved, including digestible cellulose and woody fibre, 31·62: 100·00.

Piscidia Erythrina. F. S. Halsey. (*Therapeutic Gazette*, August, 1886, 442.) The author describes several cases in which he has used this drug with success. He remarks: "I have found it to be an excellent hypnotic and anodyne, and no one case in which I employed it has it failed to relieve pain and induce sleep. One great advantage connected with it is that patients after taking it awake with none of the unpleasant after-effects which opium induces."

Vitis Vinifera. A. Hilger and L. Gross. (*Landw. Vers. Stat.*, 1886, 170–196. From *Amer. Journ. Pharm.*) The authors have examined the organic constituents of different parts of the grape vine. The sap exuding from cut vines contains sugar, inosit, a mucilaginous body, succinic acid, tartrates, and citrates. The young shoots and leaves contain potassium bitartrate, calcium tartrate, tartaric and malic acids, quercetin, tannin, starch, gum, glucose, saccharose, inosit, oxalic and glycolic acids, an ether-soluble substance, ammonium salts, and calcium sulphate and phosphate; in autumn malic acid and inosit are absent. The tendrils contain, besides much pectin compound, sugar, potassium bitartrate and calcium oxalate. The fruit contains tartaric and malic acid, free and combined with potassium and calcium, tannic, succinic, glyoxylic, and glycolic acids, inosit, dextrose, levulose, albuminoids, and traces of quercitrin and quercetin.

Parthenium Hysterophorus. (*Amer. Journ. Pharm.*, September, 1886.) This tall annual, which grows as a weed in the West Indian Islands, the Bahamas, and southward to Northern Patagonia, has recently attracted attention as a febrifuge. Dr. J. R. Tovar, of Havana, reported the successful treatment of neuralgia and of intermittent fever with an alkaloid, *parthenine*, given in doses of 0·1 gm. Dr. Ulrici (*Deutsch Med. Wochenschr.*) states that the plant is known in Cuba as *escoba amarga* or *coquitilla*, and contains uncrystallizable *parthenic acid*, the crystallizable alkaloid *parthenine*, and four other alkaloids; parthenine is the active principle. Dr. Guyet (*Gaz. Méd.*) states that parthenine is a complex substance, amorphous, in black shining scales, freely soluble in water, and is efficacious against neuralgia, but useless as an antipyretic.

The plant belongs to the order *Compositæ*. The stem is two to four feet high, stiff-hairy, furrowed and branched; the leaves are alternate, bipinnatifid, with the lobes obtuse, and the petiole winged; the upper leaves are pinnatifid or entire; the flower heads are in spreading panicles, hemispherical, about $\frac{1}{6}$-inch broad; the akenes are compressed and have a pappus, consisting of two

oblong, blunt scales. The entire plant is more or less covered with short hairs. It is known in Jamaica as *wild wormwood*, *whitehead*, *mugwort*, and *broombush*.

Cannabis Indica. F. Roux. (*Journ. de Pharm. et de Chim.*, February 1, 1887.) The author finds that the active part of Indian hemp is the resin. The alcoholic extract produces exciting properties, whilst the ethereal extract is inert.

A New Constituent of Indian Hemp. E. Jahns. (*Archiv Pharm.*, 1887, 479.) The author reports that he has separated from Indian hemp a base which he has identified as choline, and points out that this result corresponds fairly well with the statements of previous workers, except in respect to the crystallizability of Dr. Hay's alkaloid and its solubility in ether. The quantity of choline obtained by the author from different samples of Indian hemp varied considerably, but amounted at the most to one-tenth per cent.; it was also found to be present to a less extent in commercial "cannabinum tannicum."

Mitchella Repens. E. Breneisér. (*Amer. Journ. Pharm.*, May, 1887.) An analysis of this plant was made by the author with the following results: Volatile oil was found to be absent. Petroleum benzin dissolved 1·180 per cent., consisting of chlorophyll and wax, the latter saponifiable by alcoholic potash solution. Ether took up 1·400, of which ·240 was soluble in water, and ·940 soluble in alcohol. The aqueous solution contained a principle precipitated by tannin and by picric acid, but neither alkaloid nor glucoside. The resin taken up by alcohol was soluble in potash, and this solution yielded nothing to benzin, benzol, or chloroform; the liquid obtained on treating the resin with acidulated water gave precipitates with tannin and picric acid, but yielded nothing to benzin, benzol, or chloroform. The alcoholic extract of the plant amounted to 3·800 per cent., of which 3·440 was soluble in water, and this contained 1·630 of glucose, estimated by Fehling's solution. Water now dissolved from the plant 20·699 per cent., from which alcohol precipitated 5·140 of mucilaginous matter and ·536 of inorganic compounds; the further addition of alcohol precipitated 3·679 per cent. of dextrin and allied carbohydrates; 6·009 per cent of glucose was found; also a saponin-like principle (precipitated by baryta, and frothing in aqueous solution). Dilute soda solution dissolved 2·360 albumen, 1·840 other organic matter, and ·120 inorganic matter; total, 4·320 per cent. Dilute hydrochloric acid took up 4·418 organic and 2·820 inorganic matter, total, 7·238. Treatment with chlorine

occasioned a loss of 11·784 per cent.; the residue now weighed 33·460, and after deducting 11·240 for moisture in the drug, the loss not accounted for by the analysis amounts to 4·879 per cent. The ash of the air-dry plant weighed 5·440 per cent., only ·360 of which was soluble in water; the ash consisted of carbonates, chlorides, sulphates, and phosphates of sodium, potassium, calcium, magnesium, and iron.

Eupatorium Perfoliatum. O. F. Dana. (*Amer. Journ. Pharm.*, May, 1887.) The percentages of extract obtained from this plant by the successive treatment with different solvents has been ascertained by the author. The results are as follows: moisture, 10·50; extract by petroleum benzin 3·80, by ether 4·60, by alcohol 33·80, by water 24·80, by alkali 5·80, cellulin 11·70; loss by treatment with chlorine, etc., 5·00. The ash amounted to 8·3 per cent. Crystals were observed in the benzin extract, and were prepared in larger quantity, by exhausting the plant with alcohol, treating this extract with ether and the ethereal extract with benzin.

The editor of the above paper adds that these crystals were isolated in the same manner by G. Latin (abstract, *Year-Book of Pharmacy*, 1881, 145), who succeeded in obtaining them in a pure state, and showed them to be wax or possibly resin. The bitter principle has been obtained by Latin in a pure or nearly pure condition, and found to be a glucoside; he states it to be soluble in ether, while according to Parsons (*Amer. Journ. Pharm.*, 1879, 342), it is insoluble in the menstruum named.

Euphorbia Drummondi. J. Reid. (*Austral. Med. Gaz.*, Oct., 1886. From *Amer. Journ. Pharm.*) *Euphorbia Drummondi*, a native of West Australia, is stated to possess valuable anæsthetic properties, and to contain an alkaloid which the author called *drumine*. A tincture is prepared of the plant or milk juice with alcohol containing hydrochloric acid, then concentrated by distillation, precipitated by ammonia, and filtered; the residue is dissolved in dilute hydrochloric acid, decolorized by animal charcoal, and evaporated, when boat-shaped, colourless crystals are obtained. The alkaloid is stated to be almost insoluble in ether, but freely soluble in chloroform; also in water. A four per cent. solution of the alkaloid dropped into the eye produced local insensibility without appreciably dilating the pupil. A subcutaneous injection of three grains showed no effect in a cat beyond local anæsthesia; but a larger dose by the mouth caused paralysis of the limbs and difficult breathing, and strychnine failed to produce muscular contraction. Applied to the tongue or nostrils, loss of taste was

observed, but small doses swallowed were not followed by any perceptible constitutional symptoms. The author recommends the alkaloid more particularly in small operations, sprains, and local irritation.

J. M. Maisch adds to this paper that recent experiments made by Dr. A. Ogston (*Brit. Med. Journ.*, Feb. 26, 1887) demonstrate that drumine has little if any effect as an anæsthetic. Instilled into the conjunctiva it produced no anæsthesia and had no perceptible effect on the pupil. Used hypodermically on four persons in doses of four and six minims of a four per cent. solution, a sharp and aching pain, followed by swelling and tenderness of the spot, was produced, but no anæsthesia. The material employed was received directly from the author.

Euphorbia Helioscopia. Dr. Baudry. (*Bull. Méd. du Nord.* From *Amer. Journ. Pharm.*) A case of severe ulceration is reported by the author resulting from the application of a poultice of the bruised plant. The milk juice is stated to be employed by peasants as a cure for warts.

This annual, which belongs to the group of *Tithymalus*, is indigenous to Europe and naturalized in some parts of the United States, in fields and waste places, and is characterized by its terminal umbel-like inflorescence, its obovate, finely serrated, and more or less wedge-shaped leaves, and its smooth, almost three-lobed fruit, containing coarsely reticulated, brownish seeds. With some botanically allied species it was formerly employed as a hydragogue cathartic, and is regarded as being less acrid than many other species of the same genus.

Euphorbia Peplis. Dr. Afonsky. (*Russk. Meditz.*, 1886. From *Amer. Journ. Pharm.*) This plant is said to be used as a domestic remedy in hydrophobia, and has been used successfully by the author as a preventive, the drug being given in the form of powder after cauterizing the wound with hydrochloric acid, and using also pilocarpine hypodermically.

Equisetum Hyemale. F. J. Young. (*Amer. Journ. Pharm.*, September, 1886.) This plant is employed as a remedy in dropsical affections. The author has known it to be prescribed in infusion together with digitalis and potassium acetate; but from the results of his analysis he comes to the conclusion that the effects of the medicine would have been the same if the equisetum had been omitted. The air-dry drug yielded 18·2 per cent. of ash, consisting mostly of silica. Petroleum benzin exhausted from the powder 1·4 per cent. of a brownish-green, semi-liquid fixed oil,

which was readily saponified, and was soluble in ether, chloroform, and carbon bisulphide. Ether now took up 5·33 per cent. of a green, semi-solid resin, soluble in chloroform, benzol, and absolute alcohol, and imparting to water, or acidulated water, a greenish colour, but no decided taste. Alcohol dissolved from the residuary powder 1·60 per cent. of resinous extract, free from tannin, alkaloid, and glucoside. The powder gave to water 4·84 per cent. of extract, of which 2·25 per cent. was shown to be sugar by Fehling's solution, and 0·60 per cent. of mucilaginous matter was left undissolved by alcohol of 66 per cent.

Anacharis Canadensis. M. Brandes. (*Med. News*, Aug. 28, 1886.) The cultivation of this plant is stated by the author to have caused the disappearance of malaria and diarrhœa in a marshy district where these diseases formerly appeared yearly in a sporadic or epidemic form.

Polygonum Hydropiper. C. J. Rademaker. (*Amer. Journ. Pharm.*, August, 1886.) A further contradiction is given by the author to the statement by H. Trimble and H. J. Schuchard, that the principle isolated by him from *Polygonum hydropiper*, and described by him under the name of polygonic acid, was a mixture of tannic and gallic acids (see abstract, *Year-Book of Pharmacy*, 1886, 210).

Anona Muricata. (*Chemist and Druggist*, August 14, 1886.) Almost all parts of the plant have a medicinal value. A decoction of the root is used as an antidote for fish-poisoning, and the bark serves as an astringent. The leaves are useful in softening abscesses, and as the seeds in the fruit contain tannin, they are employed as an astringent, or a wine can be prepared from them by fermentation, which is said to be beneficial in cases of diarrhœa. Several kinds of *anona*, such as *polyalthia*, *xylopia*, *artobotrys*, are also highly prized as medicines. Most of these plants have a sharp aromatic odour and taste. The flavour of the fruit resembles that of oil of turpentine.

Fabiana Imbricata. C. Ochsenius. (*Chemist and Druggist*, March 19, 1887. From *Archiv der Pharm.*) The author gives particulars concerning the new Chilian drug *Fabiana imbricata*, which has recently been introduced into Europe and the United States. The plant yielding the drug is a woody shrub, flourishing in the dry mountain regions of the Chilian Republic, especially in the central and southern provinces. The plant belongs to the tamarisks, and, during the flowering period, has the appearance of an erica. It does not generally attain over three and a half

feet in height; but in some cases—for instance, in the neighbourhood of Elqui, in Coquimbo—it has been found to grow fourteen feet high. The wood is much used for manufacturing small articles, such as spoons. In Chili the leaves and twigs of the shrub have long been employed in distoma hepaticum zeder, a liver disease to which cattle grazing on moist meadows are greatly subject. For the same disease the leaves of the *Boldoa fragrans*, are frequently administered. These leaves are much esteemed in Chili as a remedy for syphilis, hydrophobia, etc., and have recently been recommended by Chilian doctors for affections of the human liver.

Hydrangea Arborescens. C. S. Bondurant. (*Amer. Journ. Pharm.*, March, 1887.) The following is a summary of the results of the author's analysis:

Extracted by—	Per cent.
Petroleum Spirit: Fixed and Vol. Oil	2·28
Ether: Glucoside and Resin	1·57
Absolute Alcohol: Glucoside and two Resins	2·31
Distilled Water: Mucilage, Saponin, and Sugar	9·52
Dilute Soda: Mucilage and Albuminoids	8·37
Dilute Hydrochloric Acid; Calcium Oxalate	1·40
Starch	7·28
Lignin	4·83
Ash	3·41
Cellulose Moisture, etc., undetermined	59·03
Total.	100·00

No tannin was found to be present in the drug, contrary to statement made by Mr. Barr.

The author proposes the name *hydrangin* for the crystallizable glucoside he obtained from both the alcoholic and ethereal extracts. It somewhat resembles æsculin, but differs from it by its ready solubility in ether, its insolubility in strong hydrochloric acid, and by its not being precipitated by silver nitrate, mercuric chloride, nor neutral lead acetate. A characteristic reaction for hydrangin is obtained on dissolving it in sulphuric acid, and adding a small crystal of potassium bichromate, when a dark purple colour is produced, which, after some minutes, fades to violet; and on addition of a few drops of water an olive green is produced, which gradually fades.

New Adulterants of Saffron. Dr. Niederstadt. (*Pharm. Journ.*, 3rd series, xvii., 688.) The author reports on a sample of saffron which he found to be adulterated with tiny splinters of

sandal wood. If the sophisticated saffron be repeatedly washed with water, and the washings allowed to stand, the minute splinters of sandal wood that separate out may be identified under the microscope. His examination of Barcelona and Orleans saffron shows that the latter is considerably superior to the former. From the best Orleans saffron he obtained only 5·84 per cent. of mineral matter and 14 per cent. of water. In three samples of Barcelona saffron he found more than 14 per cent. of mineral matter and from 15 to 17 per cent of water. He also found the saffron adulterated with chloride of sodium and glycerin, probably added to prevent the saffron losing weight by drying. The glycerin may be recognised by pressing the saffron on bibulous paper or by the greasy feel of the saffron when rubbed between the fingers. Honey, which is also used as an adulterant, is less easily recognised, since the best saffron has been found to contain as much as 13 per cent. of a sugar resembling or identical with glucose.

Constituents of Stigmata Maydis. C. J. Rademaker and J. L. Fischer. (*Amer. Journ. Pharm.*, August, 1886.) The following shows the amount of the most important constituents of this drug:

	Per cent.	
Fixed Oil	5·25	Petroleum Spirit Extract.
Resin, Crystalline principle and Chlorophyll	2·25	Ether Extract.
Resin, Crystalline principle and Chlorophyll	3·25	Alcohol Extract.
Sugar, Gum and Extractive	19·50	Water Extract.
Albuminoids, Phlobaphene, etc.	3·50	From Alkaline Solution.
Salts and Extractive	5·50	From Acid Solution.
Cellulose	37·00	
Water	20·00	
	96·25	

Estimation of Santonin in Wormseed. F. A. Flückiger. (*Pharm. Journ.*, 3rd series, xvii., 449.) The estimation was conducted as follows:

Five parts of the raw material and one part of milk of lime were boiled for two hours in a considerable quantity of dilute alcohol, and the liquid poured off after cooling; this treatment was repeated at least twice more, and the alcohol was then distilled off from the united extracts. The residual liquid was then saturated in the cold with carbonic acid, filtered off from

the precipitate after standing some hours, and the filtrate evaporated to dryness. The residue was triturated with animal charcoal and alcohol of specific gravity 0·935, and the paste rinsed into a retort, where it was digested with a measured quantity of alcohol. After boiling, the contents of the retort were thrown on a filter, washed with hot alcohol, and the alcohol driven off from the filtrate, from which, after some hours, crystals of santonin separated.

The results obtained confirm the observation that the drug attains its greatest richness in satonin in the latter half of July and in August, immediately before flowering. After flowering it disappears. It appears also that the santonin only occurs in the parts above the soil, and not in the compact, sapless roots. It remains yet to be ascertained whether the small radical leafy shoots bearing no fruit, which the plant produces in addition to the flowering stems, contain any santonin.

Dalmatian Insect Powder. H. Semler. (*Amer. Druggist*, January, 1887.) The Dalmatian insect powder, *Chrysanthemum cinerariæfolium*, B. et H., known also by its Dalmatian name *buhach*, has been cultivated for several years past on a large scale in certain portions of California, the cultivators being Dalmatians who have settled there.

The best soil for this plant is loam with a large proportion of sand. This kind of soil is particularly suitable for sowing, but it should be well mixed with old dung. The seed itself is mixed with sand and distributed over the soil as uniformly as possible, after which the soil is raked to the depth of about half an inch, and then gently pressed by passing a roller over it. Until the plants spring up, the beds must be irrigated every evening, unless it rains. But great care must be taken not to overdo it, as the plant is very sensitive, throughout its whole life, towards undue moisture of the soil. After the plants have sprung up, they need not be watered more than twice a week. Weeds must be kept away until transplantation takes place, which occurs when the plant is about six inches high. It is then set out precisely like cabbage, about twenty inches distant from every neighbour, and afterwards needs no further attention.

Buhach is a biennial [?] plant, therefore it flowers in the year subsequent to that of sowing. The flowers must be cut off just when they are about to open, as they contain the largest amount of essential oil in this condition. The cut flowers must be carefully guarded against dampness, and must be dried in the shade,

never by exposure to the sun or to artificial heat. After the period of flowering is over, the plants are cut off four inches over the ground, reduced to powder, and this powder mixed with that of the flowers, in a proportion not exceeding 1 part of the former to 2 parts of the latter. The finer the mixed powder of herb and flower is, the more effective will it prove to be. If any one wishes to prepare the powder himself, and does not possess a suitable mill, he may use a mortar covered with leather. The quantity thus worked in a mortar should, however, not exceed about one pound, to avoid heating the powder. When the substance appears to be comminuted, it is transferred to a fine hair-sieve, and the refuse remaining on it put back in the mortar. It is very difficult to reduce the stems to powder in this manner, which is not a serious disadvantage, as the flowers are the most valuable portion of the plant. Insect powder should be preserved in glass or metallic vessels, which should be closed air-tight.

Insect powder may be used either in the form of dry powder, by fumigation, in the form of alcoholic extract, mixed with water, or in the form of infusion.

Carduus Marianus. G. Foy. (*Medical Press*, 1887, 492. From *Pharm. Journ.*) The author states that this plant is now being received with professional favour in France, where the tincture and alcoholic extract are both being prescribed. He remarks that the extract is a useful adjunct to aloes, since it possesses cholagogue properties.

The Pharmacognosy and Chemistry of Calabar Beans. P. Mac Ewan. (*Pharm. Journ.*, 3rd series, xvii. 641.) The author states that the cylindrical seed noticed by Mr. Holmes among commercial calabar bean in 1879, does not appear to have occurred in the market since that time. The commercial drug varies in colour between violet-black and coffee-brown, the former being the fully ripe seeds, and the latter probably immature. For assaying the seed it is best ground in a mill. The two varieties were found to contain 7·2 per cent. of moisture; the black yielded 3·1, and the brown seed 3·4 per cent. of ash. Petroleum ether extracted from the brown 0·2, and from the black 1·068 per cent. of a golden yellow thick oil, containing crystals of physosterin. Ether now extracted 0·36 per cent. of a yellow oil of agreeable odour, and containing a granular substance apparently different from physosterin. For estimating the alkaloid, the volumetric process, with Mayer's solution, failed to give reliable results, but the gravimetric method was more satisfactory. The author recommends the fol-

lowing process: exhaust the powdered bean, by digestion and percolation, with a mixture of alcohol 3 parts and water 1 part, evaporate the spirit, precipitate with lead acetate, remove excess of lead from the filtrate, render alkaline by ammonium carbonate, and dissolve the alkaloid with chloroform. The alkaloidal residue should be of a pale amber colour, and wholly soluble in dilute acid. Thus obtained, the alkaloid was found to be soluble in ether, and its iodohydrargyrate to be quite soluble in alcohol; for these reasons the author is inclined to doubt the existence, in calabar bean, of calabarine, announced by Harnack and Witkowski.

A Contribution to the Pharmacognosy of Strophanthus. W. Elborne. (*Pharm. Journ.*, 3rd series, xvii. 743.) The seeds of strophanthus at present occurring in commerce (supposed to be yielded by *Strophanthus Kombé*, the Kombé arrow poison) have recently been examined and reported upon in a paper constituting a valuable contribution to the pharmacognosy of this poisonous drug, which latter has recently come into extensive use as a valuable remedy in affections of the heart. The plant is a native of tropical Africa, and belongs to the natural order *Apocynaceæ*; it is a woody climber growing in the forest, both of the valley and the hills, and found at various places between the coast and the centre of the continent above the Victoria Falls and the Zambesi; the fruits, consisting of follicles from 8 to 10 inches in length, contain about two hundred greenish brown seeds, to which latter are attached plumose, hairy appendages presenting a very beautiful and characteristic appearance; the ripe seeds, freed from the comose hair, have been used by the native tribes from a remote period for the preparation of an arrow poison, the latter being prepared by bruising the seeds in a mortar and mixing into a paste with water, with which the arrows are smeared and the poison allowed to dry on. Game wounded with an arrow thus poisoned dies at once, seldom being able to escape more than a hundred yards; the flesh, except in the immediate proximity of the wound, may be eaten without evil effects.

The seeds and hairs of strophanthus hispidus were examined in France by E. Hardy and N. Gallois, who found in the seeds a crystalline active principle, neither of a glucosidal nor alkaloidal nature, which they named "strophantine," soluble in water and in alcohol, but insoluble in ether, chloroform, and benzol: and in the hairs they found a crystalline alkaloid, which they termed "ineine," not possessing the same physiological action as strophantine. Prof. Fraser stated that he has isolated from the seed of *Stro-*

phanthus Kombé 8–10 per cent. of a crystalline glucoside, which he has termed "strophanthin."

The author in his investigation of the seed failed to obtain more than 4 per cent. of an amorphous glucosidal active bitter principle, soluble in water and in alcohol, insoluble in ether, chloroform, and petroleum ether. Furthermore, the hairs of the seed which he examined contained no trace of alkaloid, a fact which has been subsequently confirmed. The following is a *résumé* of the analysis of the dried seed:—

		Per cent.
I.	Petroleum Ether extracted Fixed Oil . .	20·8
II.	Ether extracted Chlorophyll and Fat . .	·9
III.	Absolute Alcohol extracted Bitter Glucoside	1·5
IV.	Water extracted Bitter Glucoside . . 2·9 (1 in 70,000 of water imparts a decided bitterness.)	4·4
	Albuminous matters	19·6
	Insoluble residue	54·3
		100·0

Strophanthus seeds contain an extremely bitter glucosidal active principle, intimately combined with an excessively large quantity of albumen, which latter is of such a nature that from aqueous solution basic acetate of lead, tannin, mercuric chloride, or the addition of two volumes of absolute alcohol, only partially precipitate it. Amylic alcohol is capable of removing the glucoside from aqueous extracts by agitation, but owing to the emulsion it forms with the albumen, the process of separation is very tedious. In reference to the rectified spirit tincture, that made by Fraser's revised process of 1 in 20 is a great improvement upon the original 1 in 8 strength, which latter left the marc in a very unexhausted state.

From experiments made upon the tincture by the revised process, the author found that the rectified spirit exhausted the seed of about 7·0 per cent. of extractive of an albuminous nature, leaving about 1·5 per cent. of the bitter principle in the marc; and further, that the loss of the latter would not be remedied by increasing the quantity of the menstruum, due to the coagulating effect the spirit exerted over a certain portion of the albumen with which that portion of the bitter principle was associated. By lowering the alcoholic strength of the menstruum it could readily be effected, yet not without the extraction of a corresponding large quantity of albuminous matter, which would prove highly objectionable, however, since the latter, by over-dilution, is, on

escape of the alcohol, very prone to decompose and develop a very fœtid odour.

The author is still engaged upon an extended investigation of this drug. The tincture of the seed at present used in pharmacy is prepared according to the following revised process (Fraser):— Reduce the seeds, freed from stalks and hairs, to a moderately fine powder, and dry the powder for twelve hours at a temperature of from 100° to 120° F. One ounce or one part of the powder is then packed in a percolator, and dry ether (free from alcohol and water) is added until the powder is saturated and the ether begins to drop into the receiver, when the percolation is arrested for twenty-four hours, after which it is allowed to proceed slowly until ten fluid ounces or ten fluid parts have been collected; the powder is then removed from the percolator and exposed to the air, or heated to 100° F. if necessary, to drive off the ether, any lumps being broken up, and the resulting dry powder is re-packed in the percolator, and allowed to macerate in contact with sufficient rectified spirit for forty-eight hours; after which rectified spirit is added until 20 fluid parts of the percolated tincture have been obtained.

Note on the Pharmacology of Strophanthus. H. D. Rolleston. (*Pharm. Journ.*, 3rd series, xvii. 761.) In trying physiological experiments with the various preparations of the drug, it was found that the ethereal extracts contained an active principle resembling that found in the alcoholic tinctures.

In all experiments with the ethereal extracts, the ether was got rid of, so as to avoid the fallacy and interference in results from the action of the solvent on the heart, for though acting in an opposite direction, viz., killing the heart in diastole, the presence of ether would render valueless, if not completely vitiate, any experiment.

The ethereal extract of the seeds was mixed with (distilled) water, and the mixture concentrated on a warm bath (temperature 30° C.); by this means the ether was got rid of, and drops of oil, coloured green with chlorophyll, were precipitated. On filtering, the bitter taste characteristic of strophanthin (Fraser, *Brit. Med. Journ.*, November 14, 1885) was present in the filtrate. The aqueous solution of the ethereal extract thus obtained, when given in small doses to frogs produced a slowing of the heart's beat with increased force, followed by a condition of systolic contraction with beats at intervals, superimposed singly, or in groups of two or three. In stronger doses the heart became tonically contracted,

with beats at intervals, passing into a condition of systolic rigour, with the ventricles pale and contracted, the auricle being usually contracted, but in some cases distended.

Given to dogs, it produced a marked increase in the force of the heart's beat and of the pulse, then slowing of heart's rhythm, with some evidence of increased arterial tension, then irregularity of the beat, a very constant form after a comparatively large dose being one large wave, followed directly by a small one, then a pause, in some cases groups of beats being seen. The heart eventually stopped in diastole, sometimes greatly dilated.

The ethereal extracts of the pericarps and hairs were also found to be active, though not to such an extent as the ethereal extract of the seeds; of the two former the pericarps were rather more active, *i.e.*, contained more of the active principle. The alcoholic tinctures of the seeds, pericarps, and hairs were found to be active.

At Professor Dunstan's suggestion experiments were tried with ethereal extracts prepared from anhydrous seeds with anhydrous ether. The same positive result was obtained as in the case of the ethereal extracts previously examined.

Specimens of the oils of white and green strophanthus, prepared by Helbing, were examined, and also found to be active.

It therefore appears that strophanthin is soluble in ether, at any rate when the oil is present, and that the ethereal extract is therefore of value; but the author refrains from expressing any opinion on the purely pharmaceutical question of whether or not ether should be used in preparing the tincture.

Note on False Strophanthus Seed. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xvii. 903.) The seeds reported upon are referred by the author to a species of *Kickxia*, probably *K. africana*. The seeds present an appearance as if the hairs of the awn were bent backwards. On careful examination, however, under a lens, it became evident that the seed itself was entire, and presented no point of attachment. On examining the end of the apparent awn, it was observed to present the appearance of having been broken off. It was obvious, therefore, that the apparent awn was really the hairy pedicel or funiculus of the seed. This curious feature is alluded to in Bentham's description of the genus in the words, "*Semina elongata apice ecomosa, basi aristam longissimam longissime retrorsum plumosam comam simulantem producta.*" On cutting the seeds across, the cotyledons were found to be irregularly folded or contortuplicate.

Strophanthus Seed. T. F. Hanausek. (*Pharm. Journ.*, 3rd series, xvii. 972, from *Pharm. Post.*) The author publishes an account of the anatomical structure of this seed. Although by the aid of the microscope strophanthus seeds may be distinguished from seeds of other genera, it is somewhat doubtful, according to Mr. Kirkby, who has examined several kinds of the seeds, whether any markedly distinctive microscopical characters occur by which the seeds of one species might be readily distinguished from another. The hairs of the seeds are swollen at the base, something like those of the nux vomica seed. The author considers that the reactions given with the seed by liquor potassæ and sulphuric acid are characteristic. With the former a transverse section of the seed shows the testa as a golden-brown line, the albumen colourless, and the embryo of a greenish canary-yellow. With concentrated sulphuric acid a fresh section of the seed shows the testa and hairs of a golden-brown colour, the albumen verdigris-green, then emerald-green, and the embryo first yellow, then greenish bronze coloured, then copper coloured, and finally, after one or two minutes, garnet-red or even blood-red. These observations refer to the Kombé seed of commerce, or greenish brown seed. It is stated by Mr. Lindsay, the curator of the Botanical Garden at Edinburgh, that this seed has produced plants identical in appearance with those obtained from the seed used by Prof. Fraser, but there is reason to suppose that this seed is derived from two species. Mr. Christy, in a very useful *résumé* of the available information concerning strophanthus in "New Commercial Plants," No 10, mentions that from three seeds sown, and apparently of the same species, two plants came up, one having smooth and the other hairy leaves. Mr. Lindsay also states that two different seedlings came up from some of the greenish brown seed recently sown by him.

A New Species of Strophanthus. J. M. Maisch. (*Pharm. Journ.*, 3rd series, xvii. 972.) The author directs attention to a new species of strophanthus, discovered near the Congo river, and which is now being cultivated in the Botanical Gardens at Breslau. The seeds are furnished with an awn which is feathery from base to apex. The seeds are poisonous, but it has not been ascertained whether the active principle is strophanthin. The flowers are much larger than those of *Strophanthus hispidus*, and the corolla lobes are much longer.

Adulterated Aniseed. C. L. Lochman. (*American Druggist*, May, 1887.) The author states that in every case in which he has planted Italian aniseed conium has come up mixed with it, although

such has not been the case where German aniseed was planted. He concludes from his examination that Italian aniseed contains as a rule 2·5 per cent., if not more, of conium fruits. He believes that the admixture probably arises from the fact that conium, like henbane, sometimes flowers and fruits the first year, and is thus overlooked. Under a good lens conium fruit, which closely resembles aniseed in colour, may be easily recognised by being glabrous and covered between the ridges with minute wrinkles. Aniseed, on the contrary, is covered with minute hairs.

The Soja Bean. J. Stingl and T. Morawski. (*Monatsh. Chem.*, vii. 176–190.) A very active diastatic ferment is present in the soja bean; this when acting on starch converts about two-thirds of it into sugar, about one-third into dextrin.

The soja bean contains only a very small quantity of dextrin; the extractive substance mistaken for dextrin consists of a mixture of sugars. These occur to the extent of about 12 per cent.

False Kola Nuts. E. Heckel and F. Schlagdenhauffen. (*Nouv. Rémèdes*, March and April, 1887; *Pharm. Journ.*, 3rd series, xvii. 802 and 884.) The authors describe a false kola nut, which they consider to be an intentional adulteration due to the increasing demand for kola nuts. It consists of the kernels of the seeds of *Heritiera littoralis*, a tree belonging to the same family as the kola, and extending from Australia and the Philippines to the east coast of Africa. Under the microscope the adulteration can be detected by the smaller size of the polygonal starch grains, which are only half the size of those of the true kola nut. In the entire state the kernel is easily distinguished by the fact that one of the cotyledons is hardly half the size of the other, fitting into the substance of the larger one, and that the shape of the seed is orbicular and flattened. It did not afford any trace of caffeine. The seeds contained about 5 per cent. of tannin, analogous to that of kola nuts, in which it is present in only half that quantity. The proportion of fatty matter in the false kola nuts is ten times as much as that in the true kola nut.

Examination of Pepper. C. Heisch. (*Analyst*, xi. 186–190.) This paper gives the results of analyses, including the determination of moisture, ash, starch, alcoholic extract, piperin, etc. The starch is estimated by boiling with 10 per cent. hydrochloric acid for three hours, and determining the amount of the sugar formed with the polarimeter. The organic matter in pepper should consist of not less than 50 per cent of starch, which is characterised

by the smallness of the granules. The presence of sand in ground pepper should be regarded as an adulteration.

Poivrette. J. Campbell Brown. (*Analyst*, February, 1887.) The substance known in the pepper trade as "poivrette," or 'pepperette," is now frequently used for the purpose of fraudulently increasing the weight and bulk of commercial pepper. It made its first appearance in Liverpool last summer, and now quite recently the author has met with it in between twenty and thirty retail samples of pepper.

Poivrette is a pale, slightly buff, or cream-coloured powder, resembling in the bulk the principal middle layers of the pepper-berry, when ground; and when mixed with pepper cannot be distinguished by the eye, nor even by the hand lens, from particles of pepper. In the earlier samples the coarser particles could be isolated by spreading the pepper on a stiff sheet of paper held in a nearly but not quite horizontal position; on tapping this with the finger tips, so as to make the larger particles jump gradually to the lower edge of the sheet, the poivrette particles could then be picked out, and easily distinguished from pepper by crushing them between the teeth. Recently, however, it has been so finely ground and sifted that it cannot always be partly separated in this way, although the toughness and hardness of the particles can always be distinguished by the teeth in a mixture.

Microscopic examination with a 1-6th or 1-8th objective, shows that it consists of pale, dense ligneous cells, some entire and marked with linear air spaces, some torn and indistinct.

Poivrette comes from Italy. The author's microscopical and chemical examination establishes the closest resemblance between this substance and olive stones.

Fictitious Pepper. N. Wender. (*Zeitschr. Oest. Apoth. Ver.*, 1887, 147.) A fictitious pepper has made its appearance in the Austrian market, and is manufactured in Buda-Pest. The author describes it as resembling a ribbed pill, and states that it is sold at about two-fifths of the wholesale price of Singapore pepper, and that it has been used for adulterating unground pepper to the extent of 75 per cent. Examined by Dr. Hanansek, this artificial product was found to be manufactured of wheat flour, most likely mixed with alcoholic extract of pepper, and coloured with lampblack. It was free from capsicum.

Composition of Sinapis Alba during Growth. M. Troschke. (*Bied. Centr.*, 1886, 395-397.) The periods when examination of the composition of white mustard plants was made, were (I.)

before blooming, (II.) at commencement of bloom, (III.) full of bloom, and (IV.) at end of bloom.

The composition of the air-dry plant was as follows:—

	Period.			
	I.	II.	III.	IV.
Water	16·0	16·0	16·0	16·0
Ash	8·9	7·1	6·1	5·5
Fibre	20·1	26·9	31·3	37·2
Fat	3·0	2·5	2·9	2·7
Crude Protein	14·0	10·2	8·7	6·8
Pure Albuminoids	10·2	7·9	7·4	6·5
Extractives	38·0	37·3	35·0	31·8

Composition and Application of the Seeds of Holcus Sorgho. M. Bordas. (*Comptes Rendus*, January 31, 1887.) These seeds contain 42 per cent. of starch, and, according to the author's experiments, yield, per 100 kilos., 26 litres of alcohol of a good quality.

Butea Frondosa. N. Waeber. (*Pharm. Zeitschr. für Russland*, 1886.) The seeds are flat, about $\frac{1}{2}$ inch long, 1 inch broad; testa dark reddish brown, veined; hilum projecting; cotyledons broad, leafy, veined; radicle small; taste somewhat bitter. Alkaloids and glucosides were not found. The results of the author's analysis were:—

Moisture	6·62 per cent.
Ash	5·14 ,,
Fat	18·20 ,,
Wax soluble in Ether	0·25 ,,
Albuminoids soluble in Water	9·12 ,,
Soluble in Soda	1·95 ,,
Insoluble in Water and Soda	8·49 ,,
Substance apparently nitrogenated, soluble in Alcohol	0·82 ,,
Mucilage	2·28 ,,
Glucose	6·87 ,,
Organic Acids	4·00 ,,
Other substances soluble in Water	2·16 ,,
Metarabic Acid and Phlobaphene	10·10 ,,
Cellulose	3·80 ,,
Other insoluble substances	22·20 ,,

Constituents of Illicium Religiosum. J. F. Eykman. (*Rec. Trav. Chim.*, v. 299–304.) The fruit of this plant has yielded to the author an acid of the formula $C_7H_{10}O_5$, soluble in alcohol and ether, insoluble in chloroform and benzene. It is proposed to designate this substance *shikimic acid*. On distillation, it is for

the most part decomposed into phenol and carbonic anhydride, but small quantities of protocatechuic acid are obtained; this acid is also present in the above-mentioned plants.

Bablah. V. Wilbuszewitez. (*Pharm. Zeitschr. für Russl.*, 1886; *Amer. Journ. Pharm.*, September, 1886.) This is the fruit of *Acacia Bambolah*, indigenous to India. The author estimated the tannin present with potassium permanganate, which indicated 12·1242 per cent., the amount agreeing nearly with the weight of the tannin isolated. One of the tannins was sparingly soluble in cold water. The reactions of the four varieties of tannin were similar: blue-black with ferric salts; black-green with ammonium vanadate; copper acetate, brown; copper sulphate, yellowish to brown; tartar emetic, yellowish; acetate of lead, yellowish, etc. Gallic acid was also obtained in notable quantities. For oxidation, 1·20125 to 1·27127 gm. of the four varieties of tannin required 1 gm. of potassium permanganate. By decomposition with alkalies the tannin yielded protocatechuic acid, and by treatment with dilute sulphuric acid phlobaphene, ellagic and gallic acids were obtained.

Sophora Speciosa. M. Kalteyer and W. E. Neil. (*Amer. Journ. Pharm.*, October, 1886.) This evergreen shrub is a native of Texas and New Mexico, flourishing on rough, rocky hill-sides, and avoiding the rich black soil of the prairie. Near Matagorda Bay it is a small tree about thirty feet in height; near San Antonio it attains the height of six or eight feet, and grows in patches, intermingled with the mezquite, often clinging to the edge of a ledge of rock, with large portions of the roots bare and exposed to the heat and cold of many summers and winters, and by its long taproot enabled to withstand the frequent droughts. The trunk is tough, crooked, and rough, with a grey-brown thin bark, and with hard and heavy yellow wood, which in some localities is called *lignum vitæ*. The leaves are impari-pinnate; the leaflets in 3 to 5 pairs, about 1½ inch long, obovate or oblanceolate, obtuse or emarginate, entire, reticulate, dark green and glossy above, and paler beneath. The showy flowers appear in February and March, grow in racemes, and have a blue-purple papilionaceous corolla, ten distinct stamens, and a strong, fragrant odour. The fruit is indehiscent, more or less moniliform, often curved, greyish-pubescent, and contains from 1 to 8 seeds. The seeds are roundish-ovate, about ½ inch long and ⅜ inch thick; the testa is hard, brittle, somewhat granular, dark red or sometimes yellowish, and marked from the slightly flattened hilum by a longitudinal ridge. It con-

tains a thin layer of firm, whitish albumen, and an embryo of the shape of the seed, with two white, rather concavo-convex, cotyledons, and a short radicle bent at a right angle. The average weight of the seed is 20 grains, that of the kernel about 12 grains, and of the integuments 8 grains. The seed is inodorous, and the taste bean-like and somewhat bitter. Though known to be poisonous, and hence called *poison-bean*, it is largely used by boys in the place of marbles.

Some time ago (see abstract, *Year-Book of Pharmacy*, 1878, 219) the seeds attracted attention through the investigation of Dr. H. C. Wood, who isolated a poisonous alkaloid, *sophorine*. The authors found the alkaloid both in the testa and in the kernel.

For proximate analysis the integuments and kernel were used separately. The results are tabulated as follows:—

	Percentage from Testa.	Kernel.
Extracted by *Petroleum Spirit*:		
Saponifiable fixed Oil, sp. gr. ·912	1·360	21·050
Extracted by *Ether*:		
(Resin or Wax)	·100	trace.
Extracted by *Alcohol*:		
Phlobaphene	1·000	2·610
Alkaloid, Organic Acids (Tannin in Testa), and other organic substances	2·350	7·540
Extracted by *Water*:		
Inorganic Salts	1·000	2·300
Mucilage	4·150	1·500
Albumen	—	1·750
Dextrin	1·900	2·200
Organic Acid and Colouring Matter	6·900	6·000
Soluble Arabic Acid (?)	1·050	6·573
Extracted by *Caustic Soda*:		
Mucilage and Albuminoids	1·200	9·073
Not Precipitated by Acetic Acid and Alcohol	3·700	4·250
Extracted by *Hydrochloric Acid*:		
Pararabin	3·750	6·450
Insoluble:		
Lignin	6·876	4·380
Residue	55·084	14·945
Moisture	9·575	7·500

The alkaloid seems to be present in larger proportion in the testa than in the kernel. Its aqueous solution gave with potassio-

mercuric iodide a bulky white, and with gold chloride a crystalline yellow, precipitate. Sulphuric acid and potassium chromate produced at once a muddy brown colour, rapidly changing to light green, which slowly faded. Sulphuric acid gave a light, flesh-coloured solution; ferric chloride only a perceptible darkening.

Catalpa Bignonioides. F. K. Brown. (*Amer. Journ. Pharm.*, May, 1887.) The seeds were examined by the author, who demonstrated the presence of resin, fixed oil, tannin, and sugar, and on distilling with water obtained a distillate having somewhat of a rancid odour. Two crystalline bodies were obtained by treating the powdered seeds with a mixture of ether, alcohol, and ammonia, acidulating the concentrated filtrate, removing oil and other impurities with ether, neutralizing with ammonia, and agitating with a mixture of ether and chloroform; on evaporating the ethereal solution, needles were left, which were soluble in alcohol, ether, and chloroform, insoluble in water, almost tasteless, and after boiling with dilute sulphuric acid did not reduce Fehling's solution. The aqueous liquid left after treatment with ether and chloroform yielded crystals, which must have contained ammonium sulphate, and possibly also a glucoside, since after boiling with sulphuric acid a reaction with Fehling's solution was obtained.

Gymnocladus Canadensis. S. S. Mell. (*Amer. Journ. Pharm.*, May, 1887.) The author observed that the seeds weigh on an average 30 grains, contain 8·5 per cent. of moisture, and yield 2·75 per cent. of ash. Petroleum benzin extracts about 10 per cent. of fixed oil, which is yellowish, saponifiable, and of the sp. gr. ·919. Ether extracts a little wax, fat, and resin. The alcoholic extract amounts to 3·25 per cent., and contains a little tannin and a small quantity of glucoside, which can be removed from the aqueous solution by chloroform, and which appears to be present also in the immature fruit; it has a peculiar odour and an acrid, burning taste. The seeds contain also mucilage, starch, and albuminoids.

Guilandina Bonduc. E. Heckel and F. Schlagdenhauffen. (*Comptes Rendus*, ciii. 89.) From the cotyledons of the yellow seeds of this tree the authors have isolated the bitter principle in the form of a white powder, which is nearly insoluble in water and petroleum benzin, sparingly soluble in ether and carbon bisulphide, and freely soluble in alcohol, acetone, chloroform, and glacial acetic acid. Sulphuric acid colours it brown, and afterwards purplish red; hydrochloric acid produces a rose colour, and

nitric acid forms with it a red resin. It has been found efficient by Dr. Isnard in intermittent fever, in doses of 0·1 to 0·2 gm.

Cucumis Myriocarpus. J. M. Maisch. (*Amer. Journ. Pharm.*, December, 1886.)

Cucumis Myriocarpus is known in Southern Africa as *cucur*. The medicinal portion of the plant is the fruit, which is yellow, sub-globose, about the size of a large gooseberry, somewhat soft, prickly, weighs from 60 to 100 grains, and contains numerous seeds. The pulp has a faint cucumber-like odour and a decidedly bitter taste, is soft and viscid, and becomes more fluid on being warmed. The Kaffirs use the green fruit as an emetic, heating it first, and then squirting the pulp of two fruits into the mouth, when emesis occurs in about fifteen minutes. The rind of the fruit and the testa of the seed are slightly bitter; the embryo is tasteless. Dr. G. Armstrong Atkinson (*Edinb. Med. Journ.*, 1886) found the pulp to act as a cholagogue purgative when given in non-emetic doses. Its emetic action appears to be local, and to be followed by purgation in case a sufficient amount of the pulp had been retained.

Constituents of Pumpkin Seed. J. G. Marbourg. (*Amer. Journ. Pharm.*, February, 1887.) The seeds were found to be free from starch, and yielded 35 per cent. of a reddish fixed oil, extracted by benzol, and 3·05 per cent. of alcoholic extract.

The ash amounts to 3·7 per cent. of the air-dry material. Water dissolved from the ash 57·03 per cent., diluted hydrochloric acid 39·59 per cent., and caustic soda 2·03 per cent., leaving 1·35 per cent. of insoluble residue. The ash consisted of carbonate, phosphate and chloride of potassium, sodium, calcium, magnesium and iron, and silica.

Phytolacca. W. F. Wagner. (*Amer. Journ. Pharm.*, February, 1887.) The author found tannin in the berries, but not in the root. The active constituent was not isolated.

Pharbitis Triloba. M. Schutze. (*Pharm. Centralh.*, June 2, 1887, 270.) The author has examined the fruit of *Pharbitis triloba*, a convolvulaceous plant indigenous to Japan, and used medicinally in that country. He has made the interesting observation that this drug contains convolvulin. A preliminary treatment of the finely-divided fruit with ether removed a quantity of greenish brown extract, consisting principally of fixed oil. The residue was then exhausted with alcohol, and from the alcoholic extract were obtained, by suitable treatment, a tannin giving a green precipitate with salts of iron, a crystalline acid, and a

brown resin. This resin, after purification by precipitation from alcohol and treatment with animal charcoal, was obtained as a yellowish white amorphous mass, yielding on trituration an almost odourless, whitish powder, which had acid properties, irritated the mucous membrane, and provoked sneezing. The resin had a melting-point about 140° C., but first became transparent at 148° to 150° C., and decomposed at a higher temperature. It was freely soluble in alcohol and acetic acid, and almost insoluble in water, but in hot water it became softened without notable solution. It was dissolved by alkalies, and with heat by alkaline carbonates, separating upon the addition of acids as a white precipitate. It was insoluble in ether, chloroform, light petroleum spirit, benzol, and carbon bisulphide. The resin did not reduce Fehling's solution, but exhibited glucosidal properties upon boiling it with dilute hydrochloric acid; it was reddened by concentrated sulphuric acid, and when treated with nitric acid it yielded sebacic acid as a decomposition product. In these and other characters, as well as in elementary composition, it corresponded with convolvulin from jalap root, with which body the author considers it to be identical.

Parkia Biglobosa. E. Heckel and F. Schlagdenhauffen. (*Journ. de Pharm. et de Chim.*, 1887, 601. From *Pharm. Journ.*) The authors have made an analysis of the fruit of *Parkia biglobosa* (*Leguminosæ*), which they state is known, in common with kola nuts, under the name of "café du Soudan." By the natives of different parts of equatorial Africa, the tree passes under the names of "houlle," "néré," "nérétou," "doroa," and "roumuo." The pods appear to contain a large quantity of sugar, yielding to boiling alcohol as much as 59·6 of soluble matter, of which 39·25 is glucose, and 15·65 inverted sugar.

The Seeds of Abrus Precatorius. S. Martin. (*Nature*, May 19, 1887, 70.) Jequirity seeds (*Abrus precatorius*) have recently been examined by the author, who states that he found the saline extract of the seeds to contain a globulin identical with that occurring in papaw juice, and belonging to the group of vegetable paraglobulins; also an albumose identical with the α-phyt-albumose of the papaw juice, described by the author. He also points out that the vegetable paraglobulins differ from the myosins in the fact that the latter readily become changed into albuminate when the sodium chloride holding them in solution has been dialysed away.

Rubus Chamæmorus. I. Troitzky. (*Russk. Med.*, 1886; from *Amer. Journ. Pharm.*). *Rubus chamæmorus*, known as *cloudberry*, is indigenous to Canada and the White Mountains, to northern Asia and northern Europe. The amber-coloured fruit has a pleasant acidulous taste. The pubescent and wrinkled leaves are about $1\frac{1}{2}$ inch long and 2 inches broad, reniform in shape, roundish five-lobed, and crenately dentate, have an unpleasant sweet, afterwards bitter, taste, and are popularly used in Siberia in various urinary complaints. Recently the leaves have been recommended by the author as an excellent diuretic in dropsies, in the form of infusion prepared from a drachm of the bruised leaves by digestion with a cupful of boiling water; this quantity is taken morning and evening for about a month; the taste is stated to be not very unpleasant, and the patient to become habituated to this tea.

Cali Nuts. E. Merck. (*Pharm. Journ.*, 3rd series, xvii. 686.) Under the name of "cali nuts," seeds have been recently met with in commerce which, according to the author, present a great similarity to the calabar bean. The external appearance and the anatomical structure leave no doubt that they are derived from a papilionaceous plant, belonging to the tribe *Phaseoleæ*, but nothing more definite is known as to their origin, except that, like calabar beans, they come from the West African coast. The only superficial distinction between the cali nut and the calabar bean is said to be that, whilst the length of the latter is always greater than the breadth, the former is rounder. It has been ascertained that the cali nut contains an alkaloid which chemically and physiologically behaves like physostigmine, and corresponds with it in composition.

Californian Buckthorns used in Medicine. J. G. Steele. (*Pharmaceutical Record*, February 1, 1887, and *Pharm. Journ.*, 3rd series, xvii. 823.) The paper contains notices of *Rhamnus alnifolia*, *R. Purshiana*, *R. crocea*, and *R. californica*. For particulars reference must be made to the original article.

Eugenia Jambolana. G. C. Kingsbury. (*Brit. Med. Journ.*, March 19, 1887, 617.) The seeds of this plant have been tried by the author as a remedy for diabetes, with some degree of success. In a case which had lasted for six months, and in which the patient was quite prostrate and suffering from great thirst, the administration of 5 grains six times in twenty-four hours for a fortnight removed the abnormal thirst and hunger, and enabled the patient to get up and walk for an hour at a time.

Constituents of Cacao Shells. P. S. Clarkson. (*Amer. Journ. Pharm.*, June, 1887.) The author's analysis shows the following composition :—

	Per cent.
Ash	9·07
Moisture	66·0
Petroleum Extract, Cacao Butter	5·32
Ether Extract, Resin	·93
Alcohol (absolute) Extract: Alkaloid, ·90, colouring matter, 4·70	5·60
Distilled Water Extract: Mucilage, 5·60, Albuminoids, ·70	6·30
Dilute Soda Extract, Albuminoids.	7·90
Total Albuminoids by combustion 10·92	
Dilute Acid Extract, Calcium Oxalate, etc.	6·00
Loss by Chlorine, Liguin, etc.	12·60
Hydrocellulose, etc.	14·10
Cellulose.	20·92
	95·34
Undetermined matter and loss	4·66
	100·00

The Ash of some Pharmaceutically Important Seeds, Fruits, etc. H. Warnecke. (*Pharmaceutische Zeitung*, September 8, 1886; *Pharm. Journ.*, 3rd series, xvii. 330.) The following figures refer to the air-dried substance, and give the average of several closely concordant analytical results :—

	Per cent.
Semen Colchici	2·66
,, Sabadillæ	3·45
,, Myristicæ*	2·00
Macis	1·39
,, after removal of 30·13 per cent. of Fat	2·74
Semen Staphisagriæ	9·88
,, Nigellæ.	3·67
,, Sinapis albæ	4·63
,, Rapæ	4·36
,, Gossypii arborei	4·49
Cotton Seed Flour	6·85
Pasta Guarana	1·36
Semen Cydoniæ	3·55
,, Abri precatorii	2·79

* By boiling pulv. sem. myristicæ with benzol for two hours in a return condenser, 41·25 per cent. of fat was removed. The dried residual powder gave 3·77 per cent. of ash.

	Per cent.
Semen Tonco	3·57
,, Hyoscyami	4·51
,, Belladonnæ	2·22
,, Strychni	1·14
,, Ignatii	2·34
,, Cucurbitæ	2·88
Fructus Cardamomi	6·12
Cubebæ	5·45
Fructus Cannabis	4·83
,, Cocculi	5·20
,, Anisi stellati	2·16
,, Anisi religiosi	2·02
,, Colæ	2·53
,, Aurantii immaturi	5·85
Flavedo Fructus Aurantii	3·90
Cortex Fructus Aurantii, with the white inner tissue removed	5·28
Cortex Fructus citri	3·55
,, Fructus Belæ Indicæ	2·08
Pulpa Fructus Belæ Indicæ	3·72
Fructus Anacardii occidentalis	1·64
,, Anacardii orientalis	2·14
,, Rhamni cathartici maturi	2·80
,, Rhamni cathartici immaturi	3·67
,, Petroselini	7·04
,, Carui	5·27
,, Ajowan	10·45
,, Anisi	6·70
,, Fœnieuli	7·25
,, Dauci silvestris	5·96
,, Cumini	8·09
,, Conii	6·69
,, Coriandri	5·21
,, Pimentæ	4·00
,, Capsici	4·66
Piper Cayennense	4·54

Glandulæ Lupuli are required by the Pharmacopœa Germanica to contain less than 10 per cent. of ash, but the author has not met with any sample that answered to this requirement.* All the samples were contaminated with sand, which upon shaking with chloroform sank to the bottom, the glands floating above. A sample from Wiggers's collection left upon combustion 15·33 per cent. of residue, whilst other samples, from various pharmacists and drug houses, gave 18·14, 23·6, and even 44·76 per cent.; of the last mentioned, 4 to 5 per cent. dissolved in hydrochloric acid, the

* The British Pharmacopœia allows 15 per cent.

remainder being admixed sand. In order to ascertain the true ash content of hop glands, the author tried to free a quantity from sand by washing it with water six times in a large beaker. After drying over sulphuric acid, the lupulin gave upon incineration an average of 10·81 per cent. of residue, which still contained some sand adherent to the sticky glands. Flückiger found in a good sample, dried in a water-bath, 7·7 per cent. of ash.

In conclusion, the author estimates the ash in ipecacuanha root at 1·98 per cent.; the wood giving 1·37 per cent., and the bark 2·25 per cent.

Proportion of Ash in Some Drugs. H. Trimble. (*Amer. Journ. Pharm.*, 1887, 278.) J. A. Ferguson determined the amount of ash in three sample of *Ceylon cinnamon* with the following results:—No. 1, 4·00 per cent.; No. 2, 4·00 per cent.; No. 3, 5·00 per cent

Four samples of powdered *cassia* yielded respectively: No. 1, 2·8 per cent.; No. 2, 2·5 per cent.; No. 3, 4·6 per cent.; No. 4, 5·00 per cent.

In the first series No. 1 was certainly, and No. 2 probably, pure, while No. 3 was regarded as adulterated. Of the cassia samples, Nos. 3 and 4 were certainly adulterated, No. 1 pure, and No. 2 probably pure. Nos. 1 in either case may be taken as standards.

R. C. Werner examined five samples of *ground mustard* (*Sinapis alba*). No. 1, which was ascertained to be quite pure, yielded 6·00 per cent. of ash; No. 2, 5·00 per cent.; No. 3, 4·50 per cent.; No. 4. 4·25 per cent.; No. 5, 5·25 per cent. of ash. Each of the last four gave abundant evidence of starch. This was the only adulterant present.

G. Steinmann examined seven samples of *powdered squill*. The ash amounted from No. 1, to 3·30 per cent.; No. 2, to 8·20 per cent.; No. 3, to 2·70 per cent.; No. 4, to 3·95 per cent.; No. 5, to 3·65 per cent.; No. 6, to 3·30 per cent.; No. 7, to 4·00 per cent. No. 1 was known to be pure. The ash of No. 2 consisted largely of calcium sulphate, which points to an admixture of about five per cent. of gypsum, added, no doubt, to prevent the "caking," as well as to cheapen. No. 3 contained starch, and Nos. 4, 5, and 6 were probably pure, a difference in the amount of moisture would account for the variation in ash. No. 7 contained starch, and probably some other impurity, or the ash would have been less from the presence of starch, instead of higher than the average.

Some Plants of Afghanistan, and their Medicinal Products. J. E. T. Aitchison. (*Pharm. Journ.*, 3rd series, xvii. 465.) This paper contains notices of the following plants:—*Ferula fœtida* syn.

F. Scorodosma and *Scorodosma fœtidum; Dorema Ammoniacum; Ferula Galbaniflua; Ferula suaveolens; Trachydium Lehmanii* syn. *Eremodaucus Lehmanii*, and *Albertia margaritifera; Psammogeton setifolium; Cotoneaster nummularia; Alhagi Camelorum; Tamarix gallica*, var. *mannifera; Salsola fœtida; Glycyrrhiza glabra* and *G. glandulifera; Astragalus heratensis* and *A. strobiliferus; Rheum songaricum; Orchis laxiflora* and *O. latifolia; Microrhynchus spinosus; Delphinium Zalil; Paparer somniferum; Merendera Persica;* and *Colchicum luteum*. For particulars, reference should be made to the original article, which is not suited for condensation.

Drugs of Mauritius. (*Chem. and Drug.*, from *Journ. Soc. Arts.*) Medicinal plants have been but little studied in Mauritius. A remedy for dysentery is sought in the *ipica sauvage* or *ipica du pays* (*Tylophora asthmatica*). A decoction of the slender thread-like stem of the parasitic *tsihitrafototra* (*Cassytha filiformis*) is given for intestinal derangement, and as a tonic for scrofulous and rachitic infants. An oleoresin, resembling elemi, probably produced by *Canarium Colophania*, is employed in the form of plaster as a detersive. The yellow juice which flows from the incised stems of the guava (*Psidium pomiferum*) is used as an application to ringworm, and a skin disease called *tampane*. The wood of the shrub *liane poilly* (*Embelia micrantha*) is administered as a tonic, and given in decoction for nephritis. The leaves and seed of the *sogar gota* or *caloque* (*Cæsalpinia Bonducella*) are used for certain diseases, and the seeds, powdered and mixed with pepper, constitute a febrifuge. Small senna (*Cassia occidentalis*) is used in asthma, and as a fomentation in some skin diseases. A decoction of the root possesses diuretic properties, and the leaves are used by the negroes, when smeared with a little candle-grease, as a substitute for adhesive plaster.

Indian Drugs. E. Egasse. (*Journ. Soc. Chem. Ind.*, 1887, 49.) *Chasmantera cordifolia* (*Cocculus Cordifolius*).—Under the names of gulaucha, guloe, and giloe, this plant flourishes in India, the drug being sold extensively in the bazaars as a tonic and antiperiodic, in the form of cylindrical pieces, 2–5 cm. long and 1–5 cm. in diameter. It is a perennial creeper, climbing to the summit of the highest trees, its branches putting forth roots which, reaching to the ground, initiate a fresh growth; roots, stem, and leaves are equally in demand as a drug. The Indian pharmacopœia commends its use as a tincture (4–8 c.c. *in die*); as an extract (0·6 gm. to 1 gm. *per diem*, in the form of pills); and as an infusion (1 : 10), of which 60 c.c. to 90 c.c. are to be taken thrice a day. The stems

contain berberine, an uncrystallizable bitter substance changed by dilute sulphuric acid into a glucoside, and a bitter kind of starch meal, known as "palo."

Toddalia aculeata (*Paullinia aculeata*), one of the family of *Rutaceæ*, flourishes on the coast of Coromandel, in southern China, Ceylon, Java, and the isles of Mauritius and Bourbon. All parts of the plant possess an acrid flavour when fresh; the leaves are employed to relieve pains in the bowels; and the fruit, when ripe, is used as a substitute for pepper, whilst after drying it is made into vinegar by the natives. The root has long been used as a stimulant and febrifuge, the Indian pharmacopœia recommending a tincture and an infusion, in doses of 10 c.c. of the former, or 3 grams to 60 grams of the latter, twice or thrice in the day. Notable quantities of a resinous body, an ethereal oil, in flavour recalling oil of cinnamon, and a bitter substance, are found in the outer portions of the roots.

Agaricus Albus. A. Peter. (*Amer. Journ. Pharm.*, February, 1887, from *Medical News.*) *Agaricus albus* has been successfully used by the author for relieving the sweating of consumptives. Ten grains given at bed-time had a cathartic effect; but given in five-grain doses no such effect was observed, and in about a week all sweating ceased. When a return of the night sweats is threatened, relief is again afforded by the remedy, which has no effect upon the cough.

Agaric acid, in doses of $\frac{1}{12}$th to $\frac{1}{8}$th grain, has been similarly employed.

The Chief Constituents of Polyporus Officinalis. J. Schmieder. (*Pharm. Journ.*, 3rd series, xvii. 162.) The chief constituents detected in larch agaric (white agaric) are agaricol, $C_{10}H_{15}OH$; cholesterin, cetylic alcohol, an acid isomeric with ricinolic acid, and having the formula $C_{18}H_{34}O_3$; several resins, an aromatic alcohol, having the formula $C_9H_{18}O$, a nitrogenous body, probably an albuminoid, succinic acid, and malic acid.

Bovista Gigantæa. F. Nettlefold. (*Chemical News*, April 29, 1887.) The reputation as a styptic of the dried fungus in rural pharmacy induced the author to make an investigation of the ash.

These are dome-shaped, stalkless fungi, growing close to the ground in masses of the more luxuriant grass, which it is possible the mineral matter they collect from the soil may help to flourish.

Their size is about 12–16″ diameter. They are invested in a tough membranous integument, containing chiefly cellular tissue.

Dry substance at 100	8·35 per cent.
Water	91·65 ,,
Ash	0·571 ,,
,, on the dry substance.	6·36 ,,

Analysis of the Ash.

	Calculated on Plant.	Calculated on Residue.
Insoluble residue in H Cl,	0·00	—
Alumina	0·107	15·66 per cent.
Magnesia	0·020	2·93 ,,
$H_2 S O_4$	0·060	8·79 ,,
$Si O_2$	0·003	0·44 ,,
Ca O, mere traces	—	—
Phosphate of Soda	0·381	72·18 ,,

It is noticeable that phosphate of soda is used to stop hemorrhage; and it may be owing to this substance that its reputation is due.

The solution is of an orange colour, and exhales the odour of urea when heated.

Irish Moss as an Emulsifier. A. Tscheppe. (*Pharm. Record*, March 15, 1887. From *Pharm. Journ.*) The author calls attention to the advantages presented by decoction of Irish moss for preparing an emulsion of cod-liver oil. He uses a decoction made at a water-bath temperature, and strained, with the moss in the proportion of one drachm to five fluid ounces of water, with which he says an emulsification can hardly fail. The formula recommended is:—Decoction of moss, five parts; glycerine, two parts; alcohol, one part; flavour with oil of winter-green and oil of bitter almonds, and when cold add cod-liver oil, eight parts, in three portions, shaking vigorously after each addition. The glycerine and alcohol are introduced for preserving and sweetening only, and play no part in the emulsification.

Irish Moss as a Substitute for Gum Acacia in Pharmacy. P. Boa. (*Pharm. Journ.*, 3rd series, xvii. 942, 943.) The author recommends a mucilage made from Irish moss either by boiling or by cold maceration. Such a mucilage he finds useful for many purposes for which gum acacia is used at present, and especially for making emulsions with cod-liver oil, confirming in this respect the observations made by A. Tscheppe (see preceding abstract).

Gelosin. M. Guérin. (*Journ. de Pharm. et de Chim.*, xiv. 318.) Gelosin is a mucilaginous substance extracted from *Gelidium corneum*, an alga of Japan, and is found in commerce as dry, whitish fragments, extremely flexible. Gelosin forms an excellent

vehicle for the administration of soluble medicaments or for making suppositories, cataplasms, bougies, etc. The author has presented to the Société de thérapeutique, of Paris, some specimens of gelosin medicated with camphor, creasote, sulphate of zinc, turpeth mineral, cocaine, extract of belladonna, iodoform, corrosive sublimate, carbolic acid, coal tar, etc. To manipulate this substance, all that is required is to add an equal weight of warm water to dissolve it, and then to incorporate with it the medicament. Conveniently sterilized gelosin might be advantageously employed in bacteriological researches.

Kava Resin. L. Lewin. (*Pharm. Journ.*, 3rd series, xvii. 508.) The author reports some further experiments with kava resin, or lewinin. He finds that the injection of six or seven minims of a solution produces a complete loss of sensibility in the surrounding area, which does not pass off for five days. The anæsthesia thus obtained is so extreme, that even strong induced currents fail to produce more than a slight pricking sensation. When a small quantity of the resin is placed on the tip of the tongue, the bitterest medicine cannot be tasted.

Notes on the Pharmacy of Chian Turpentine. H. Campbell. (*Pharm. Journ.*, 3rd series, xvii. 445.) Chian turpentine has been exhibited in the form of pills, and of an emulsion. The finely divided state in which it exists in the emulsion renders it more likely to be absorbed (when swallowed) than if it is given in the pilular form.

The emulsion should contain an invariable proportion of the purified oleo-resin, and must be freed from the ether used in the process.

To do this the author prepares an ethereal tincture, ascertains the strength of it, converts it into an emulsion, and exposes in an open vessel, with frequent stirring, until all the ether has gone off.

To make the ethereal tincture:—

Put any convenient quantity of the turpentine into a wide-mouthed bottle, with an equal bulk of ether, cork tightly and shake frequently, until all soluble matter has dissolved, set aside until the ethereal liquid has become bright, decant it, and evaporate half a fluid ounce in a tared evaporating dish—at first in a current of air; finally exposing to a very gentle heat for a minute or two (the heat of warm water is sufficient if the dish be rotated).

When the ether has gone off, weigh the dish and its contents, deduct the weight of the former, and thus ascertain the quantity of pure oleo-resin in each half-ounce of tincture.

The standardized tincture may of course be kept for any length of time, and the emulsion made from it as required.

To prepare the emulsion:—

Place in a large mortar, 240 grains of pulv. acaciæ and 50 grains of pulv. tragacanth., add as much ethereal solution as contains 240 grains of the turpentine, mix, and add all at once a fluid ounce of water; triturate until an emulsion is formed, then dilute gradually to eight fluid ounces. Two drachms will contain seven and a half grains of the pure drug, the usual initial dose.

Remove all traces of ether by exposure, with frequent stirring, in an open vessel, preferably in the cold.

The removal of all the ether is important, because the dose of emulsion is gradually increased, and the treatment continued for a considerable time.

Examination of the so-called Spruce-Gum. A. F. Menges. (*Pharm. Journ.*, 3rd series, xvii. 65, 66.) The so-called spruce-gum of commerce is the balsamic exudation of *Abies nigra*, the black or double spruce, which, according to Gray, occurs in swamps and cold mountain woods from New England to Wisconsin and northward, and southward along the mountains. The source of this commercial article was traced by Prof. E. L. Patch a few years since (*New Remedies*, January, 1882, 23), and was then definitely referred to the above tree, although it was also stated that a much smaller quantity is produced by *Abies alba*, the so-called white spruce, but none from *Abies Canadensis*, or the hemlock spruce, which affords the U. S. officinal Canada pitch or hemlock pitch. The method of collecting spruce-gum has already been fully described (abstract, *Year-Book of Pharmacy*, 1886, 218).

In the present paper a full description is given by the author of a number of experiments, the results of which show that the so-called spruce-gum differs in many respects from the other balsamic exudations of the Coniferæ which have as yet been chemically examined. For particulars reference should be made to the source above quoted, as the paper does not admit of abstraction.

A New Constituent of Asafœtida. E. Schmidt. (*Archiv der Pharm.* [3], xxiv. 534, 535.) The constituent referred to is vanillin, which was extracted in small quantities by the following process:—The powdered asafœtida was repeatedly exhausted with ether, the filtrate shaken up with concentrated hydrogen sodium sulphite solution, and the liquid thus obtained supersaturated with dilute sulphuric acid. After expelling sulphurous anhydride, the extraction with ether and subsequent treatment was repeated, and

a third extraction made. After removing the ether by distillation, the resulting vanillin was dissolved in water, and the filtered solution allowed to evaporate over sulphuric acid. Well-formed crystals were thus obtained.

The Testing of Balsams, Resins, and Gum Resins. (*Pharm. Zeitung*, August 11, 1886, 477. From *Pharm. Journ.*) Dieterich, and, more recently, A. Kremel have attempted to extend the Köttstorfer method of examining fats and oils to the testing of substances included in the groups of balsams, resins, and gum resins. The leading idea in Köttstorfer's method, it will be remembered, is that in fats and oils, besides free fat acids, there are present glycerine ethers of fat acids. By titration it is ascertained how much potassium hydrate is required by a unit of the fat or oil to combine with the free acid, and, further, how much is used up in the saponification of the glycerine ether. The former quantity is distinguished as the acid number, the latter as the ether number, and the sum of the two as the saponification number. Quite similar data are yielded by balsams, resins, and gum resins, as all these substances contain free acids mixed with varieties of ethers.

The determination of these bodies may, therefore, be carried out in a manner quite analogous to the Köttstorfer method. About one gram of the substance to be examined is dissolved in alcohol free from acid reaction, some drops of phenolphthalein added, and then titrated with half-normal potash solution until there is a permanent red coloration. The quantity of caustic potash used for one gram of the substance is taken in milligrams, and this is called the acid number. In those substances where ether is present in addition to acid, a definite portion of the liquid is heated with excess of half-normal potash solution, and then titrated back with hydrochloric acid. The quantity of alkali used is calculated to one gram of the substance, and the number of the milligrams similarly taken as the ether number. The sum of the two gives the saponification number.

In the examination of substances not completely soluble in alcohol, they are dissolved with the aid of ether-alcohol or ether-chloroform. Gum resins are first exhausted in a Soxhlet apparatus with alcohol, and the alcoholic extract, after drying and weighing, is estimated; the numbers obtained are not calculated in respect to the whole of the substance originally taken, but only for the quantity of resin soluble in alcohol. In the determination of light coloured substances, the use of phenolphthalein presents no

difficulty; with dark-coloured substances, such as peru balsam, guaiacum resin, etc., the difficulty is overcome by adding water to the alcoholic solution up to the point of milky turbidity, and then dropping in alternately potash solution and, after shaking, phenolphthalein, the end reaction being easily recognised by the formation of a red ring upon the surface of the milky liquid. In some cases (copal and sandarac) there is a formation of precipitate after the addition of potash solution, due to the potassium salts of the particular resin acids being difficultly soluble in alcohol; when this occurs, the addition of water will redissolve the precipitate.

The following table, giving the results of the examination of different balsams, shows that a conclusion could be very well drawn from numbers obtained as to the nature of a sample. For instance, an addition of gurjun balsam to copaiba balsam would very considerably lower the acid number of the latter.

Balsams.	1 gram Substance = mg. K O H.		
	Acid Number.	Ether Number.	Saponification Number.
Balsamum Canadense	83	—	—
,, ,,	81·3	—	—
,, Copaivæ Maracaibo	73–75	—	—
,, ,, ,,	76	—	—
,, Cop. Mar. from Capaifera nitida	78·7	—	—
,, Copaivæ Maturin	77·1	—	—
,, ,, Para	29·6	—	—
,, ,, (?)	78·2	—	—
,, Dipterocarpi (Gurjun Bals.)	20 0	—	—
,, ,, ,, ,,	19·3	—	—
,, ,, ,, ,,	14·2	—	—
,, ,, ,, ,,	5·8	—	—
,, Mecca	45·1	—	—
,, ,,	51·8	—	—
,, Peruvianum	40·4	189·8	230·2
,, ,,	40·8	199·2	240·0
,, ,,	49·4	181·1	230·5
,, ,, from Myroxylon Peruiferum	36·7	104·9	141·6
,, Tolu	127·2	26·7	153·9
,, ,,	100·6	58·7	159·3
Terebinthin. comm.	128·7	—	—
,, ,,	124·4	—	—
,, Venet.	68·4	—	—
,, ,,	70·3	—	—
,, Chia	47·8	—	—
,, ,,	53·4	—	—
Styrax liquid.	47·6	31·9	79·5
,, Alcohol. depur.	61·0	76·0	137·0

The important kinds of resins are also distinguishable from one another by considerable differences in the figures, as will be seen from the following table :—

Resins.	1 gram Substance = mg. K H O.		
	Acid Number.	Ether Number.	Saponification Number.
Benzoin, Siam	141·4	55·4	196·5
,, Penang	122·2	57·0	179·2
,, Sumatra	96·0	60 9	156·9
Colophonium, light	163·2	—	—
,, dark	151·1	—	—
,, americ.	173·0	—	—
,, anglic.	169·1	—	—
Copal	132 0	—	—
,, afric.	147·3	—	—
,, indic.	140·2	—	—
,, brasil.	127·4	—	—
,, from Guibourtia copalifera	128·9	—	—
,, Zanzibar	85·3	—	—
,, ,,	80·0	—	—
Damar.	31·0	—	—
,,	34 3	—	—
,, from Damara orient	34 2	—	—
,, blanc from Vateria indica	15·4	—	—
Elemi, Manilla	3·0	24·2	27·2
Elemi	17·6	7·8	25·4
Euphorbium	13·4	64·6	78·0
Guaiacum	23·28	—	—
,,	44·0	—	—
Jalapin	14·7	172·9	187·6
Jalap resin	12·9	119·8	132·7
,, ,,	12·1	120·7	132·8
Lacca in granis (alc. depur.)	—	—	174·8
Shellac, white	73·7	102·8	176·5
,, yellow	65·5	50·2	115·7
Mastic	61·8	—	—
,,	90·9	—	—
Pix burgund.	142·2	—	—
Resina Pini	77·8	—	—
,, ,, (alcoh. dep.)	102·6	—	—
Sandarac	144·2	—	—
Scammonium e radice	14·6	171·0	185·6
,, Aleppo	8·2	172·0	180·2
Succinum	34·4	74·5	108·9
,,	33·4	91·1	124·5

With gum resins the indications are not so useful :—

Gum Resin.	Per cent. of Resin.	1 gram Resin = mg. KHO.		
		Acid Number.	Ether Number.	Saponification Number.
Ammoniacum, afric.	77·6	59·0	123·0	182·0
,, persic	67·7	112·0	30·6	142·6
,, ,,	67·1	110·0	50·0	160·0
,,	70·7	100·0	50·6	150·6
Asafœtida	72·1	26·8	145·2	172·0
,,	35·6	54·8	182·1	236·9
Bdellium	48·6	26·0	34·7	60·7
Galbanum	74·3	28·3	119·3	147·6
,,	74·2	28·0	132·2	160·2
Gamboge	79·6	100·0	56·7	156·7
Myrrha, indica	30·7	42·1	130·8	172·9
Myrrha	39·5	64·0	95·0	159·0
,,	—	60·2	116·5	176·7
,,	—	70·3	145·8	216·1
Olibanum	—	59·3	6·6	65·9
,,	72·1	46·8	41·0	87·8
,, indicum	67·0	50·3	60·5	110·8

The titration of a gum resin is best effected by mixing one gram of the substance with some indifferent body (powdered gypsum by preference), and extracting it with 95 per cent. alcohol. The residue from evaporation of the alcoholic extract, which gives the percentage of resin, is then redissolved in 50 c.c. of alcohol; half of the solution is used in the acid determination, and the remainder in the other determination, the quantity of potash used being calculated to the gram of pure resin. The numbers obtained with gum resins were not very concordant, whilst the differences between the different kinds are not so great as with the resins. At present, therefore, it seems that titration will only have a limited application to the determination of gum resins.

Commercial Jalapin and Jalap Resin. E. White. (*Pharm. Journ.*, 3rd series, 1887, 650.) Seven samples of commercial jalapin were found by the author to contain between 3·5 and 7·3 per cent. of ether-soluble resin, while an eighth sample was completely soluble in ether, and was probably derived from Tampico jalap. The moisture present in the samples, which were in powder and nearly white, amounted to between 2 and 5 per cent., and the alcohol-soluble resin, between 87·8 and 94·8 per cent.

Commercial jalap resin was likewise examined, six samples yielding the following results :—

Sol. in Ether.	Sol. in Alcohol.	Sol. in Water.
7·8	88·2	trace.
7·2	89·2	none.
8·4	72·4	16·6
77·8	16·6	3·1
25·6	72·0	trace.
46·0	50·4	none.

The ether-soluble resins were in all cases plastic and tenacious. Only two of the six resins correspond to the requirements of the Pharmacopœia.

Guaiacum as an Emmenagogue. J. Sawyer. (*Chemist and Druggist.* From *Birmingham Med. Rev.*) The author states that he has given guaiacum in a large number of cases, and regards the drug as an active remedy in promoting the menstrual secretion in amenorrhœa. It appears most efficient, when given alone, in those cases in which the cause of the complaint is obscure. He gives 10 grains of powdered guaiacum, in a wineglassful of milk, every morning before breakfast. The remedy may thus be given safely for some weeks. In a few cases the drug causes a little abdominal pain and purging, which disappeared on the remedy being stopped for a short time. In some cases of dysmenorrhœa guaiacum has been found to possess considerable curative efficacy. The ammoniated tincture of guaiacum is a reliable remedy when given during the painful period. From half a drachm to a drachm may be given as a dose in a wineglassful of water every two or three hours until the pain is relieved.

Curaçoa Aloin. W. Stoeder. (*Nieuw. Tijdschrift v. de Pharm. Neder.* 1887, 98. From *Pharm. Journ.*) The aloin of Curaçoa aloes has been examined by the author. It was obtained by Tilden's method; 250 grams of the aloes were dissolved in 2 litres of water, containing 1 per cent. of sulphuric acid, and the solution after twenty-four hours was decanted from the resinous deposit which had formed, and was evaporated on a water-bath to half its volume. In a few days a crystalline crust had formed, which, drained, pressed between blotting paper, and re-crystallized from spirit of 92 per cent., afforded sulphur-yellow, microscopic, obtuse needles. The yield of aloin thus obtained was 5·5 per cent. It is odourless, has a bitter taste, melts when heated, becoming black and diffusing an odour of caramel, and then burns, leaving no ash. It is moderately soluble in water, very soluble in spirit, and in pure ether and chloroform almost insoluble. The solution in water is of a light yellow colour; ammonia makes it darker and then red.

When the aqueous solution is heated, the upper layer becomes red, and this colour spreads quickly through the solution, turning to wine-red, indicating oxidation to aloetin. It quickly reduces Fehling's solution when warmed. Sulphuric and nitric acids colour it a pure red, but on stirring the mixture it becomes yellow. If then the vapour of fuming nitric acid be passed over it, a greyish blue colour is produced, which, however, quickly disappears. Bromo-bromide of potassium gives an abundant precipitate in an aqueous solution of Curaçoa aloin. Solution of tannin gives no precipitate. It thus resembles nataloin in the effect produced on it by fuming nitric acid, and is like barbalion and socaloin in the formation of a bromo-derivative, but differs from barbaloin in not giving a precipitate with tannin.

Note on a Sample of Galbanum from Ferula Galbaniflua. E. G. Baker. (*Pharm. Journ.*, 3rd series, xvii. 468.) The gum-resin reported upon consisted of agglutinated tears of a white or reddish brown colour, usually compact and hard, but softening if held in the hand.

When broken it presents a dull, white, waxy fracture resembling ordinary ammoniacum; in fact, judging from external appearances, it might easily be mistaken for a sample of that drug.

The odour is peculiar, but not unpleasant. Mixed with the gum-resin portions of the stem from which it was obtained were found.

The analysis gives the following results:—

		Grams.	Per cent.
Volatile Oil		·1554 =	3·108
Ether extractive } Resin.		3·0600 =	61·200
Alcohol extractive }		·3788 =	7·576
Water extractive, Gum		·8514 =	17·028
Insoluble matter		·5280 =	10·560
		4·9736	

Note on the Estimation of Morphine in Opium. J. O. Braithwaite and E. H. Farr. (*Pharm. Journ.*, 3rd series, xvii. 398.) The author's experiments justify the conclusion that the official process of the Pharmacopœia for assaying opium may be much accelerated, without impairing its accuracy in the slightest degree, by reducing the time for standing from twelve hours to two hours.

Assay of Opium. C. M. Stillwell. (*Amer. Chem. Journ.*, viii. 295–308.) The author's method differs from those of Flückiger and Squibb in a number of details. The sampling must be very care-

fully conducted, and the whole made homogeneous by rolling with the hands on a slab of glass, in case the opium is soft; but by grinding with or without additional drying if it be hard. About 10 grams of the sample is broken up with 100 c.c. of water in a beaker, and when completely disintegrated allowed to remain some hours; a few drops of sulphuric acid may be added. The solution is filtered and the residue washed with about 20 c.c. of water, then returned to the beaker, digested for some minutes with 30 c.c. of water, again filtered, and this process repeated twice more. The washings are first concentrated at a gentle heat on a water-bath, then the stronger solution is added, and the whole evaporated to about 25 c.c. When cold, 5 c.c. of alcohol (sp. gr. 0·82) is added, and the whole transferred to an Erlenmeyer's flask, using 5 to 10 c.c. of wash water; 5 c.c. of alcohol, and finally 30 c.c. of ether, are added with gentle shaking; any precipitate that may form is to be disregarded, as it is removed afterwards, 4 c.c. of ammonia solution (sp. gr. 0·960) is added, the flask closed with a cork moistened with ether, and at once shaken until the morphine separates, when it is allowed to remain twelve hours.

The ethereal layer is decanted on to a small filter, the flask rinsed several times with 10 c.c. of water without shaking, and these rinsings also decanted on to the filter; the aqueous portion is then filtered, the crystals removed from the flask, and the whole washed with morphiated spirit (1 part of strong ammonia and 20 parts of alcohol, the whole saturated with morphine, namely, 0·33 per cent.); secondly, with morphiated water (containing 0·04 per cent.); again with morphiated spirit, and finally twice with 10 c.c. of ether to remove all narcotine. The paper is dried at 100°. The mother-liquor and the first washings of ether and morphiated spirit are treated with 3 c.c. of ammonia in a closed flask, and again allowed to remain to make sure of the precipitation being complete. The chief impurity in the morphine so obtained is calcium meconate, and some organic matters insoluble in water and alcohol; the purification is effected by treating the dried and weighed precipitate with hot alcohol of 95 per cent.; after removing the bulk of it to a beaker, the paper and residue, after thorough extraction with hot alcohol, are dried and weighed, thus giving the weight of the pure morphine.

Assay of Opium. V. Venturini. (*Gazzetta chim. Ital.*, xvi. 239–246.) The author has critically examined and compared the various methods in use for the morphine assay of opium. Of the gravimetric methods, he gives preference to those of Flückiger and

of Conroy; and of the volumetric processes, he decides in favour of the one recommended by Kieffer, which consists in the reduction of a solution of potassium ferricyanide, standardized by a solution of sodium hyposulphite.

Assay of Opium. H. Adrian and E. Gallois. (*Journ. de Pharm. et de Chim.* [5], xv. 193–197; *Journ. Chem. Soc.*, 1887, 622.) In 1867, Guilbermond proposed to estimate the morphine in an aliquot part of the extract obtained from the opium. More recently Doux proposed to modify Regnault's process in the same direction. He treats 50 grams of opium with 200 c.c. of alcohol at 70°, and takes 105 c.c. of the filtrate as representing accurately 25 grams of opium. The authors hold that to arrive at accurate and comparable results, it is indispensable to take into account, in every case, the amount of water and of soluble constituents contained in the opium. They consider the opium as being composed of water, material soluble in alcohol at 70°, and insoluble residue. The sample for assay is pounded in a mortar; 5 grams is extracted with 50 c.c. of alcohol at 70°, with which it is kept in contact for twelve hours; the residue is then filtered off, dried, and weighed on a tared filter. The loss gives the amount of water and soluble matter, and the amount contained in the portion taken for the morphine estimation is of course deduced. 50 grams of the sample is placed in a tared and stoppered flask with a wide neck, treated with 200 grams of alcohol at 70°, placed in a bath of 25–30°, and frequently agitated. When the estimation of water and soluble constituents is finished, the flask is carefully weighed, and alcohol is added to make up the liquid contents of the flask exactly to 250 grams. After filtering, 200 grams of this liquid exactly contain the morphine from 40 grams of opium; this morphine is precipitated by ammonia, washed with alcohol at 40°, dried, treated with chloroform, and dried again as in Regnault's process, but taking care to wait thirty-six hours before collecting the deposit. The method requires somewhat more time than Regnault's, but it has the advantage of being applicable to all opiums, whatever their composition, and it gives exact results.

Assay of Opium. O. Schliekum. (*Archiv der Pharm.* [3], xxv. 13–32.) The method recommended is founded on that proposed by Dieterich, and depends on the fact that if a not too concentrated solution of morphine salts is mixed with a slight excess of ammonia and half its weight of alcohol, and is boiled down to one-half the volume of the mixture, no precipitation of morphine follows when the original volume of solution is made up by adding

water. The perfectly neutral solution thus obtained remains quite clear and free from morphine crystals. For opium, 3 grams is frequently shaken with a mixture of 15 grams dilute alcohol and 15 grams water, and digested during twelve hours. The filtrate is made faintly alkaline with ammonia, and evaporated to half its volume. The solution is made up to its original weight and filtered. 21·25 grams of this filtrate is treated with 5 grams of ether and 0·4 gram of ammonia, and shaken round occasionally during five or six hours. The ethereal layer is taken off with a pipette, and passed through two equal filters, on which the morphine is collected, and washed twice with 2 c.c. of water each time. After drying at 100°, the morphine is weighed, one paper serving as tare. Of opium extract, 1·5 gram is treated with 10·5 grams of dilute alcohol, and 10·5 grams of water without heat, and filtered. The weighed filtrate rendered slightly alkaline by ammonia is boiled down to one-half, made up to its original weight with water, and filtered. 15 grams of the filtrate are treated with ether and ammonia as above. Of tincture 25 grams are taken, made slightly alkaline with ammonia, and treated as above.

Contribution to the Assay of Opium. E. Dieterich. (*Journ. Soc. Chem. Ind.*, 1887, 148.) Knowing that all processes in common use for testing opium give unreliable results, the author has examined the method employed by Flückiger with a view to its perfection. The chief objections to this process are:—The addition of alcohol hinders the precipitation of the morphia, and, on the other hand, promotes the separation of calcium salts. The deposition of the alkaloid is influenced by the duration and intensity of the shaking (*Chem. Zeit.*, x. 1224). And finally, the author finds that on adding the ammonia slowly, a flocculent precipitate of narcotine at first separates (the whole of this body being separable by accurate neutralisation), and is afterwards masked by the crystalline morphia precipitate. He therefore recommends the adoption of the following methods, which are expeditious and accurate:—

For Opium Powder.—6 grams of the dried substance are extracted with 60 grams of water, with occasional shaking, during twelve hours. After filtration, 2 c.c. of normal ammonia are added to 50 grams of the solution, and the narcotine is removed by passing through a 10 cm. filter. 44·4 grams of this second filtrate (=4 grams opium) are then mixed in a weighed Erlenmeyer's flask, with 10 grams of ether, and thoroughly shaken for one minute, then with 4 c.c. of normal ammonia, and again shaken; after stand-

ing for six hours the ether layer is poured off through an 8 cm. filter, a further quantity of 10 grams of ether is then agitated with the liquid, and after separation filtered, and finally the aqueous solution is passed through the same filter, the crystals clinging to the walls of the glass vessel being disregarded. The flask and filter are each washed twice with 5 c.c. of ether-saturated water, and dried at 100° C. The crystals of morphine may then be transferred without loss by means of a camel-hair brush from the filter to the flask, where they are heated at 100° until the weight is constant.

For Opium Extract.—3 grams are dissolved in 42 grams of water, and after one hour treated with 2 c.c. of ammonia and filtered as above; 31·7 grams of the filtrate (=2 grams extract) are then used for the subsequent stages of the process, which are conducted as in the case of the powder.

For Opium Tincture.—50 grams are evaporated to one half their bulk; the original volume is made up with distilled water, and the assay completed as already described, 44·4 grams (=4 grams tincture) of the filtrate from the narcotine being employed.

Assay of Laudanum. C. Bullock. (*Amer. Journ. Pharm.*, March, 1887.) The resinous matter taken up by dilute alcohol from opium presents an obstacle in the determination of the morphia contained in the tincture. The following simple process was found to work well, and to give satisfactory results.

The tincture is evaporated on a water bath at a low heat to about one-fourth of its volume; to the fluid extract thus obtained pure kaolin is stirred in until a thick paste is formed; water is then added gradually with constant stirring, to make an homogeneous mixture; this is transferred to a wet filter, and after the liquid has drained through, the contents of the filter are washed with water until the filtrate is clear and without bitterness.

The solution first draining through the filter is set aside, and the washings are evaporated on a water bath, and added to the reserved portion. The separation of the morphia is then effected after the process of Dr. E. R. Squibb.

The kaolin separates the resinous matter in a finely divided condition, and permits the soluble salts to be washed out without difficulty.

The Discovery of the Mydriatic Action of the Solanaceæ. R. Kobert. (*Therapeutic Gazette*, July 15, 1886.) This is an elaborate and interesting sketch of the history of the subject which, however, is not suited for abstraction. We recommend it to the

reader's attention, and refer him to the original article, or to a reprint of it in the *Pharmaceutical Journal*, August 21, 1886, p. 144.

Plants containing Oxalic Acid. MM. Berthelot and André. (*Comptes Rendus*, cii. 995–1001, 1043–1049.) The plants selected and examined at various stages of their growth were *Rumex acetosa*, *Amarantus caudatus*, *Chenopodium quinoa*, and *Mesembrianthemum cristallinum*. The juice of the first is always acid, that of the second and third neutral, or feebly acid, while that of the last is neutral in the early stages of growth, but becomes acid as the plant develops. The plants also differ very considerably in the ratio between the soluble and insoluble oxalates which they contain.

Chlorosis in Plants. J. v. Sachs. (*Bied. Centr.*, 1886, 602–604; *Journ. Chem. Soc.*, 1887, 76.) When attacked by this disease, the leaves pale and turn perfectly white; weak plants succumb quickly. Stronger ones are attacked year after year, until their reserve material is exhausted; they then die. The touching of a diseased leaf with a dilute solution of a iron salt often causes the production of chlorophyll and cures the disease. However, from extended observations, the author does not think that it is altogether the absence of iron that causes the disease, as plants growing on the same soil are irregularly attacked, some escaping altogether. His experience leads him to think that the roots or leading vessels suffer some alteration which prevents the minute quantities of iron contained in the sap from reaching the leaves. A too rapid and luxuriant growth favours the disease. In the winters of certain years, thousands of trees and shrubs were heavily pruned; the energy divided between numerous growths was concentrated on a much less number; they grew rapidly and luxuriantly; the first leaves were green, but the later were quite white. Trenches 20 to 30 cm. deep and wide were dug round the diseased trees at a distance of 80 to 100 cm.; in these trenches ferrous sulphate in lumps was placed, in quantities varying from 1 to 5 kilos., according to the size of the tree. Water was then freely admitted, and the trenches filled up with earth. Within three to six days the smaller bushes commenced to green, within fourteen days no sign of chlorosis was visible, and in the following spring all the growths were normal.

An experiment of the author's has, he considers, an important bearing on vegetable physiology. Certain acacia trees showed symptoms of chlorosis, in particular the thick branches of a twenty-year old tree. The author caused holes to be bored in the main stem, just beneath the bifurcation of the branch with the core

of the tree. In these holes he placed corks fitted with funnels charged afterwards with ferrous sulphate or ferric chloride in dilute solution. In dry weather the tree absorbed the solution so readily that the funnels had to be frequently refilled. The leaves in line of each funnel became quite green in ten to fourteen days, but those not in the line remained white. This the author thinks a proof that each branch and twig has its own sap-ducts.

Exhausted Cantharides. J. O. Braithwaite and E. H. Farr. (*Pharm. Journ.*, 3rd series, xvii. 399.) A suspicious sample of cantharides examined by the authors was of the usual appearance, but weaker in odour and also lighter and more brittle than the unsophisticated insects. It yielded but 2 per cent. of dry ethereal extract, against 10 per cent. obtained from genuine insects. The extractive from the latter was fatty and greenish yellow, showing numerous crystals of cantharidin; whilst that from the other was brownish yellow, and showed no trace of any crystalline body. The extractive from the suspected sample had but a very slight blistering effect compared with that from the genuine.

Chinese Cantharides. (*Pharm. Journ.*, 3rd series, xvii. 608 and 688.) Two Chinese insects have lately been met with in the London market as cantharides; one of them is *Lytta Gorhami*, which is likely to contain some cantharidin, and is at present under investigation, and the other belongs to a group of insects which are not remarkable for vesicating properties. It is the *Huechys sanguineus*, of the family *Cicadidæ*, of the order *Hemiptera*. This insect, which is remarkable for its vermilion-coloured body, has the odour of cantharides, but it is not known whether it really possesses any vesicating property, although it is said to possess in China a reputation as a blistering agent.

Huechys Sanguinea: Does it Vesicate? J. Moss. (*Pharm. Journ.*, 3rd series, xvii. 845.) The vermilion-coloured "cantharides," referred to in the preceding abstract, have been examined by the author, who finds that although they possess a mild rubefacient property, this is not sufficiently strong enough to produce a blister, and that therefore *Huechys sanguinea* will not be a useful addition to the materia medica.

Bahama Sponges. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xvii. 761–763.) Until the discovery of sponges in the Bahamas and in the vicinity of Florida, all the sponges of commerce were derived from the eastern half of the Mediterranean sea, which still supplies the finest qualities. A great number of

varieties, both in form and relative degrees of softness or hardness, are recognised; one London sponge merchant even asserting that there are as many as four hundred Mediterranean kinds. These varieties, whether of European or American origin, are referred by zoologists to three principal types :—

1. *Spongia officinalis*, which is the source of the Turkey cup sponge.

2. *Spongia agaricina*, affording a cup sponge of harder and more unyielding texture than the Turkey cup, and known as the Zimocca sponge.

3. *Spongia equina*, yielding the bath or honeycomb sponge.

The first, according to Saville Kent, is distinguished by its usually cup-shaped contour, by the exceedingly fine elastic and densely interwoven fibres of which it is composed, and by the oscules being more crowded towards the centre of the cup.

The second, or Zimocca sponge, is recognised at sight from the Turkey cup sponge—which it closely resembles in shape, although the cups are flatter and more saucer-shaped as a rule—by the fact that the larger openings, instead of being crowded towards the centre of the cup, are uniformly scattered at nearly regular distances over its whole upper surface, and by being much harder and more unyielding to the touch. The fibres are closely interwoven, as in the Turkey kind, but are coarser and less elastic. It is only one-third the value of Turkey sponge.

The third, or honeycomb sponge, has a more spheroidal or rounded form, flattened above, and the larger or excurrent openings are irregularly scattered over the upper surface. In this kind the erect or primary fibres are not visible.

The Bahama sponges correspond closely with the typical forms above described in general characters, and by A. Hyatt, the American expert, are considered to be varieties of these species. He expresses the opinion, however, that the coarser varieties of the European sponges are finer, firmer, and more elastic than the finest of the corresponding American sub-species, the inferiority of the latter being attributed to the larger amount of foreign matter included in their primary fibres, the looser mesh of the fibres, which are comparatively coarse, and the larger and more numerous canals.

The Bahama sponges are referable, according to Mr. Hyatt, to the following sub-species :—

Reef, or glove sponge, to *Spongia officinalis*, var. *tubulifera*.

Sheep's wool sponge, to *Spongia equina*, var. *gossypina*.

Abaco velvet and cay velvet sponge, to *Spongia equina*, var. *meandriniformis*.

Grass sponge, to *Spongia equina*, var. *cerebriformis*, and *Spongia graminea*.

Hardhead sponge, to *Spongia agaricina*, var. *typica*.

Yellow sponge, to *Spongia agaricina*, vars. *corlosia*, *dura*, and *punctata*.

A full description of each of these species will be found in the original paper.

Essential Oils. MM. Schimmel. (*Pharm. Journ.*, 3rd series, xvii. 927.)

Asarum Oil.—A distillate from the root of *Asarum Europeum*. Three hundred and fifty-two kilos. gave 3·8 kilos. of essential oil, containing a considerable quantity of asarum camphor (asaron), which partially separated at the ordinary temperature. It has recently been investigated by Professor Poleck, of Breslau (*Pharm Journ.* [3], xv. 82).

Poplar-buds Oil (*Ol. gemmæ populi*).—A distillate from dried poplar buds. Yield of oil about one-half per cent. A light yellow ethereal oil, having a beautiful odour, somewhat recalling that of chamomiles. It boils almost constant between 255° and 265° C., and has a sp. gr. at 15° C. of 0·900.

Southernwood Oil (*Ol. Artemisiæ*).—Distillate from the herb of *Artemisia Abrotanum*.

Cloveroot Oil (*Ol. Rad. Caryophyllatæ*).—Distillate from the root of *Geum urbanum*. This is described as an oil having an extremely fine and agreeable cinnamon-like odour, and a spicy taste, from which crystalline constituents separate. It is thought that if it can be prepared at a low price, it would prove practically useful.

Pimpinella Oil (*Ol. Rad. Pimpinellæ*).—Distillate from the root of *Pimpinella Saxifraga*. Has the taste and odour of the root.

Interesting notices of a number of other essential oils, by the same authors, will also be found in *Pharmaceutical Journal*, pp. 869, 870.

Specific Gravity of the Principal Essential Oils, etc., of Commerce, according to Examination of Normal Pure Qualities. (*Pharm. Journ.*, from *MM. Schimmel and Co.'s Spring Report*, Leipzig.)

Name of Essential Oil.	Temperature.			Remarks.
	10° C.	15° C.	20° C.	
Anise	—	0·985	0·980	
Anise, extra pure anethol	—	—	0·985	(At 25° (m.p. 21–22°).
Angelica root	0·860	0·858	0·853	
Valerian	0·947	0·945	0·940	
Bergamott, Ia Reg.	0·887	0·883	0·880	
Bitter Almond	1·063	1·060	1·055	Av. 1·060
Cajeput (green)	0·927	0·925	0·922	
Calamus	0·961	0·959	0·957	
Carvol	0·967	0·963	0·958	,, 0·962–0·965
Cassia (cinnamon flowers)	1·073	1·068	1·063	
Cassia (rect.)	1·058	1·055	1·052	,, 1·05–1·06
Cedar-wood	0·948	0·945	0·940	
Cardamom (Ceyl.)	0·902	0·900	0·897	
Citronella (E. I.), melissa	0·900	0·896	0·893	
Lemon	0·856	0·854	0·851	
Cumin	0·925	0·922	0·918	
Cubeb	0·918	0·915	0·912	
Coriander	0·872	0·867	0·864	,, 0·860–0·870
Eucalyptol p. alb.	0·935	0·931	0·928	
Eucalyptus (glob.)	0·925	0·922	0·918	
Dill	0·905	0·900	0·896	
Fennel seed, rect.	0·975	0·970	0·965	,, 0·965–0·975
Ginger	0·885	0·882	0·878	
Spearmint, German rect.	0·930	0·925	0·922	
Caraway, double rect., from German field caraways	0·905	0·900	0·896	
Caraway, double rectified, from Dutch caraways	0·911	0·908	0·905	
Mace	0·858	0·855	0·852	
Mirbane	—	—	1·200	
Clove stalks	1·065	1·061	1·057	,, 1·060–1·065
Cloves	1·065	1·062	1·059	,, 1·060–1·065
Peppermint, F. S. and Co.	0·906	0·903	0·901	,, 0·900–0·910
Peppermint, Mitcham	0·905	0·900	0·898	,, 0·900–0·905
Safrol	1·109	1·104	1·100	
Sassafras	1·068	1·065	1·060	,, 1·05–1·07
Mustard, gen. ess.	1·030	1·025	1·020	
Mustard, artificial	1·025	1·020	1·016	
Sandal-wood (super. E. I.)	0·978	0·975	0·973	
Star-anise	0·990	0·985	0·980	
Juniper (double rect.)	0·863	0·858	0·855	
Wintergreen (nat.)	1·189	1·185	1·182	
Wintergreen (art.)	1·192	1·187	1·183	
Cinnamon, Ceyl.	1·035	1·030	1·027	,, 1·03–1·035

Variations in the above figures may occur in the third place of decimals, without suspicion of sophistication being justified on that account, but greater deficiencies are excluded.

Essential Oils. E. Weber. (*Liebig's Annalen*, ccxxxviii. 89–108; *Journ. Chem. Soc.*, 1887, 596.) Oil of rosemary not only

contains camphor, borneol, and a terpene, but also cyneol, $C_{10}H_{18}O$, which was discovered by Wallach and Brass in *Oleum cynæ*.

Oil of cardamoms begins to boil at 164°, and the temperature gradually rises to 220°. A small quantity of a crystalline compound, which melts at 60–61°, is left in the retort. The liquid distilling over below 170° consists of water, acetic and formic acids.

The oil contains *terpinene*, boiling at 179–182°, and another terpene, which boils at 180–183° (probably limonene or dipentene), and yields a hydrochloride which melts at 52°. The portion of the distillate coming over between 205° and 220° contains the compound $C_{10}H_{18}O$, which is probably identical with Wallach's *terpineol*.

Essential Oils. O. Wallach. (*Liebig's Annalen*, ccxxxviii. 78–89.) Schmidt and Oglialoro have pointed out that oil of cubebs contains two sesquiterpenes, $C_{15}H_{24}$, one of which yields a crystalline hydrochloride, $C_{15}H_{24}2\,H\,Cl$, melting at 117–118°. The author has succeeded in obtaining this hydrochloride from oil of cubebs, patchouli (*b. p.* 270–280°), oil of galbanum, *Oleum cadinum*, and *Oleum sabinæ*. It is best obtained by distilling *Oleum cadinum* in a current of steam, and treating the distillate with potash to remove phenols. The purified oil is distilled over potash, and the portion boiling between 260° and 280° is diluted with ether and saturated with hydrogen chloride. The hydrochloride can be recrystallized from ethyl acetate.

The solution is lævogyrate. The terpene is easily obtained by heating the hydrochloride with anhydrous sodium acetate and acetic acid. The sesquiterpene boils at 274–275°. Its sp. gr. at 16° = 0·921. It has a great tendency to resinify.

The Essential Oils of Lemon, Bergamot, and Orange Peel. P. Soltsien. (*Chem. Centr.*, 1886, 936, 937.) The author prepared these oils specially to be certain of their purity, and examined them together with some turpentines by means of Heppe's copper butyrate reaction (see abstract, *Year-Book of Pharmacy*, 1886, 229). He finds that the action depends upon the age of the oil, and is therefore of little value as a test.

The Essential Oil of Phellandrium Aquaticum. L. Pesci. (*Gazzetta Chim. Ital.*, xvi. 225–231.) The seeds of *Phellandrium aquaticum* contain about 2·5 per cent. of a terpene, $C_{10}H_{16}$, named by the author *phellandrene*. It is a liquid resembling geraniums in odour, soluble in alcohol, ether, and benzene. It boils at 171° under a pressure of 766 mm.; its sp. gr. at 10° is 0·856, and its specific rotatory power $[\alpha]_D = +17·64°$. It combines with hydro-

chloric acid to form a mixture of a monohydrochloride and a di-hydrochloride; heated for some time at its boiling point, it is converted into a polymeric modification, *diphellandrene*, $C_{20}H_{32}$, an amorphous, white substance, soluble in ether and chloroform; this melts at 86° and is lævorotatory.

The Oils of Erigeron and Fireweed. A. M. Todd. (*Amer. Journ. Pharm.*, June, 1887.) The oil of erigeron (*oleum erigerontis canadensis*) and the oil of true fireweed (*oleum erechthitis hieracifolia*) are distilled from plants of the most distinct types possible, and seem to be almost as distinct in therapeutic action; both are highly valuable in medicine when pure, but their usefulness has been nearly destroyed and their value little understood since they have been almost universally confounded with each other, both in science and commerce, and even when not so confounded are rarely met with in a state of purity.

From the author's experiments, the following comparisons between the two oils may be made, and the following conclusions drawn:—

1. *Polarization.*—Pure oil of erigeron in the natural state should not polarize nearer the zero point than −26, nor farther than −60; rectified oil, freed from resin, may polarize somewhat nearer the zero point than the limit given, and the first fractions should be dextrogyre. Pure fireweed, if lævogyre, should not polarize farther than −4, and if dextrogyre, farther than +4.

2. *Specific Gravity.*—Pure natural oil of fireweed, unless resinous (which may be noted by its leaving a stain upon paper when evaporated), should not possess a sp. gr. above ·855 nor below ·845; and erigeron, under like circumstances, not above ·865 nor below ·855. The difference in sp. gr. being about ·010.

3. *Boiling Point.*—The temperature of the *vapour* being taken fireweed should not vaporize to any marked extent below 355°; nor should this temperature be increased more than 10° F., until five per cent. of the oil has been evaporated. Erigeron should not boil vigorously below 342° F., nor above 347° F., until five per cent. has been volatilized.

4. *Resinoid.*—When distilled with water or steam, the resinous product of erigeron is a deep reddish brown, that of fireweed a light straw colour. The effect of rectification by steam with both is to produce a brilliant and colourless oil. Both oils possess characteristic odours.

Detection of Spermaceti as an Adulterant in Oil of Rose. M. Hoppe. (*Chemist and Druggist*, March, 19, 1887.) The sus-

pected oil is agitated with from one and one half to twice its weight of melted glacial acetic acid, the resulting crystalline mass transferred to a filter, and washed with vinegar to remove the oil, then with water until the odour of rose has quite disappeared, and finally washed with solution of soda, and again with water. Should any residue result, its identity with spermaceti is evidenced by the odour produced, similar to burning oil when charred, and may be reproduced after some time by again heating the substance.

Oil of Sandal Wood. C. Méhu. (*Journ. de Pharm.*, September, 1886. 209. From *Pharm. Journ.*) The internal administration of oil of sandal wood is followed by the apperance in the urine of a resin having the sandal wood odour, which is apparently kept in solution by sodium phosphate, and plays the part of a weak acid. It can be separated by acidulating the urine with phosphoric or tartaric acid, and shaking it with ether. The ether on evaporation leaves a resinoid matter having a light brown tint and the odour of sandal wood, and which gives with concentrated sulphuric acid the same yellow, brown, and red colorations as the oil. The author adds that pure oil of sandal wood, unsophisticated with oil of copaiba or oil of turpentine, does not impart the odour of violets to the urine.

Croton Oil. R. Kobert. (*Chemiker Zeit.*, 1887, 416.) The author reports the results of researches made at his suggestion by Ernst von Hirschheydt, which show that the oil contains Buchheim's crotonoleic acid, partly in the free state and partly as glyceride. The latter is not poisonous, but the free acid is very irritating and drastic. The glyceride being decomposed by the pancreatic ferment, thereby becomes purgative when taken internally; but the same effect may be produced by giving crotonoleic acid in pills covered with keratin with the view of preventing irritation of the stomach; but obviously irritation of the intestines will be produced by both compounds.

For the preparation of *crotonoleic acid* the author recommends digestion in a water-bath of the alcohol-soluble portion of croton oil with an excess of concentrated baryta solution; the thick white mass is thoroughly mixed and washed with cold distilled water, whereby colouring matter and barium acetate, butyrate, and tiglinate are removed; the residue is drained, dried, and exhausted by ether, which leaves behind the barium salts of stearic, palmitic, and lauric acids. On evaporating the ethereal solution, a mixture of barium oleate and crotonoleate is obtained, of which the latter only is dissolved by alcohol; this solution is decomposed by the

careful addition of H_2SO_4, and after filtering evaporated. The main difficulty for the preparation of free crotonoleic acid lies in the readiness of its being decomposed by baryta water under the influence of too high a heat.

Method for Distinguishing Castor Oil from Other Fatty Oils. Dr. Finkener. (*Analyst*, 1887, 53.) The author's experiments were carried out with the object of finding a suitable method for customs purposes. A 100 c.c. glass cylinder of 25 mm. diameter, is provided with a 10 or 60 c.c. mark (measured from the bottom). The oil is run in to the 10 c.c. mark, and the tube is then filled up to the 60 c.c. mark with spirits of wine (·829 sp. gr.). Absolute alcohol cannot be employed; at 17·5° C. spirits of wine of ·829 sp. gr. dissolves castor oil in almost every proportion, but the other oils only slightly. The tube is closed, well-shaken, and the mixture examined after standing two or three minutes. Pure castor oil gives a clear solution. But even with 10 per cent. of other oils (olive, sesame, linseed, cotton-seed, rapeseed oils) a turbidity is obtained, at the normal temperature, which does not disappear even above 20° C. Another test tried was the following:—On treating pure castor oil with sulphuric acid, a product (a sulpho-acid) is obtained, which gives an almost perfectly clear solution with 40 times the quantity of water. On treating other fatty oils (such as sesame or olive oil) similarly, very milky precipitates are obtained. The method is, however, of no good, as mixtures of 80 per cent. of castor oil and 20 per cent. of olive or sesame oil, treated similarly, also give almost perfectly clear solutions.

Adulteration of Olive Oil. (*Pharm. Journ.*, 3rd series, xvii. 61.) A recent number of the trade report of E. Dieterich gives an account of a comprehensive series of experiments made with the object of obtaining satisfactory tests for the presence of different adulterants of olive oil, which is used largely in his establishment in the manufacture of plasters. Some of the published methods were thoroughly tried with the following results:—

Equal volumes of oil and nitric acid, of sp. gr. 1·400, shaken together are said to assume, if cotton-seed oil be present, a more or less brown colour. This was confirmed, the test allowing the detection of an addition of 10 per cent.

The presence of sesame oil has been stated to be recognisable by shaking together equal volumes of oil and hydrochloric acid, sp. gr. 1·190, in the latter of which some fragments of cane-sugar have been dissolved, the sophistication being indicated by a reddening of the acid layer. It was found that the coloration

of the acid also takes place with pure olive oil after about three-quarters of an hour; on the other hand, upon the addition of sesame oil, a rose-coloured zone is formed very quickly, even during the separation of the two layers. If this be not very distinct, a control experiment with pure oil, placed by the side of it for better comparison, will readily show the difference.

The statements as to the melting and solidification points of the fat acids of the different oils vary very much; according to Bach, those of cotton-seed oil are 38° and 35° C., and according to Hübl, 30·5° and 27·5° C. In order to form a judgment upon this point, the fat acids of olive oil and of the other oils used as adulterants were experimented with, as well as those of mixtures containing 25 per cent. of the foreign oils. The precaution was adopted, before taking the melting and solidifying points, to allow the fat acids to solidify during at least twenty-four hours at 15° C.; the melting point was taken when the fat acids had melted quite clear, and the solidifying point when the mass began to show turbidity. In all cases care was taken to raise the temperature as slowly as possible. The following were the results obtained:—

A.—Pure Oils.

	Melting Point.	Solidifying Point.
Ol. Oliv. prov. No. 00 Ol. Oliv. prov. No. 0 Ol. Oliv. comm. flav.	26·5° to 28·5° Average of	23·5° to 24·6° 19 samples.
Ol. Arachis	33·5°	31°
Ol. Arachis (so-called Crown Oil, water white)	31·5°	29°
Ol. Arachis (so-called Crown Oil, yellow)	32°	29·5°
Ol. Gossypii	38·5°	36°
Ol. Helianthi	23°	18°
Ol. Sesami	31·5°	28·5°
Ol. Lini Ol. Raparum Ol. Ricini	still fluid at 13	

B.—Mixtures of Olive Oil.

With	Melting Point.	Solidifying Point.
25 per cent. of Ol. Arachis	29°	26°
25 per cent. of Ol. Gossypii	30°	27·3°
25 per cent. of Ol. Helianthi	25°	20·5°
25 per cent. of Ol. Sesami	28°	25°
25 per cent. of Ol. Lini	24·5°	19·5°
25 per cent. of Ol. Raparum	23°	19°

It appears, therefore, that additions of 25 per cent. cannot be detected with great certainty, whilst lower percentages cannot be recognised. The determinations would, consequently, have value at most only as additional evidence in doubtful cases; but they would even then be superfluous, since with a high percentage of adulteration there is scarcely any doubt.

Attempts to base a method of examination upon the elaidin formed through the treatment of the oil with nitric acid and copper filings failed entirely, both because the differences between the elaidin obtained from pure oil and from mixtures were too small, and because the elaidin prepared from one and the same oil had not always the same character. The saponifying power of the oil before and after the formation of elaidin was also taken as a starting point, but equally without result.

Considerable attention was paid also to the iodine addition method, published by Hübl. This is based upon the assumption that almost all fats contain acids of the acetic, acrylic, and tetrolic acid series, and that the quantity of these acids in any particular fat is a definite one, and is different in different fats. These three groups of fat acids show a very characteristic distinction in their behaviour toward's the halogens, the first series under ordinary conditions remaining indifferent, whilst the second series readily take up two, and the third four atoms of halogen The quantity of added halogen will therefore vary with the composition of the fat, and constant figures will be obtained which will be dependent upon the kind and relative quantities of the unsaturated acids, and consequently standing in intimate relation with the constitution of the respective fats. The problem, therefore, is to effect the addition of the halogen under conditions that will exclude substitution, and then to estimate with certainty the amount of added halogen.

Iodine is more suitable for the purpose than chlorine or bromine. But since iodine acts at ordinary temperatures too sluggishly on fats, whilst at higher temperatures the results are unequal, an alcoholic solution of iodine in presence of mercuric chloride is used; and as only few oils are soluble in alcohol, chloroform is taken as a solvent. The mixture of iodine and mercuric chloride solution, called by the author "iodine solution," reacts at ordinary temperatures upon the unsaturated fat acids, forming chlorine and iodine addition products, whilst the saturated acids present remain unattacked. The amount of iodine thus taken up is then ascertained and calculated into percentage, the result being the "iodine number."

In order to test this method, the "iodine number" of unmixed fats was first obtained, and then of mixtures containing various percentages of adulterant. These experiments confirmed essentially Hübl's statement, and with twenty-three samples of olive oil, especially, numbers were obtained which agreed with those given by him. In the following table the numbers obtained by Dieterich and by Hübl are given side by side for comparison :—

A.—Pure Oils.

	Iodine Number.	
	Dieterich.	Hübl.
Ol. Oliv. prov. No. 00 Ol. Oliv. prov. No. 0 Ol. Oliv. comm. flav.	81·6–84·4 23 samples	81·6–84·5
Ol. Arachis	91	101–105
Ol. Gossypii	108·5	105–108
Ol. Helianthi	132·25	—
Ol. Lini	154	154–160
Ol. Raparum	99·8–100·5	97–105
Ol. Sesami	110	105–108

The only essential difference in the two series of figures is in respect to oleum arachis, which notwithstanding repetition of the experiment gave to Dieterich only 91, and came nearest to olive oil. This is the more unfortunate, since it is arachis oil that is at the present time most used as an adulterant.

B.—Iodine Numbers of Mixtures of Olive Oil.

With.	25 p. c.	15 p. c.	10 p. c.	5 p. c.
Ol. Arachis	85·53	85·10	84·10	82·9
Ol. Gossypii	89·50	87·10	86·10	83·4
Ol. Helianthi	96·24	90·30	87·0	84·6
Ol. Lini.	102·20	93·80	88·70	85·9
Ol. Raparum	87·20	85·30	82·70	82·2
Ol. Sesami	90·55	87·90	85·90	83·4

As adulterations with 5 to 10 per cent. are seldom met with, whilst admixtures of 20 per cent. and upwards much more frequently occur, Hübl's iodine addition method gives tolerably certain indications, except in the case of arachis oil. At any rate

Herr Dieterich believes it to be the most trustworthy method that at present exists.

Some experiments were also made as to the solubility of iodine in different fat oils, with the following results :—

Ol. Amygdalarum	took up	57	per cent.	of Iodine.
Ol. Arachis	,,	45	,,	,,
Ol. Gossypii	,,	38	,,	,,
Ol. Helianthi	,,	23	,,	,,
Ol. Lini	,,	19	,,	,,
Ol. Olivarum	,,	44	,,	,,
Ol. Raparum	,,	41	,,	,,
Ol. Ricini	,,	51	,,	,,
Ol. Sesami	,,	39	,,	,,

The iodine was rubbed up with the oil in successive percentage quantities, each addition being allowed to stand, with frequent stirring, until dissolved, before another one was made. Finally the iodine was shaken out from the saturated oil with spirit, and estimated volumetrically. Herr Dieterich thinks that a recommendation which has been made as to the addition of castor oil to tincture of iodine, based upon the solvent power as shown above, is worthy of attention. It would prevent the too rapid volatilization of the iodine when painted upon the skin, and would possibly modify its action.

Properties of Olive, Sesame, and Cotton Oils. T. Leone and A. Longi. (*Gazzetta Chim. Ital.*, xvi. 393–398; *Journ. Chem. Soc.*, 1887, 536.) The authors, with a view to the recognition of the presence of sesame and cotton oils in cases of sophistication of olive oil, have examined the physical and chemical properties of these oils, such as the proportion of solid acids obtained on saponification, the quantity of alkali required to complete this process, the specific gravities at 100° of the oils and the resultant acids, the points of fusion and solidification of the acids, and the indices of refraction of the oils. As a result of their examination, it follows that the quantities of solid acids and of alkali required for saponification are appreciably equal for all three oils, but the sp. gr. of olive oil at 100° is less than that of sesame and cotton oils by about 0·005, the index of refraction of the former is also somewhat less than those of the latter. But the most marked difference is observed in the points of fusion and solidification of the resultant acids, for those from olive oil melt at 24–27°, and begin to solidify at 17·50°, whilst those from cotton and sesame oils melt at 36–40°, and solidify at 34·30° and 34–32° respectively.

Characteristics of Olive Oil. A. Levallois. (*Comptes Rendus*, civ. 371–373; *Journ. Chem. Soc.*, 1887, 535.) The author has examined a large number of genuine samples of olive oil from the olive yards of the south-east of France.

The colour of the oil was determined by means of a Duboscq colorimeter. The colour at the commencement of a crop is 70 times as intense as at the end. The sp. gr. at 15° varies from 0·9167 to 0·9177, and the differences observed with different species are only very slight. The sp. gr. of olive oil at 24° is 0·911, whilst that of the other oils at the same temperature is as follows:—

Sesame	0·917
Cotton-seed	0·9165
Earth-nut	0·912
Poppy	0·9205
Colza	0·910
Camelina	0·920
Linseed	0·928

The sp. gr. of colza and earth-nut oil are somewhat near that of olive, but their other properties make it easy to distinguish between them. Cailletet's reagent (nitric acid saturated with nitrogen oxides) usually gives a green coloration, inclining occasionally to yellowish green.

Audoynaud's reaction (addition of nitrosulphuric acid and ether to a mixture of the oil with potassium dichromate) gives also a greenish or yellowish green coloration.

The determination of the non-saturated fatty acids by treating the non-saponified oil with bromine or iodine gave no concordant results. The following method is satisfactory:—5 grams of the oil are weighed into a test-tube about 15 cm. long and 15 mm. diameter, mixed with 10 c.c. of a 20 per cent. solution of potassium hydrate in alcohol of 93°, and agitated, when the oil dissolves. The liquid is then heated on a water-bath to a temperature sufficient to produce gentle ebullition, and after about 15 minutes saponification is complete. The volume of the liquid is then made up to 50 c.c. by adding alcohol, and 5 c.c. of the solution is placed in a tube provided with a glass stopper, acidified with hydrochloric acid, and then mixed with a concentrated aqueous solution of bromine from a burette, with vigorous agitation, until the liquid acquires a persistent pale yellow tint. About 0·1 c.c. of solution is required to produce the end reaction, and this should be subtracted from the total volume added. The bromine is

standardised by means of a decinormal solution of arsenious acid, mixed with hydrochloric acid. Different samples of oil from the same species of olive absorbed from 0·512 to 0·522 gram of bromine per gram of oil. The absorption by oil from different species of olive varied from 0·500 to 0·544, the last result being obtained with oil from Blanquetier which also has an exceptionally high sp. gr. The amount of bromine absorbed by 1 gram of other oils is as follows :—

Cotton-seed	0·645
Sesame	0·695
Earth-nut	0·530
Poppy	0·835
Colza	0·640
Camelina	0·817
Linseed	1·000

The alcoholic solution of soap from oil of earth-nut becomes solid as soon as the temperature falls to 15°, but the corresponding solution of olive-oil soap remains liquid.

The most constant characteristic of olive oil is its sp. gr., but the determination of the bromine absorbed is also very useful.

Oil of Male Fern. G. Daccomo. (*Annali di Chim. Med. Farm.*, 1886; *Amer. Journ. Pharm.*, August, 1886.) The author has subjected to fresh chemical study the ethereal extract from the rhizome of *Aspidium Filix-mas*. Thirty kilograms of material were exhausted with ether, in a percolator, and after spontaneous evaporation, left 1750 grams of ethereal extractive. This extract, after treatment with a mixture of alcohol and ether, left as a remainder a brown pulverulent residue of 70 grams in weight. The insoluble residue so obtained was agitated with a solution of caustic potash (1–100), and from the filtered liquid, on the addition of acetic acid, gave a voluminous precipitate of filicic acid (filicin of Trommsdorff). The portion that was not dissolved by the potash, and that remained upon the filter, was then exhausted with boiling alcohol, which deposited, on cooling, a white, flocculent material, wax-like in appearance, which after repeated crystallizations from alcohol, was used for the ultimate analysis. The figures obtained led to the formula $C_{13}H_{26}O$.

This substance is insoluble in water, very little soluble in ether or in cold alcohol. It is not saponified on prolonged ebullition with caustic potash in concentrated alcoholic solution. The residue, left on the filter, after the boiling alcohol treatment, was merely extractive.

The more soluble portion of the ethereal extract, that is, that dissolved in the mixture of alcohol and ether, was, after reduction to the consistence of an extract, exhausted first with cold water. This aqueous solution, treated with acetate of lead to precipitate the tannin (filitannic acid?), washed and subjected to a current of sulphuretted hydrogen, to remove excess of lead, left a saccharine residue.

The residue from the aqueous exhaustion was then treated with alcohol at 85° C., which, evaporated, left, as residue, a large quantity of a black extractive, soluble in caustic potash. The small residue left consisted of a wax-like fatty material soluble in alcohol, especially in the cold. From the alcoholic treatment, there did not remain as residue more than a small quantity of green fixed oil.

Galenic Pharmacy. T. Redwood. (*Amer. Journ. Pharm.*, 3rd series, xvii. 43.) This paper concludes a very interesting report, commenced in *Pharm. Journ.*, 3rd series, xvi., on a great number of preparations of the British Pharmacopœia. As it is not suited for dealing with in the form of an abstract, we cannot do more in this place than draw the reader's attention to the paper, and refer him to the sources above quoted.

The Pharmaceutical Preparations of Atropa Belladonna. Part III.: Suggestions for Standard Galenical Preparations. W. R. Dunstan and F. Ransom. (*Pharm. Journ.*, 3rd series, xvii. 843.) The authors give the following directions for preparing a

Standard Extract of Belladonna.

Belladonna Root in No. 20 powder .	1	pound.
Rectified Spirit	48 fl. ounces.	
Distilled Water	12 ,,	,,

Mix the spirit with the water. Macerate the belladonna in two pints of this mixture for forty-eight hours, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remainder of the diluted spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and measure the exact volume of the mixture (*a*). Estimate the alkaloidal nature of this solution by the following method:—

Evaporate fifty cubic centimetres of the liquid over a water-bath with a gentle heat, until all the alcohol is dispelled. Dissolve the extract thus obtained in about five cubic centimetres of warm distilled water, acidulated with a few drops of diluted hydrochloric

acid; filter, if necessary, through a small fragment of cotton wool; pour into a stoppered glass separator, and add ammonia until the solution is distinctly alkaline. Agitate for a few minutes with five cubic centimetres of chloroform, separate, and again wash the aqueous liquid with three cubic centimetres of chloroform. Agitate the mixed chloroform solutions with five cubic centimetres of diluted hydrochloric acid, separate, again wash with three cubic centimetres of the diluted acid, mix the acid solutions, render alkaline with ammonia, and agitate with five cubic centimetres of chloroform. After separation wash the alkaline solution with three cubic centimetres of chloroform, mix the chloroform solutions, evaporate in a dish of known weight, and dry the residue, which should be nearly colourless, at a temperature of 200° F. (93° C.). The weight of the residue thus obtained multiplied by two will give the parts by weight of the alkaloids in 100 fluid parts of the liquid. The exact volume of this liquid being known, and the strength having been thus ascertained, calculate the total amount of alkaloid present therein.

Evaporate to dryness over a water-bath, and add sufficient sugar of milk to make the mixed product exactly fifty times the weight of the total alkaloid found to have been present in the liquid (*a*), allowing for that quantity which was used for the estimation. Mix intimately, powder as quickly as possible in a dry atmosphere, and transfer at once to a well-stoppered bottle. This extract will contain two per cent. of total alkaloid.

Liniment of Belladonna.

Standard Extract of Belladonna	3	ounces.
Camphor	1	ounce.
Rectified Spirit	24	fl. ounces.
Distilled Water	6	„ „

Dissolve the camphor in the spirit and the extract in the slightly warmed water. When cold mix the two solutions, allow any undissolved sugar of milk present to subside, and pour off the clear liquor, which should measure thirty fluid ounces. One hundred fluid grains of this liniment contain $\frac{1}{3}$th grain of total alkaloid, that is ·2 per cent. of atropine and hyoscyamine.

Tincture of Belladonna.

Standard Extract of Belladonna	148	grains.
Distilled Water	4	fl. ounces.
Rectified Spirit	a sufficiency.	

Dissolve the extract in the warmed water, and then add sufficient spirit to produce twenty fluid ounces. Allow any undissolved sugar of milk to subside, and decant the clear solution. One fluid ounce of this tincture contains $\frac{3}{20}$th grain of total alkaloid. One hundred cubic centimetres evaporated to dryness in the water-bath will leave a residue containing ·034 grain of atropine and hyoscyamine, these alkaloids to be isolated by the process we have previously described.

Officinal Extracts. F. J. Lammer. (*Amer. Journ. Pharm.*, November, 1886.) The author prepared the following extracts according to the directions of the *U.S. Pharmacopœia*, and determined the percentage yield of the finished products.

Extr. Aconiti	12·766 per cent.
,, Aloes aquosum	91·54 ,,
,, Arnicæ radicis	19·53 ,,
,, Belladonnæ alcoh.	32·23 ,,
,, Cannabis indicæ	16·56 ,,
,, Cinchonæ	26·4 ,,
,, Colchici radicis	23·2 ,,
,, Colchici seminis	9·63 ,,
,, Colocynthidis	15·135 ,,
,, ,, comp.	95·77 ,,
,, Conii alcohol	10·73 ,,
,, Digitalis	25·5 ,,
,, Euonymi	18·31 ,,
,, Gentianæ	44·6 ,,
,, Glycyrrhizæ purum	25·32 ,,
,, Hæmatoxyli	5·3 ,,
,, Hyoscyami alcoh.	16·64 ,,
,, Iridis	8·9 ,,
,, Juglandis	16·82 ,,
,, Krameriæ	8·4 ,,
,, Leptandræ	15·97 ,,
,, Malti	44·72 ,,
,, Mezerei	7·1 ,,
,, Nucis vomicæ	6·17 ,,
,, Opii	49·6 ,,
,, Physostigmatis	6·2 ,,
,, Podophylli	8·31 ,,
,, Quassiæ	2·24 ,,
,, Rhei	25·66 ,,
,, Stramonii	14·02 ,,
,, Taraxaci	11·3 ,,

Estimation of Alkaloids in Narcotic Extracts. E. Dieterich. (*Pharmaceut. Centralhalle*, 1887; *Amer. Journ. Pharm.*, April, 1887 179–187.)

Examination of Extracts of Belladonna, Aconite, Conium, and Hyoscyamus.—Titrate 0·2 gram of powdered lime, prepared from marble, with 3 grams of water; add 2 grams of extract, and when this is dissolved, carefully add 10 grams of powdered lime. The mixture is then placed in a closed continuous displacement apparatus, the receiving bottle, containing about 30 grams of ether, is suspended over a water-bath (not too hot) and the process of extraction is regulated by bringing the ether bottle nearer or farther from the water-bath. With extracts of belladonna, aconite, and hyoscyamus, extraction is carried on for thirty or forty-five minutes at the highest; conium extract requires at least two hours. It is advisable to exhaust a second time with ether. The ethereal solution of the alkaloids is transferred to a tared porcelain capsule, and the receiving bottle rinsed two or three times with small portions of ether; 1 c.c. of distilled water is added, and the ether carefully evaporated over a water-bath at a temperature not exceeding 30° C., care being taken not to work near hydrochloric, nitric, acetic, or other volatile acid. The residue, weighing 1·5 grams, is dissolved in 0·5 c.c. of alcohol, sp. gr. ·892, the solution diluted with 10 c.c. of distilled water, and after adding one or two drops of rosolic acid solution (1 : 100 alcohol), titrated with 100th normal sulphuric acid, each cubic centimetre of which neutralizes 0·00289 gram of atropine or hyoscyamine, 0·00523 gram of aconitine, and 0·00127 of conine.

The following results were obtained:

Extract of belladonna (thirteen experiments): 1·170, 1·184, 1·163, 1·170, 1·156, 1·142, 1·156, 1·142, 1·156, 1·170, 1·184, 1·170, 1·170, per cent.

Extract of aconite root (six experiments): 1·305, 1·252, 1·279, 1·252, 1·279, 1·279 per cent.

Extract of hyoscyamus (six experiments): ·780, ·766, ·766, ·751, ·751, ·766 per cent.

Extract of conium (six experiments): ·609, ·597, ·622, ·622, ·597, ·589 per cent.

Examination of Extract of Nux Vomica.—0·2 gram of powdered lime and 1 gram of extract of nux vomica are intimately mixed, 3 c.c. of distilled water added and evenly mixed with 10 grams of powdered lime, then exhausted in the same manner as before for $1\frac{1}{2}$ or $1\frac{3}{4}$ hours. The receiving bottle is rinsed with alcohol twice, and then with ether, and after adding 1 c.c. of distilled water, the percolate is evaporated in a tared porcelain capsule (at the same temperature, and with the same caution as stated above) to 1·5

gram; then add 0·5 c.c. of alcohol. sp. gr. ·892, 10 c.c. of distilled water, and 2 drops of rosolic acid solution, and titrate with 1–20th normal sulphuric acid. Towards the end it is advisable to use delicate blue litmus paper, conveying the solution on the paper by means of platinum wire; 1 c.c. of 1–20th normal sulphuric acid corresponds to 0·0182 gram of alkaloid.

The method may be modified by triturating 1 gram of extr. nux vomica with 3 c.c. of normal ammonia, and adding 10 grams of powdered lime. The first process yielded the following results in a number of experiments: 18·74, 18·92, 18·74, 18·56, 18·65 per cent. alkaloid.

Extracts. V. Coblentz. (*Proc. Amer. Pharm. Assoc.*, 1886. From *Amer. Journ. Pharm.*) This paper is a continuation of previous researches. For assaying *extractum ignatiæ*, the alkaloids were isolated by the method of Dunstan and Short, but it was found necessary to agitate the acid solution repeatedly with ether and chloroform, in order to remove all colouring matter and extractive; agitation with ammonia and absolute ether containing chloroform then yielded the alkaloids white. For the estimation of the alkaloids, strychnine and brucine, Mayer's solution gives variable results, as has been shown also by Dr. A. B. Lyons (*Drug. Circ.*, June, 1886). Dunstan and Short's method with potassium ferrocyanide gives correct results, but requires close attention, and does not permit of rapid work. Dr. Schweissinger's alkalimetric method is rapidly executed and exact. 1 c.c. $\frac{1}{10}$ *n* H Cl neutralizes 0·00394 gram of brucine, and 0·0034 gram of strychnine. The weighed mixed alkaloids are dissolved in a slight excess of measured $\frac{1}{10}$ *n* H Cl; the excess of acid, determined by $\frac{1}{10}$ *n* alkali, is deducted; the total weight of alkaloid is divided by the number of c.c. required for neutralizing it; the quotient is subtracted from 3·94; the remainder is divided by six, when the quotient, after removing the decimal point three places to the right, indicates the weight of strychnine, that of brucine being found by difference. When the amount of alkaloid is small, weighing of the solutions gives the most accurate results; with more than 0·1 gram measuring is practically accurate. The total alkaloids from 5 grams of the extract varied in five samples between ·194 and ·237 gram; the strychnine between ·1068 and ·1813 gram.

Extractum Podophylli.—Five samples were examined by treating with alcohol, concentrating and precipitating with acidulated water; the amount of resin thus obtained varied between 6·5 and

11·5 per cent., equivalent to from 3·2 to 5·9 per cent. of the drug.

Extractum Valerianæ.—The amount soluble in strong alcohol from 5 grams of five samples varied between 0·93 and 1·17 gram.

Extractum Senegæ.—The extract was exhausted with a mixture of two parts of alcohol and one of water, the liquid concentrated, freed from colouring matter by ether, and precipitated by alcohol and ether. The yield from 5 grams of six samples varied between ·340 and ·503 gram. Proctor obtained $5\frac{1}{2}$ per cent. of polygallic acid from senega root.

Extractum Belladonnæ.—The alkaloid was estimated by the method of Dunstan and Ransom (abstract, *Year-Book of Pharmacy*, 1885, 391), and was found to vary in five samples between ·41 and ·68 per cent. of belladonna root.

Note on Fluid Extract of Cinchona Bark. A. C. Abraham. (*Pharm. Journ.*, 3rd series, xvii. 897.) The author draws the following conclusions from his experimental observations:—

In order to obtain a fluid extract representing as far as possible the bark from which it is made in an unaltered state, the latter should first be fully exhausted with water, and the residue then extracted with the acid menstruum. Boiling water is preferable to cold. The acid menstruum should be at least double the strength of that ordered by the Pharmacopœia.

Improved Formula for Extractum Pruni Virginianæ Fluidum. C. M. Boger. (*Amer. Journ. Pharm.*, May, 1887.) The following formula has yielded good results, and develops all the prussic acid; there is no precipitate, nor does any form on standing:—

Take of Ground Wild Cherry Bark . .	℥xvj.
Water and Alcohol, each	f ℥x.
Glycerin	℥iv.

Moisten the bark with ten ounces of water, and put loosely in the percolator, close tightly and allow it to macerate sixty hours; then pack very firmly, mix the ten fluid ounces of alcohol and four drachms of glycerin, and pour it upon the bark, now cork up the percolator tightly, and macerate twenty-four hours longer; at the expiration of this time remove the cork, and about twelve fluid ounces of percolate will come through; water should now be poured on to force the other four fluid ounces out, when the percolation should be stopped, and the product will be finished. The author arrives at the conclusion that to continue the percolation beyond this point is worse than useless, as it necessitates

subsequent evaporation; nor does it add any medicinal strength to the preparation. It does add quite a considerable quantity of tannin and gallic acid, which latter results from the conversion of the tannin by heat.

Note on Fluid Extract of Scutellaria. E. Pennock. (*Amer. Journ. Pharm.*, 1887, 334.) This extract, as met with in commerce, usually contains a certain amount of precipitate. The author states that the formation of this precipitate may be prevented, or considerably lessened, by using a menstruum containing 5 per cent. of glycerin; the percentage of alcohol is not stated.

Pancreatic Extract. M. Stutzer. (*Zeitschr. für physiol. Chem.*, xi. 209.) A very active pancreatic extract may be prepared by chopping up finely a bullock's pancreas, previously freed from fat, triturating it with sand, and exposing it to the air for twenty-four to thirty-six hours. It is next rubbed up with lime water and glycerin (sp. gr. 1·23), in the proportion of two litres of each for every kilogram of minced pancreas, and allowed to macerate from four to six days with occasional stirring, next pressed, and the liquor run rapidly through a loose filtering medium. An extract prepared in this way gave maximum results upon the addition of three times its volume of water containing sodium chloride equal to 0·25 per cent. of the weight of the extract.

Haschisch and Cannabinon. (*Pharm. Journ.*, from *Pharm. Rundschau*, February, 1887.) Haschisch is said to be prepared by treating alcoholic extract of Indian hemp with caustic alkali, which combines with all the ingredients of acid character, and brings them into solution. The residue is the "pure haschisch," and consists essentially of a mixture of the soft resin cannabinon, and the alkaloid tetanine. It forms a brown, soft, resinoid substance, insoluble in water, but forming golden yellow solutions in alcohol, ether, and chloroform. A small dose, one-third of a grain, of "haschisch purum" is said to act as a stimulant, and a larger dose to produce the hemp effects completely, with subsequent sleep; but in determining the dose, the characteristics of the patient should be borne in mind. The full effect is only produced when the drug is in a fine state of division. It is, therefore, recommended to be administered in the pastille form, with powdered cacao or powdered roasted coffee as a vehicle.

If from the foregoing preparation the poisonous tetanine be removed by means of tannic acid, the remaining cannabinon has no stimulant action, but only the narcotic property. It forms a soft brown resin, with physical properties resembling those of

"haschisch," and for greater convenience in dispensing it is usually supplied as a ten per cent. trituration with milk sugar. Made up in the pastille form, with cocoa or coffee, it is administered in doses of from one-half to one and a half grains as a hypnotic, especially for hysterical or insane patients, but is contra-indicated where heart disease exists.

Concentrated Liquid Preparations for Dilution. J. L. Lemberger. (*Proc. Amer. Pharm. Assoc.*, 1886. From *Amer. Pharm. Journ.*) The author considers it quite feasible to prepare concentrated liquid preparations of some drugs which may be diluted so as to bring them to the pharmacopœial strength. The concentrated liquor of gentian, for preparing the compound infusion of gentian, is cited as an example; and from honestly prepared fluid extracts of ergot, aconite root, or nux vomica, a wine or tincture can be prepared, fulfilling all the requirements of the corresponding pharmacopœial preparations.

The Infusions of the British Pharmacopœia. R. A. Cripps. (*Pharm. Journ.*, 3rd series, xvii. 385–387.) This paper contains tables showing the alterations in the mode of preparing the official infusions according to the new Pharmacopœia as compared with the directions of the Pharmacopœia of 1867; and showing also the influence of these alterations on the products.

Of the total number of twenty-nine infusions, no fewer than seventeen have been more or less altered, that of dulcamara has been omitted, and one new one (*jaborandi*) introduced. In those cases in which the time has been reduced, without any modification, there has been, except in the case of bearberry, a decrease in the solid residue, in some instances a considerable one; there has, however, been no great difference in physical properties.

The infusions of digitalis and gentian show a diminution about equivalent to the decrease in the proportion of drugs ordered in the new formulæ.

The influence of the finer division of the drugs, however, is to considerably increase the activity of the resulting preparations, some of these infusions calling for special remarks.

Cascarilla.—A coarse powder is ordered by the old Pharmacopœia; a sieve of eight meshes to the linear inch was employed as fairly representing a coarse powder. The infusions prepared according to the 1885 Pharmacopœia was fully one-third stronger than that of the 1867 edition.

Cinchona.—The great variation in the yellow and red barks rendered a strict comparison of the old and new infusions impos-

sible; however, the influence of the other changes was observed, using the same sample of the bark in each case; four infusions were made.

No. 1.—No. 8 powder, two hours, without acid (1867).	Influence of powder.	Influence of time.
No. 2.—No. 40 powder, two hours, without acid.		
No. 3.—No. 40 powder, one hour, without acid.	Influence of acid.	
No. 4.—No. 40 powder, one hour, with acid.		

The effect of a finer powder is not really so marked as in most cases, showing an increase of only about 3 per cent. of the total alkaloids.

When the infusion is made in one hour, *cæteris paribus*, the resulting preparation is distinctly stronger than that made in two hours; this anomaly is explained by the fact that the cinchotannates of the alkaloids are much less soluble in cold than in hot water, a larger amount is therefore deposited before straining.

The greatest difference is caused, however, by the acid, the infusion containing which is fully half as strong again (in alkaloids) as the strongest of the others.

In estimating the solid residue, it was necessary to neutralize the sulphuric acid by soda, correcting the weight of residue for sulphate of sodium.

Krameria.—In this case the effect of the finer division of the root is very marked, but a No. 20 powder would have been more suitable on account of the great difficulty in obtaining rhatany in No. 40 powder, the operation of powdering an ounce occupying as long as the preparation of the infusion.

Linseed.—The great difference is due to the increased amount of liquorice.

For other particulars the tables in the original paper should be consulted.

Tincture of Strophanthus. (*Pharm. Journ.*, 3rd series, xvii. 304.) Messrs Burroughs, Wellcome & Co. report upon the following process, for which they are indebted to Prof. Fraser:—Two and a half ounces of the prime seeds are deprived of fat by means of ether, and then percolated with rectified spirit until one pint of tincture is obtained. The solution of fat in ether is rejected, as so far it has not been found of any use, and naturally interferes with making a clear solution of the tincture in water. All unripe,

imperfect seeds, and all but full-grown pods, should be rejected, as they are very deficient in active principle.

Tincture of Strophanthus. W. Martindale. (*Pharm. Journ.*, 3rd series, xvii. 411 and 503.) The author describes a number of experiments, the results of which lead him to the conclusion that, as a provisional formula for the tincture, a 1 in 20 strength should be adopted, and that the seeds alone should be used, and be first freed from their oil. The process would be as follows:—

R. Strophanthus Seeds, deprived of hairs . 1 part.

Reduce to powder—this is easiest done by pounding with broken glass—pack, and percolate with

Ether, specific gravity 0·720 . . 6 fluid parts.

Then expose the marc to the air to dry, and again pack, and percolate with

Rectified Spirit, q.s. to produce . 20 fluid parts.

Dose, 4 to 10 minims.

This tincture will be one-half the strength of a 1 in 8 tincture, as, although two and a half times the quantity of product is obtained, the drug is more nearly exhausted than by the less quantity of menstruum. It is important also that the preparation should not be so concentrated that a small dose cannot be easily and correctly apportioned.

Tincture of Strophanthus. J. Moss. (*Pharm. Journ.*, 3rd series, xvii. 524.) The author concurs in W. Martindale's recommendation of a formula yielding a tincture of less potency than that proposed by Dr. Fraser. He also records the results of experiments proving that the preliminary percolation of the seeds with ether causes no appreciable loss of active principle.

Tincture of Strophanthus. Prof. Fraser. (*Pharm. Journ.* from *Brit. Med. Journ.*, January 22, 1887, 151.) The author formally adopts the suggestions made in favour of a tincture more dilute than that originally used by him, the strength now chosen being 1 in 20, as recommended by Martindale (see above). The method of preparation now given by the author is to reduce the seeds, freed from stalks and hairs, to a moderately fine powder, and dry the powder for twelve hours at a temperature of from 100–120° F. One ounce or one part of the powder is then packed in a percolator, and ether, free from alcohol or water, is added until the powder is saturated and the ether begins to drop, when

the percolation is stopped for twenty-four hours, after which it is allowed to go on slowly until 10 fluid ounces, or 10 fluid parts of ether, have been used; if the last running of the ether is not almost colourless more should be used. The powder is then removed from the percolator and exposed to the air, or heated to 100° F. if necessary, to drive off the ether, any lumps being broken up, and the uniform, nearly white, dry powder is repacked in the percolator and allowed to macerate in contact with sufficient rectified spirit for forty-eight hours; after which rectified spirit is passed slowly through until twenty fluid parts of percolate have been obtained. The author gives the dose of this tincture as from five to ten minims; it may also be used in doses of half a minim to two minims frequently repeated. He describes it as nearly colourless, having a very pale yellow tinge, being neutral in reaction, and intensely and rather persistently bitter to the taste. It mixes unchanged with water, and is not precipitated by tannin; the solution becomes opalescent on the addition of ether. Solution of perchloride of iron also produces a slight haziness and intensifies the colour, which after some hours becomes greenish yellow.

Tincture of Strophanthus. H. Helbing. (*Pharm. Journ.*, 3rd series, xvii. 747–750.) The author calls attention to the diversity in the percentage of extract obtained from the tincture of commerce which seems to necessitate an attempt at uniformity and the fixing of a standard for the tincture. He believes that even with the greatest accuracy it is impossible to exhaust completely the seeds in the process of preparing the tincture.

The white strophanthus seeds, if treated in the same manner as the Kombé seed, show a loss during drying of 5 per cent.; the percentage of oil is somewhat less, being 28·33 per cent.; the oil is also of a green colour, but a little paler. If the two oils are heated on a water-bath, they lose their emerald-green colour, and change it for an opalescent brownish-red. The tincture derived from these seeds is found by the author to be of the same nature and colour as that from Kombé seeds.

Tincture of Rhatany. J. O. Braithwaite and E. H. Farr. (*Pharm. Journ.*, 3rd series, xvii. 399.) Following a suggestion of Mr. Holmes, the authors have studied the two official kinds of rhatany with reference to their comparative suitability for pharmaceutical purposes. The experiments were made on rhatany selected from bulk, as forming a fair sample of the whole, and were conducted in each case under conditions as nearly as possible uniform.

The amount of extractive was as follows:—

Krameria triandra.		*Krameria argentea.*	
1.	27·12	1.	21·52
2.	24·96		
3.	25·04		
4.	27·60	2.	26·72

The experiments Nos. 1 and 2, with *K. argentea* correspond with Nos. 1 and 4 respectively of those with *K. triandra* having been conducted under precisely the same conditions of temperature, etc.

The tincture made from Para Savanilla rhatany forms a bright mixture with water in all proportions, whilst that made from Peruvian rhatany becomes turbid on adding water. The taste of the Para, as might be expected, is a trifle more astringent, but in other respects there is little difference.

One other point might be mentioned in this connection, which is about the method of preparing the tincture. The authors find that by maceration for a longer period than forty-eight hours, a better tincture is produced than if the exact time be adhered to; this being more marked in the case of Para rhatany.

The temperature also has marked influence on the product; this, too, being greater with the Para variety.

Tinctura Ferri Acetatis, B.P. 1885. T. Stephenson. (*Pharm. Journ.*, 3rd series, xvii. 495.) The author shows that this tincture, and also the official liquor, are liable to form a deposit of ferric hydrate after some time, a defect similar to that well known as regards the tincture of the 1867 Pharmacopœia. He finds that as regards the liquor, the most practical way of meeting the difficulty is to keep the strong liquor and dilute it when required. He also considers it very desirable that the liquor should be as free as possible from ammonia. The tincture he considers, at best, a very unsatisfactory preparation.

Soluble Essence of Ginger. L. F. Stevens. (*Proc. Amer. Pharm. Assoc.*, 1886. From *Amer. Pharm. Journ.*) After a critical review of the various methods which have been recommended, the author finds the following process yielding a liquid containing everything desired without having the flavour and aroma impaired, as is the case with the employment of heat, alkalies, or carbonates. Shake 1 pint of fluid extract of Jamaica ginger with 4 ounces of powdered pumice stone, and 3 pints of water, adding it slowly and allowing intervals for rest and subsidence. The water precipitates the hot resin and some colouring matter, the formation of clots being prevented by the pumice stone. The

filtered product is of a light straw or amber colour, of an agreeable odour and flavour, and therapeutically is a prompt, diffusible stimulant, without irritating properties. The hot resin may be obtained from the filter by drying and washing with alcohol.

Note on Vinum Ipecacuanhæ. F. C. J. Bird. (*Chemist and Druggist*, April 2, 1887.) The author records some experiments made both with coarse powdered ipecacuanhæ and also with the whole root, and arrives at the conclusion that the Pharmacopœia is correct in directing coarse powder to be used. He suggests, however, that much less percolate should be collected.

Loss of Alcohol in making Tinctures and Fluid Extracts. J. G. Feil. (*Proc. Amer. Pharm. Assoc.*, 1886. From *Amer. Pharm. Journ.*) Working with from 5 to 50 pounds of drugs, the loss of alcohol averaged 9·8 per cent.; working with smaller quantities, it is estimated to exceed 25 per cent. in some cases.

A Simple Mode for Percolation under Pressure. T. Maben. (*Pharm. Journ.*, 3rd series, xvii. 941.) A description is given in this paper of a simple and very useful form of apparatus for percolation with the aid of a vacuum pump. The reader is referred to the original article, which is illustrated by a woodcut illustration.

A New Process for the Preparation of Syrup of Tolu. F. Stephenson. (*Pharm. Journ.*, 3rd series, xvii. 785.) In the preparation of this syrup it occurred to the author that the balsam might be sufficiently exhausted by cold maceration, if the tolu was in a fine state of division, and the syrup completed without the application of heat. The following formula is the result of his experiments in this direction :—

Balsam of Tolu	1¼ ounce.
Finest Loaf Sugar	2 pounds.
Water	16 ounces.

Reduce the balsam to powder by trituration with 8 ozs. of the sugar. Place the mixture in a bottle with water, and macerate for forty-eight hours with occasional agitation. Then filter through paper till bright, and dissolve the remainder of the sugar in the filtrate. This is best done by crushing (not powdering) the sugar, placing it in a percolator, and passing the filtrate through. The result is a clear and very full flavoured syrup, which the author thinks compares favourably with the product of any other published formula. With so large a proportion of sugar (which might

perhaps be lessened without disadvantage), the percolation is rather slow. It is found somewhat difficult to completely clarify the syrup.

Note on Aromatic Spirit of Ammonia. A. C. Abraham. (*Pharm. Journ.*, 3rd series, xvii. 512.) The author's examination of a number of samples of this preparation shows that, although the official process is capable of giving very constant results, such results are not attained by first-class houses, from which most of the samples examined had been obtained.

Estimation of Carbonate of Ammonia in Spiritus Ammoniæ Aromaticus, B. P., by means of Allen's Nitrometer. E. D. Gravill. (*Pharm. Journ.* 3rd series, xvii. 445.) For the purpose suggested in the title, the nitrometer is filled with mercury, 5 c.c. of spiritus ammoniæ aromaticus admitted, then gradually 5 c.c. of hydrochloric acid, and the volume of carbonic anhydride liberated is measured with the necessary precautions.

Spirit of Nitrous Ether. E. Painter. (*Proc. Amer. Pharm. Assoc.*, 1886. From *Amer. Pharm. Journ.*) This preparation is recommended to be made from pure nitrous ether, and this to be prepared by the action of nitrous acid gas upon alcohol. The gas is generated from a mixture of sulphuric acid, 2 lbs., arsenious acid, in lumps, $2\frac{1}{4}$ lbs., and nitric acid, $2\frac{1}{2}$ lbs., and is conducted through an empty bottle, successively through two bottles containing alcohol, and a third bottle containing water and sodium bicarbonate, for the retention of any free acid, into the condensing vessel surrounded by ice, where pure nitrous ether is obtained. This should then be mixed with three times its weight of alcohol, in which condition it may be preserved. One part of this mixture, with four parts of alcohol, makes spirit of nitrous ether of the pharmacopœial strength.

Spirit of Nitrous Ether. H. Frickhinger. (*Archiv der Pharm.* [3], xxiv. 1065–1068.) By taking alcohol of 0·812 sp. gr. instead of 0·832, as given in the German Pharmacopœia, almost the whole of the liquid may be distilled over, and there is much less free acid to contend with in the distillate. The nitric acid is not sufficient in amount to completely oxidize all the products of the reaction. The residue from the first distillation, amounting to about 2 per cent. of the original charge, is wine-yellow, strongly acid, and has a specific gravity of 1·10. It contains no nitric acid, but, on the contrary, a large quantity of oxalic acid, which can be economically converted into ammonium oxalate. If this residue

is poured into nitric acid of 1·35 sp. gr., and allowed to stand for some weeks, crystals of oxalic acid separate out from the grass-green liquid obtained. The mother-liquor becomes again colourless on warming for some time. The rectified ether is perfectly neutral in reaction; at first the sp. gr. of the distillate is 0·835, then 0·840, 0·845, and 0·850, at which point it remains until the rectification suddenly ceases.

The Pharmacognosy of the Nitrites. G. A. Atkinson. (*Pharm. Journ.*, 3rd series, xvii. 1–4.) The importance with which the compounds of nitrous acid are regarded in therapeutics, especially in the treatment of certain diseases of the circulatory, respiratory, nervous, and urinary systems, and the pharmacological knowledge regarding the nitrites as a class, are referred to as rendering their pharmacognosy worthy of careful consideration.

The author's observations tend to show that of the nitrite group (including nitro-glycerine) there are but three compounds which according to present knowledge are worthy of a permanent place in therapeutics; nitrite of amyl for inhalation, nitrite of sodium and nitro-glycerine for administration by the stomach. For subcutaneous injection any one of the three may be used, but he prefers nitrite of sodium. Nitro-glycerine, being practically stable in all conditions of the stomach, would be more suited than nitrite of sodium for exhibition through this viscus, were it not for the intense headache it is so apt to produce. The author adds that the decomposition of such a body as nitrite of sodium by the gastric juice can be largely or entirely obviated by prescribing it with bicarbonate of sodium.

Note on Liquor Strychniæ, B. P. E. H. Farr. (*Pharm. Journ.*, 3rd series, xvii. 580.) Attention is drawn in this paper to the fact that liquor strychniæ, B. P., 1885, if exposed to a low temperature, is liable to deposit crystals of hydrochlorate of strychnine, and thus to lose in strength. This observation is confirmed by several correspondents in subsequent numbers of the *Pharmaceutical Journal*.

Note on Confection of Sulphur. A. R. Robbie. (*Pharm. Journ.*, 3rd series, xvii. 759.) This confection, obtained by the directions of the Pharmacopœia, is open to the objection that when it is kept for some time, especially under circumstances favourable to evaporation, it becomes dry and hard.

The following formula gives a product which appears to leave nothing to be desired:—

Sulphur. Sublimat.	ʒiv.
P. G. Tragacanth	gr. xviij.
Tinct. Aurantii	ʒss.
Potass. Bitart.	ʒi.
Glycerini	℥vj.
Syr. Simpl.	ʒii. ℥vj.

Misce.

A sample made by the above process, which had been kept for three months in a pot loosely covered with a piece of parchment paper laid on, but not tied down, and occasionally removed, was still in perfect condition.

Quinine Pills. C. W. Holmes. (*Pharm. Journ.*, 3rd series, xvii. 454.) Simple syrup is recommended by the author as the best excipient for making these pills.

Blaud's Pills. W. Duncan. (*Pharm. Journ.*, 3rd series, xvii. 775.) The author examined nine samples of these pills, and found them to vary in the proportion of ferrous iron present from 9·9 to 22 per cent., all calculated for ferrous carbonate. He also prepared these pills himself by various published processes, in order to test their relative keeping properties. The results of his experiments lead him to the conclusion that Martindale's formula is the one that should be adopted by all who regard these pills as a preparation of ferrous carbonate, and not as a preparation of ferrous sulphate intended to form carbonate in the stomach. Martindale's formula, as recommended in the "Extra Pharmacopœia," is as follows:—

℞ Ferri Sulph.	2½ grains.
Potass. Carb.	1½ ,,
Saccharr.	1 ,,
Pulv. Trag.	⅛ ,,

Note on Blaud's Pill Mass. T. Thompson. (*Pharm. Journ.*, 3rd series, xvii. 864.) The following formula is recommended by the author:—

Dried Sulphate of Iron	36 grains.
Anhydrous Carbonate of Potassium	30 ,,
Sugar of Milk	25 ,,
Pulv. Tragacanth	10 ,,
Ol. Ricini.	q.s.

To make twenty-four 5-grain pills.

The author also suggests the use of gelatin capsules, the two desiccated salts to be incorporated separately with almond oil, then mixed and put into the capsules.

Notes on Blaud's Pills. P. Boa. (*Pharm. Journ.*, 3rd series, xvii. 865.) The author finds the following formula to give a constant and satisfactory result :—

Granulated Ferrous Sulphate, B.P. .	30 grains.
Potassium Carbonate (15 to 16 p.c. H_2O)	20 ,,
Powdered Sugar	10 ,,
Powdered Tragacanth	3 ,,

Rub the iron and sugar together, then add the potash, and after trituration add the tragacanth and beat into a mass for twelve pills. The beating required is considerable, but nothing else is needed to make a mass which rolls easily if not allowed to lie. Each pill theoretically contains a little over one grain of ferrous carbonate.

These pills are found to keep for any reasonable time with only a trifling loss of ferrous salt; it is unnecessary to coat them.

Pill Excipient. G. W. Sloan. (*Proc. Amer. Pharm. Assoc.*, 1886. From *Amer. Pharm. Journ.*) Simple cerate is recommended as being well adapted for readily decomposable or deliquescent substances, such as silver nitrate, silver oxide, gold chloride, potassium permanganate, ammonium chloride, zinc bromide, and many others. The quantity required is small, and the mass produced is smooth, plastic, firm, and readily soluble in the stomach. Powdered talc is used as a diluent if necessary, and as the powder for the pill machine.

Practical Remarks on Pearl-coating of Pills. W. Gilmour. (*Pharm. Journ.*, 3rd series, xvii. 781.) We recommend this useful paper to the attention of the reader, but refrain from giving any details here, as the substance of the paper cannot be adequately represented by an abstract.

Solubility of Gelatin as Compared with other Pill Coatings. T. Thompson. (*Pharm. Journ.*, 3rd series, xvii. 863.) The results of the author's experiments tend to prove that the gelatin-coated pill has the advantage in every respect over those coated in any other way, and that factory-made coated pills are not desirable adjuncts to a chemist's business.

Note on Linimentum Terebinthinæ and Sapo Mollis. T. Redwood. (*Pharm. Journ.*, 3rd series, xvii. 741, 742.) The author has found that those samples of soft soap which contained the largest proportions of carbonate of potassium, as well as samples of his own preparation which contained much free caustic alkali, have yielded this liniment in a thicker, more pasty condition than

it has been in when a neutral or nearly a neutral soap has been used. The result, however, largely depends on manipulation. If carefully and well prepared with neutral or nearly neutral soap, the product will be too thick to admit of its being easily put into a bottle with a narrow neck; it should be put into an open-mouthed bottle, because after standing for some days it usually becomes more liquid, and too much so to admit of its being conveniently kept in a covered pot. He arrives at the conclusion that the official formula for *Linimentum terebinthinæ* yields a thick, permanent emulsion, well suited for its intended use, if prepared with a soap that is neutral or nearly free from alkalinity; but that the definition of *Sapo mollis*, as given in the Pharmacopœia, requires correction, and otherwise admits of improvement.

Linimentum Terebinthinæ. M. Conroy. (*Chemist and Druggist*, November 20, 1886.) The author's experiments lead him to the conclusion that a fine jelly-like liniment can be made from the Pharmacopœia formula, provided the soap and water be well incorporated and the oil of turpentine added *very slowly*, with constant trituration; and secondly, that the quality of the soap and oil of turpentine does not affect the result.

Linimentum Terebinthinæ. G. E. Perry. (*Pharm. Journ.*, 3rd series, xvii. 899.) A satisfactory liniment is obtained, according to the author, by using more soap and less water than the Pharmacopœia directs, and manipulating as follows:—Dissolve in a bottle, camphor one ounce, in oil of turpentine sixteen fluid ounces; add soft soap four ounces, and water one ounce, shake. Thus made, it is an elegant, creamy emulsion, remaining sufficiently liquid, and though a slight separation will take place after a time, it is practically permanent.

Cerates and Ointments. J. E. Buckley. (*Amer. Journ. Pharm.*, November, 1886.) The author suggests that the composition of ointments should be so regulated that their fusing points be merely a little higher than the temperature of the body, both in health and disease. The following fusing points were ascertained by introducing the preparation into a glass tube of one-eighth inch bore, suspending this with a thermometer in water, and applying heat until the plug changed its position in the tube; and by heating the preparation in a cup placed in a water-bath, and stirring with a thermometer until entirely liquefied, the fluid point was determined. The preparations were all made strictly in accordance with the U.S. Pharmacopœia of 1880. The results were as follows, the temperature being given in degrees Centigrade:—

	Fused.	Fluid.	Congealed.
Ceratum	56·6	60	55·5
,, Camphoræ	57·7	62·7	53·8
,, Cantharidis	61·1	71·2	54·4
,, Cetacei	57·7	61·1	54·4
,, Extr. Canthar. . . .	70	72·1	61·2
,, Plumbi Subacet. . . .	60	62·2	54·4
,, Resinæ	51·1	54·4	48·8
,, Sabinæ	52·7	53·5	51·6
Unguentum	52·9	53·9	51·1
,, Acidi Carbol. . . .	51·9	54·4	50
,, ,, Gallici . . .	34·4	40·5	23·9
,, ,, Tann. . . .	34·4	38·3	23·8
,, Aquæ Rosæ . . .	51·1	54·4	48·8
,, Belladonnæ . . .	34·4	38·8	23·8
,, Chrysarob. . . .	34·4	38·8	23·8
,, Diachylon . . .	51·6	58·6	44·4
,, Gallæ	34·4	40 5	23·8
,, Hydrargyri . . .	45·0	51·6	44·4 29·4
,, Hydrar. Amm. . . .	33·8	38·8	23·8
,, ,, Nitrat. . .	47·2	50	31·1
,, ,, Oxid. fl. . .	52·7	60	46·6
,, ,, ,, rub. . .	50·5	54·4	42·2
,, Iodi	33·8	37·7	23·3
,, Iodiformi	35·5	39·4	23·8
,, Mezerei	50	52·2	48·3
,, Picis liq.	41·6	47·2	40·6
,, Plumbi Carb. . . .	33·8	40	23·8
,, ,, Iod. . . .	33·8	40	23·8
,, Potas. Iod. . . .	42·2	44·4	31·1
,, Stramonii . . .	41·1	44·3	28·3
,, Sulphuris	45·5	50·5	28·3
,, Sulph. Alkal. . . .	38·8	49·4	26·1
,, Veratrinæ . . .	39·4	46·5	34·4
,, Zinci Oxid. . . .	40	44·2	34·4

Linimentum Potasii Iodidi cum Sapone. A. L. Doran. (*Chemist and Druggist*, August 28, 1886.) The following formula is proposed by the author:—

Sapo Mollis (transparent)	ʒj.
Potassium Iodide	ʒiss.
Glycerin	ʒj.
S. V. R.	ʒj.
Oil of Lemons	ʒss.
Distilled Water	ʒx.

Dissolve the soap in 8 ozs. of water and the glycerine by the aid of heat, and strain while hot on to the potassium iodide, previously dissolved in the remaining 2 ozs. of water; mix, cool slightly, and add the oil dissolved in the spirit. Shake, and set aside to cool and clear.

This liniment, in addition to its other advantages, is not much affected by cold. The sapo mollis used was slightly alkaline, but, in this respect, compared favourably with commercial samples of both curd and castile soaps, which, though supplied as B.P., gave decided alkaline reactions.

Formation of Oleates during the Preparation of Ointments. C. T. George. (*Proc. Pennsylvania Pharm. Assoc.*, 1886.) Suspecting that oleates are formed in the preparation of ointments made with lard or simple cerate, and containing metals or the metallic oxides, and that the use of petroleum compounds as a base may thus be less advisable, the author has carried out a series of experiments with ointments of mercury, red oxide of mercury, yellow oxide of mercury, nitrate of mercury, oxide of zinc, and nutgalls. From the results of the experiments, the author arrives at the conclusion that the use of lard, or lard oil, and tallows, are to be recommended for the preparation of all ointments containing metals or their oxides, or vegetable powders, or extracts of any kind. Petrolatum as a base is only to be recommended for the preparation of such ointments as are used for the purpose of protecting an abraded surface of the skin, or a hacked or chapped or chafed surface, acting rather in a mechanical manner, than for any medicinal virtues they may contain.

Vaselin. C. Engler and M. Boehm. (*Dingl. polyt. Journ.*, cclxii. 468–475 and 524–530; *Journ. Chem. Soc.*, 1887, 456.) The authors call vaselin the substance extracted from petroleum residues, whilst the mixture of heavy mineral oil (*Paraffinum liquidum*) with ceresine (*Paraffinum solidum*) is regarded as "artificial vaselin." For the preparation of the natural product, two Galician oils were used. Both oils were highly dichroïc, had a green colour by reflected light, and a colour varying from yellowish to brownish red by transmitted light, and exhibited the following properties when subjected to distillation:—

	Sp. gr. at 15°.	Fraction below 150°.		150° to 200°.	
		per cent. by vol.	per cent. by weight.	per cent. by vol.	per cent. by weight.
Oil I.	0·812	30·2	26·7	35·9	35·5
„ II.	0·820	21·8	20·0	51·7	51·2

	290° to 340°.		Above 340°.	
	per cent. by vol.	per cent. by weight.	per cent. by vol.	per cent. by weight.
Oil I.	5·3	6·5	27·7	31·1
„ II.	8·8	9·4	17·0	18·9

For the production of vaselin from these oils, two methods were employed, the first consisting in dissolving the residues in petroleum spirit, bleaching the solution by filtration through animal charcoal, and expelling the solvent by distillation with steam, whilst the second method involved bleaching the oil and subjecting it to distillation in a vacuum (mercury column = 10–15 mm.) to 250°. The product obtained according to the first process formed a colourless, translucent, pasty mass melting at 32° and exhibiting no crystalline structure, even on application of cold. The vaselin extracted from the bleached oils was colourless, translucent, and free from odour. It had the following properties:—

	Yield.	Sp. gr.	Melting point.
Oil I.	13·8	0·8809	30–31°.
„ II.	13·2	0·8785	30–31°.

The composition of the different vaselins is illustrated in the subjoined table:—

	From residues.		From Petroleum Oil I.			From Petroleum Oil II.	
C	86·99	86·67	86·30	86·54	86·55	86·14	86·17
H	13·14	13·15	13·99	13·73	13·74	13·50	13·72

These results show that vaselin is composed exclusively of hydrocarbons. The oils obtained by subjecting the bleached petroleum to fractional distillation were also found to contain only carbon and hydrogen, both oxygen and sulphur being absent. The bleaching process appears to remove all oxygenated constituents and increase the amount of saturated hydrocarbons, the charcoal retaining the less highly hydrogenized hydrocarbons. Attempts were made to increase the melting-point of vaselin by subjecting it to partial redistillation. It was not, however, possible to raise the melting-point more than two or three degrees, whilst prolonged distillation resulted in reducing the melting-point, probably owing to decomposition of the vaselin. By dissolving vaselin in ether, and subjecting the ethereal solution to fractional precipitation with alcohol, the authors succeeded in separating a solid and liquid substance from vaselin. 100 grams gave 40·8 grams of solid vaselin of 0·8836 sp. gr., melting at 40°, and 59·2 grams of liquid vaselin of 0·8809 sp. gr., solidifying at −10°. Both products had the same constitution, and approximately the same boiling-points. American vaselin melting at 32–33° yielded 14 per cent. of solid vaselin, melting at 49–50°, and 86 per cent. of liquid vaselin. It is possible to separate "artificial vaselin" into a solid and liquid

substance, but the chemical and physical properties of the component parts are essentially different.

Thapsia Plaster. J. R. Crook. (*Pharm. Journ.*, 3rd series, xvii. 266.) Thapsia plaster has been in use for some time in France, and is now being tried in the United States, but cannot be said to have come into use in this country. The author considers it to be one of the most vigorous of counter-irritants, since it causes an active determination of blood from the deeper structures to the surface. There are, however, two objections to its use. These are the remarkable tendency of the eruption to spread, and the occasional severe and painful character of its local action. A tolerance of its action appears, however, to be acquired after repeated use of the plaster.

Antidotes to Cocaine. (*Lancet*, 1887, 587.) The use of nitrite of amyl as an antidote in cases of poisoning by cocaine is recommended for relieving the cerebral anæmia, and that of bromide of potassium, and the application of cold, for the convulsions which appear to be the main cause of death in fatal cases.

Chloral Hydrate and Butylchloral Hydrate as Antidotes for Strychnine and Picrotoxin. E. Koch. (*Chem. Centr.*, 1886, 811.) Butylchloral hydrate fails entirely as an antidote for strychnine, and—like chloral hydrate—is moderately efficient in picrotoxin poisoning. On the other hand, the effects of chloral hydrate and butylchloral hydrate can be effectually counteracted by picrotoxin.

Urethane as an Antidote to Strychnine, Picrotoxin, and Resorcin. M. Aurep. (*Pharm. Post*, xix. 726.) The author experimented on animals with urethane, and found it to be antagonistic to and a counter-poison for strychnine, picrotoxin, and resorcin. Urethane is equally as good as chloral, and is not dangerous, as large doses can be taken without affecting the circulation or respiration. To judge from the effect on dogs, it would require from 8 to 12 grams of urethane to overcome strychnine poisoning in a human being.

Turpentine as an Antidote to Phosphorus. E. Rondot. (*Chemist and Druggist*, September 18, 1886.) As the result of clinical observation and experiments, the author maintains the efficacy of turpentine in the treatment of poisoning by phosphorus, when taken either immediately or even some hours after the poison has been swallowed. The turpentine and phosphorus combine, and are eliminated without causing any other morbid phenomena than a local reaction on the alimentary and urinary

organs. It is important to administer the turpentine at the outset, so as to neutralise the greatest quantity possible of the poison. Even if it be not completely neutralised, the oil of turpentine renders the symptoms milder, and favours recovery. Turpentine diminishes hæmorrhage and the nervous symptoms which follow poisoning by phosphorus.

Commercial Pepsins. G. A. Grierson. (*Chemist and Druggist*, January 1, 1887.) The author has made comparative examinations of a number of commercial samples of pepsin. His results are embodied in the following table:—

No. of Sample.	Quantity dissolved from 10 grains macerated in		Difference.	Albumen Dissolved by 2 grains.	Chemical and Microscopical Examination.
	Acidulated Water.	Water.			
	grains.	grains.	grains.	grains.	
1	7	3	4	500	Maceration in ether removes 10 per cent. of fatty matter; microscopical examination reveals presence of columnar epithelium in quantity; no starch; no milk-sugar.
2	7	4	3	340	Blue with iodine; microscopical examination shows starch in small quantity and columnar epithelium; no milk-sugar.
3	6	10	4	370	Fehling's solution and microscopical examination show milk-sugar.
4	4½	3	1½	100	Blue with iodine; microscopical examination shows starch; no milk-sugar.
5	4	0	4	130	Blue with iodine; microscope shows starch in large quantity.
6	8	4	4	400	Microscope shows starch in small quantity, and epithelium.
7	7½	6½	1	80	No starch; Fehling's solution and microscopical examination show milk-sugar.
8	8	2	6	500	No starch; no milk-sugar; microscopical examination of residue from acid shows epithelium.
9	5	3½	1½	380	No milk-sugar; blue with iodine; microscopical examination shows starch.
10	10	10	0	120	No starch; Fehling's solution shows milk-sugar; microscopical examination shows this to be present in quantity.
11	3	1	2	140	No starch; no milk-sugar; microscopical examination shows it to be almost entirely composed of nucleated cells.

It will be seen that in all cases in which the proteolytic power is high, the difference between the solubility in water and in acid is comparatively great, and this may be attributed to the greater solubility of pure pepsin in acidulated than in ordinary water.

The tests were performed as follows:—Two grains of each sample were placed in a 12-ounce earthenware jar with 8 ounces of water, 1 drachm of acid. hydrochlor., P. B., and 500 grains of hard-boiled white of egg, which had previously been passed through a hair sieve. Before the pepsin was added, however, the jars with the water, acid, and white of egg were all raised to a temperature of 110° Fahr. by means of a water-bath. After adding the pepsin the temperature was gradually raised to 130° Fahr., the mixture being constantly stirred. This part of the process took half an hour, and the temperature was maintained at 130° for another half-hour, so that the whole process lasted one hour. The undissolved albumen was then thrown on muslin, and allowed to dry in the air for about twenty-four hours, and its weight, subtracted from 500 grains, gave approximately the amount dissolved. It is always advisable to use a larger quantity of albumen than the sample is expected to dissolve, as in the initial stages of the process the pepsin is more active than in the later—that is to say, that a pepsin which, when allowed 500 grains of albumen, dissolved 200, might not dissolve 100 if only started with that amount.

Nine samples of *liquid pepsins* of commerce were also examined by the same method, 1 drachm of the fluid being used in the place of 2 grains of the solid pepsin. The following shows the result:—

No. of Sample.	Albumen Dissolved. Grains.
1.	500
2.	500
3.	500
4.	300
5.	70
6.	140
7.	70
8.	110
9.	100

Nos. 1 to 4 were evidently acidulated glycerin extracts, the last of them being sold as a mixture of pepsin and pancreatin. No. 5 was sold as a compound wine containing pancreatin as well as pepsin and the natural acids of the stomach. Its action on

albumen does not say much for the activity of ferments in their natural condition. It also contained iron as an impurity. No. 6 was also an acidulated glycerin extract, and considering the menstruum used appears to be of very poor quality. Nos. 7, 8, and 9 were ordinary wines, No. 9 being a foreign make of some repute. It appears from these data that wines are much inferior to glycerin preparations in digestive power. It should be borne in mind, however, that they are given in large doses.

Alleged Incompatibility of Pepsin and Bismuth. H. K. Kroh. (*Amer. Journ. Pharm.*, November, 1886.) With the view of testing the asserted incompatibility of pepsin and bismuth salts, the author made a number of experiments regarding the digestive action of pepsin in the presence of bismuth salts. The ammonio-citrate of bismuth is unsuited for preparing clear solutions with pepsin. Bismuth subnitrate was found to somewhat retard, but not otherwise interfere with, the digestion of albumen in the presence of hydrochloric acid, added in the usual proportions. Mixtures of 1 part of pepsin, 10 parts of bismuth subnitrate, 50 of hard-boiled albumen, 500 of water, and 8 of hydrochloric acid, left only 3 parts of the albumen undissolved at the time when, in the control experiment without the bismuth salt, the albumen had been completely dissolved. The best method of administering the two remedies is in the form of mixtures, using the subnitrate of bismuth and directing the mixture to be shaken.

Antifebrin, a New Antipyretic. A. Cahn and P. Hepp, (*Centralb. für klin. Med.*, August 14, 1886; *Amer. Journ. Pharm.*, November, 1886.) The body to which this name has been given is a well-known chemical material, acetanilid or phenylacetamide, with the formula $C_6H_5NHC_2H_3O$. It is a pure white, crystalline, odourless powder, with a slight burning sensation on the tongue, is almost insoluble in cold but more readily in hot water, abundantly soluble in alcohol and alcoholic fluids. It melts at 113° C., and boils unchanged at 292° C. It has neither acid nor basic properties, and is very resistent to most reagents.

By experiments on dogs and rabbits, the authors convinced themselves that even in relatively high doses it produces no poisonous effects. The temperature of normal animals is not affected by it.

The clinical observations were made on twenty-four patients with fever, as follows: typhoid fever 8, erysipelas 5, acute rheumatism 2, pulmonary phthisis 4, abscess of the lung 1, fever in

leucæmia 1, pyæmic fever in consequence of cystitis and decubitus 1, septicæmia 1, creeping pneumonia 1.

The drug was given in individual doses of ·25 to 1 gram, stirred up in water, or in wafers, or mixed with wine. The maximum dose hitherto given has been 2 grams in twenty-four hours. The appropriate dose varies with the nature of the illness; but the authors lay down the rule that the dose required to produce the equivalent effect is about one-quarter the corresponding dose of antipyrine. They also find that distinct apyrexia is easier attained by single large doses than by repeated smaller ones. They then give some examples of the action of antifebrin.

The authors call attention to this being the first indifferent body which has been found to possess antipyretic properties, previously discovered antipyretics being either phenols (carbolic acid, hydroquinone, resorcin, salicylic acid), or bases belonging to the quinoline series (quinoline, kairine, antipyrine, thalline, quinine).

Antifebrin. P. Yvon. (*Journ. de Pharm.*, January, 1887, 22; *Pharm. Journ.*, 3rd series, xvii. 685.) Antifebrin (acetanilid), if not carefully purified, may retain traces of aniline that would impart to it a toxic action. A delicate test for this contamination is to triturate an excess of acetanilid in water and add a little solution of sodium hypobromite. If the compound has been well purified, the mixture will remain limpid and yellow, but if it contain only traces of aniline, a plentiful orange-red precipitate will be produced, the liquid taking the same colour. For medical use the author recommends the rejection of any antifebrin that is not free from odour, white, or scarcely rose tinted, converted into a colourless liquid when heated on platinum foil, completely volatilizable, and capable of standing the above test with sodium hypobromite. Heated in a capsule with mercurous nitrate, acetanilid assumes an intense green colour; the green substance is soluble in alcohol, and this reaction may be used for recognising the presence of acetanilid in urine. The urine should be shaken with chloroform, and after the evaporation of the solvent, the residue, upon being heated with mercurous nitrate, will give the green coloration if the urine contained traces of the compound.

Toxic Action of Colchicine. A. Mairet and M. Combemale. (*Comptes Rendus*, civ. 439–441; *Journ. Chem. Soc.*, 1887, 515.) Experiments with dogs and cats show that colchicine behaves as an irritant poison and attacks all the organs, but especially the digestive canal and the kidneys. The action is more rapid when

the drug is injected hypodermically, than when it is introduced into the stomach. In the first case the minimum fatal dose is 0·000571 gram per kilo. of body-weight; in the second case, 0·00125 per kilo. Details of the symptoms are given in the original paper.

Colchicine is eliminated by various secretions and chiefly with the urine, but the elimination is very slow, and therefore colchicine may behave as a cumulative poison if administered in minute quantities at not too great intervals.

Therapeutic Action of Colchicine. A. Mairet and M. Combemale. (*Comptes Rendus*, civ. 515–517.) Experiments on men, dogs, and cats show that colchicine acts either as a diuretic or a purgative, according to the dose administered, and acts by irritating the kidneys and digestive canal. The effects are the same whether the drug is administered hypodermically or by ingestion, but the action is more rapid in the former case, and the effects are produced by smaller doses. Man is three times more sensitive to its action than are cats and dogs. A dose of 2 to 3 mgrms. is sufficient to produce the diuretic, and 5 mgrms. to produce the purgative action. Colchicine increases the excretions and produces congestion at the articulations and in the bony cartilage. Its tendency to accumulate in the organism, and its great toxic power, make it essential to use the greatest care in administering it.

Physiological Action of Paraldehyde. A. Bockai. (*Chem. Centr.*, 1886, 622; *Journ. Chem. Soc.*, 1887, 391.) In opposition to Cervello, the author has found that paraldehyde acts as a stimulant before it acts as a hypnotic; the magnitude and duration of this stimulating action being in inverse ratio to the dose. During the period of excitation, the reflexes are increased, but they gradually subside with larger doses, until they are altogether completely lost.

With toxic doses, the power of reflex action is lost so rapidly that the stimulating action, as well as the original increase of reflex action, pass unobserved.

Applied locally, paraldehyde acts similarly to chloroform and ether. Death is caused by paralysis of respiration, which may to a certain extent be counteracted by artificial respiration. In consequence of its vasomotor action, paraldehyde causes an increased secretion of urine. It is a powerful antidote to strychnine, for ten times the fatal dose of strychnine may be administered to dogs that have previously received paraldehyde, without any toxic effect. Strychnine, on the other hand, is not an antidote to paraldehyde.

Physiological Action of Methylal. A. Mairet and Combemale. (*Comptes Rendus*, civ. 248–250; *Journ. Chem. Soc.*, 1887, 391.) The experiments were made on guinea-pigs, cats, dogs, and monkeys. The results show that sleep is produced more rapidly by hypodermic injection, or by inspiration of the vapour, than by injection; but in the last case it is more persistent. The higher the animal in the scale, the more sensitive is it to the hypnotic action of the methylal. In large doses, methylal exerts a toxic action, and may cause death by producing inflammatory lesions of the different organs; but in doses of 0·25–0·5 gram per kilo. of body-weight, the only symptom observed is deep sleep preceded by somewhat increased salivation; and if the slumber is very prolonged, the temperature is slightly reduced. The methylal is rapidly eliminated from the system, and the heaviness which is apparent immediately on awakening rapidly passes away.

Physiological Study of Digitaline. P. Lafon. (*Journ. de Pharm. et de Chim.*, January 15, 1887.) The author does not admit that this poison accumulates in the animal economy. It seems to undergo a considerable transformation in the circulation. Digitaline presents a relatively great resistance to physical and chemical agents, to ferments, and to putrefaction.

Boldoglucin. Dr. R. Juranville. (*Amer. Journ. Pharm.*, 1884, 580.) The author records his experiments with this glucoside. On account of its strong odour, boldoglucin cannot readily be given in the form of mixtures; but it is best administered enclosed in gelatin capsules or by means of clysters. In doses of 1·5 to 4·0 gm. it produced a decided hypnotic effect, and occasionally cessation of the hallucinations; but these, as well as sleeplessness, returned on discontinuing the use of the remedy. Though it cannot supplant other reliable hypnotics, it appears to be useful in certain forms of insomnia.

Physiological Action of Convolvulin and Jalapin. G. Dragendorff. (*Chem. Centr.*, 1886, 589; *Journ. Chem. Soc.*, 1887, 291.) The question of the excretion of these glucosides after being taken into the human stomach has been investigated by Bernatzik; traces only were found in the fæces, none in the urine. This result was confirmed by Köhler and Zincke; who, however, succeeded in isolating these purgatives from the stomach and intestines. The author has repeated these investigations, adopting a simplified method of examination of the parts for the glucosides and products of decomposition (convolvulic and jalapic acids),

based on extraction with chloroform. 0·5 gram of the glucosides was the quantity given, cats being taken as the subjects of the experiments.

The author confirmed the previous results in regard to the non-excretion of the drugs in the fæces and urine. The animals were killed after the lapse of four hours, and the organs examined; appreciable quantities of the drugs were found in the stomach and small intestines, less in the duodenum, traces only in the lungs and pancreas. No evidence was obtained that the glucosides are converted into the derived acids.

Therapeutic Value of Scopoleine. H. P. Dunn. (*Brit. Med. Journ.*, January 8, 1887. From *Pharm. Journ.*) The new mydriatic, scopoleine, obtained from Japanese belladonna root, is spoken highly of by the author. He prefers it to atropine in the treatment of keratitis, corneal ulcers, and iritis. When both atropine and eserine have failed in troublesome corneal ulcers, the use of scopoleine has been attended with success. Although he has used it in many cases, he has not in any one of them seen irritation resulting from its use. He believes that in addition to its mydriatic action, it possesses some control over the vascular supply of the eyes. The strength of the solution used by the author is one grain to the ounce.

Physiological Action of Solanine. M. Geneuil. (*Med. Record*, from *Bull. gén. Ther.*) The author has given the hydrochlorate of solanine in doses of one half a grain, repeated three or four times a day, in cases of neuralgia, rheumatism, obstinate vomiting, spasmodic nervous affections, asthma, and bronchitis, and believes that the remedy will prove to be of great value in the treatment of these and similar affections. The following are his conclusions: (1) Solanine is a poison to the terminal motor plates. It narcotizes the medulla and spinal cord, causing a paralysis of the terminal, sensory, and motor nerves. By reason of this action solanine is to be classed among the best of the analgelsics. (2) The drug may be prescribed in large doses without danger, and presents none of the inconveniences of morphine or atropine. There is no danger of a cumulative action. (3) Solanine does not cause congestion of the brain, even in the aged, and probably a like freedom from this danger exists in the case of children. (4) In all cases where it is necessary to calm excitement, relieve pain, or overcome spasm, solanine promises excellent results. It may be given with advantage in the place of morphine for the relief of any of these conditions.

The Diuretic Effects of Caffeine. L. J. v. Schroeder. (*Arch. f. Path. u. Pharmak.*, Oct., 1886; *Amer. Journ. Pharm.*, March, 1887.) The diuretic effects of caffeine, which have been previously observed by Zwenger, Gubler, Shapter, and others, have recently again been the subject of investigation. The result of the author's experiments points to two opposite effects of caffeine: (1) in stimulating the nervous system, similar to strychnine, and tending to decrease the flow of urine through the contraction of the renal vessels; and (2) in stimulating the kidney itself, and thus greatly increasing the amount of urine. That the diuretic action varies considerably in intensity was observed by Bronne (*Dissertation*, Strasburg, 1886). He administered the alkaloid in divided doses every two hours, 0·5 to 1·5 gm. being the total amount given in the morning only, so as to prevent it from causing sleeplessness; and if its employment must be prolonged, he advises its occasional discontinuance for a few days, when the remedy will act as promptly as before.

Physiological Action of Caffeine and Theine. T. J. Mays. (*Therapeutic Gazette*, September, 1886.) Léven, in 1868, showed that theine produced convulsions in frogs, while caffeine did not; and that the lethal dose of theine was larger than that of caffeine. This is confirmed by the author's experiments on frogs, from which the following conclusions are drawn:—

Theine and caffeine agree in the following—

1. They first affect the anterior extremities.

2. They diminish respiration.

3. They produce hyperæsthesia during the latter stage of the poisoning process.

They differ in the following—

1. Theine principally influences sensation, while caffeine does not.

2. Theine produces spontaneous spasms and convulsions, while caffeine does not.

3. Theine impairs the nasal reflex early in the poisoning process, while caffeine does not, if at all, until in the very last stage.

4. The lethal doses of theine is larger than that of caffeine.

Therapeutic Properties of Tribromide of Allyl. G. de Fleury. (*Archives de Pharm.*, August, 1886, 352. From *Pharm. Journ.*) Tribromide of allyl was first prepared by Wurtz, in 1857 (*Ann. de Chimie*, li. 91), by the reaction of iodide of allyl on one and a half times its weight of bromine, and is a colourless liquid, soluble in ether, boiling at 217° C., and having a specific gravity of 2·436.

According to the author this compound has been employed with good effects in hysteria, asthma, angina pectoris, and infantile convulsions. It was administered in capsules each containing five drops, two to four capsules being given daily, or subcutaneously in doses of two to four drops dissolved in one or two cubic centimetres of ether.

Eucalyptol in Phthisis. (*Chemist and Druggist*. March 19, 1887. From the *Lancet*.) Bouveret has employed hypodermic injections of eucalyptol in the treatment of phthisis. The daily dose of the antiseptic has varied from $1\frac{1}{2}$ gram to $2\frac{1}{2}$ grams. The duration of the treatment has been from fourteen to sixteen days. Sixteen cases of phthisis were treated by this method; six of the number had fever, and the remaining ten were without fever. There was rarely any local disturbance at the site of injection. It was certain that the antiseptic was absorbed; it could be detected in the breath, but not in the urine. Albuminuria was not observed as the result of the treatment. It is very doubtful whether the number of bacilli was altered in any way by the method of treatment. Sweating, as a rule, was diminished. Its chief effect is as a balsamic preparation on the bronchial secretion, which it influences favourably. MM. Perret and Chabbannes have made experiments with the five per cent. solution of eucalyptol, injecting a mixture of it with tuberculous matter under the skin of guinea-pigs. The general conclusion at which they have arrived is to the effect that the antiseptic is utterly insufficient to prevent the activity of the micro-organism that causes artificial tuberculosis.

Notes on the Pharmacy of Hydronaphthol. T. D. McElhenie (*Pharm. Journ.*, 3rd series, xvii. 352.) Hydronaphthol was introduced in 1885 by Rigney and Wolff, of New York. The principal literature on the subject is a series of articles by G. R. Fowler, on its uses in surgery.

The term hydronaphthol, although slightly vague in a scientific sense, indicates the origin and chemical kinship, and is a convenient term for commercial use. It is found to be about twelve times as strong as phenol in antiseptic power, and possesses several other advantages over that substance. It is non-irritant, and non-corrosive, and non-poisonous. The latter point was definitely ascertained by Dr. Wolff, of Philadelphia, by physiological experiments conducted at Jefferson Medical College. It is soluble in 1000 parts of water at 60° F., and 100 parts at 212° F., from which the excess separates on cooling in beautiful brown,

feathery crystals. The saturated solution (1 in 1000) has a slight aromatic odour, but it is practically tasteless. In somewhat stronger warm solutions it has a bitterish, pungent taste. It sublimes at 90° C. It occurs in silvery white pulverulent laminæ, and dissolves in four parts of alcohol, three parts of ether, and about ten parts of cotton-seed oil. The latter requires the heat of a water-bath, but remains permanent on cooling. All these solutions show a black sediment on standing, probably some tarry impurity, which will be got rid of as the process of manufacture is improved. Hydronaphthol dissolves in ten parts of glycerin at the heat of a water-bath, but almost entirely separates out on cooling, and remains suspended for days. It is freely soluble also in chloroform and benzol. Hydronaphthol is not germicidal, at least in the proportion of 0·5 in 100 parts, or five times the strength of a saturated aqueous solution, but it is reliably antiseptic in proportion of 0·1 to 0·05 per cent., preserving solutions of beef, glue, gelatin, starch, gums, and fresh wine, etc. The author has noted the following behaviour to reagents. In all cases the saturated aqueous solution was employed. This solution exposed to sunlight soon begins to darken, passing through various shades of opalescence, becoming brown after a month or so, and depositing a film on the entire inner surface of the bottle.

With Tinct. Chlor. Iron .	No change resulted.
With Tinct. Iodine . .	Discharged colour of first two or three drops, but became opaque on further addition.
With Ammonia . . .	Light purplish tinge, changing to straw colour after some hours.
Sol. Potash	No change.
Acid. Tannic	No change.
,, Salicylic. . . .	No change.
,, Acetic.	No change.
,, Sulphuric. conc. . .	No change.
,, Hydrochl. ,, . .	No change.
,, Phosphoric. ,, . .	No change.
,, Nitric. ,, . .	An orange-yellow colour, changing in a moment to a dense turbid olive-green by transmitted light, and dull purple by reflected light.
Acid. Nitro-hydrochl. conc. .	Same as nitric.
,, ,, ,, dil. .	No change.
,, Nitric. ,, .	No change.

The use of hydronaphthol will enable pharmacists to prepare fresh beef juice by sprinkling on the finely chopped beef a little of the powder, say ten grains to the pound; warm over a fire to about 130° F., and press quickly. The product would contain all the albumen, and be infinitely better than the commercial meat extracts.

Pharmacy of Terebene. (*Therapeutic Gazette*, July 15, 1886.) Terebene is stated to be best administered in the form of lozenges, for which the following formula is recommended:—

Terebene	ʒiiiss.
Acacia	ʒiij.
Water	ʒij.
Powdered Sugar	ʒvj.
Powdered Tragacanth	ʒij.

Make 100 lozenges.

With the terebene, acacia, and water, make an emulsion, which add to the powdered sugar and tragacanth, previously mixed together. Beat into a mass, and make into lozenges. The emulsion form, for administration, meets almost every requirement.

The following proportions are recommended as yielding a very good emulsion:—

Terebene	ʒiv.
Powdered Acacia	ʒiij.
Water, to make	ʒij.
Syrup of Ginger	ʒj.

First rub thoroughly together the acacia and terebene in a dry mortar, add all at once the water, rubbing rapidly until the crackling sound appears, then add the remaining water and the syrup of ginger. This emulsion is not perfectly white, owing to the syrup of ginger, which is added preferably to simple syrup because of its flavour and pungency, which somewhat mitigate the taste of the terebene.

Bromide of Arsenic as a Remedy in Diabetes. J. M. Maisch. (*Amer. Journ. Pharm.*, November, 1886.) Bromide of arsenic is given by Dr. Davis to diabetic patients in doses of from three to five drops, the diet being strictly regulated at the same time. Under this treatment the sugar disappears rapidly from the urine; but it is recommended that the administration of the remedy be afterwards continued for several weeks. Dr. Moock, has used this arsenic preparation with success in similar cases.

Medicinal Application of Nickel Bromide. A. D. Drew. (*Amer. Journ. Pharm.*, December, 1886.) This salt may be prepared by

treating the granulated metal with bromine under water, and carefully evaporating the dark green solution, when deliquescent, deep green needles are obtained, which dissolve freely in water, but are much less soluble in alcohol. The action of hydrobromic acid upon the metal, aided by heat, is very slow. Powdered nickel, heated to redness, absorbs bromine vapour, yielding bright yellow scales of the anhydrous salt, which are deliquescent, and dissolve in water with a green colour. The salt has been employed medicinally as a hypnotic and sedative, and is conveniently administered in the form of a syrup prepared as follows:—

Syrup of Nickel Bromide.—Put into a pint flask 12 ounces of water, add 377 grains of bromine and 137 grains of granulated nickel, digest at a gentle heat until reaction ceases, filter, and add sugar 24 ounces and sufficient water to make 32 fluid ounces. The syrup has a beautiful green colour, and contains 5 grains of crystallized nickel sulphate to the fluid drachm, which is an average dose.

Iodoform as an Antiseptic. C. Heyn and T. Rosving. (*Fortsch. der Med.*, January, 16, 1887.) The authors maintain that the antiseptic powers of iodoform have been assumed but not proved, and record a series of experiments which have led them to the conclusion that iodoform is not an antiseptic. They affirm that micro-organisms, even when covered with powdered iodoform, grow freely. The results of their experiments are summarized in the following conclusions:—

1. That iodoform is valueless in surgery as an antiseptic, even though it may possess other useful properties.

2. That as iodoform preparations themselves may contain pathogenous micro-organisms, they cannot be used without some danger.

3. That even though iodoform be pure there is danger in using it, unless care be taken that the apparatus (brushes, sprays, etc.), by which it is applied, are free from infective germs, for the iodoform will not kill these. In support of this view they bring forward a case recorded by Lesser, where a brush, with which a soft sore had been painted with iodoform, was applied next day to dust with iodoform a granulating wound, and a soft sore formed on the wound in consequence.

Antiseptic and Antipyretic Properties of Eugenol. G. H. Ochse. (*Pharm. Zeitschr. für Russland*, xxv. 723; *Amer. Journ. Pharm.*, March, 1887.) Eugenol, $C_{10}H_{12}O_2$, the principal component of oil of cloves, is found also in *Myrtus Pimenta* (*Pimenta officinalis*), *Amomis acris* (*Myrcia acris*), *Canella alba*, *Dicypellium caryophyl-*

latum, and in *Ravensara aromatica*. It is a phenol-like compound, insoluble in glycerin and water, and is obtained as a residue when oil of cloves is subjected to distillation with strong caustic alkalies. After the so-called light oil of cloves is distilled off, sulphuric or phosphoric acid is added, and by continuing the distillation without access of air, eugenol is obtained. Eugenol is an oily, colourless liquid, possessing the odour and taste of oil of cloves in the highest degree. In contact with air and light it soon acquires a brown colour; it boils at 247·5° C., and has a specific gravity 1·078 at 0 and 1·063 at 18·5° C. Like phenol, which it resembles very much, it has no acid reaction, does not contain the group C O O H and also forms crystallizable compounds with alkalies. When heated with hydriodic acid it evolves methyl-iodide, and when fused with potassium hydrate, it forms protocatechuic acid, $C_6 H_3 (O H)_2$ C O O H, with baryta and tin-dust it forms about ten per cent. of methyl-eugenol. When taken internally, the greater part of it is eliminated by the urine, in which however it cannot be detected by its odour. Eugenol has been given in doses of three grams per day dissolved in alcohol and diluted with water. As an antiseptic, it is superior to phenol; as a febrifuge, it is not as efficacious as quinine, salicylic acid, antipyrine or thalline.

The Use of Salicylic and Boric Acids for Preserving Solutions of Alkaloids. R. G. Eccles. (*Drugg. Circular*, July, 1886; *Pharm. Journ.*, 3rd series, xvii. 62.) The author points out that though salicylic acid possesses the power of preventing the development and propagation of fungoid germs, in solutions of the salts of alkaloids, it does not kill the germs; and their growth might begin again should a solution protected by salicylic acid become neutral. Among the drawbacks of a too extensive use of this acid for such purposes, he refers to its power of destroying the action of the digestive ferments which have now become such valuable medicines, and may often have to be administered to patients who are also taking alkaloids dispensed in the form of solutions preserved by salicylic acid. He also calls attention to the irritating effects of salicylic acid on the kidneys, and to its irritant action when applied locally in collyria. As between salicylic and boric acids, he considers that the latter must be acknowledged the preferable in collyria. It is much more soothing, notwithstanding the fact that it requires nearly forty times the amount to do the same work. All who have tried the two upon the conjunctiva never hesitate in giving the preference to boric acid. Dr. Squibb now prefers it to everything else, and thinks that a better article

for the purpose is unnecessary. Certainly its almost negative medical properties would seem to commend it here. It is soothing to inflamed tissues, and is not likely to be physiologically contra-indicated in many cases. The author's choice, however, after a trial of many kinds is benzoic acid. Applied to the eyes in solution of more than double the strength necessary to protect, it does not produce the least irritation. One grain has about the same antiseptic power as a drachm of boric acid. In fruit juices the flavour is not in the least impaired by it, and in alkaloidal solutions no nauseous taste is superimposed on that of the active ingredient. Like all others, it is sometimes contra-indicated, but less frequently than salicylic acid, and no oftener than boric. It is excreted as hippuric acid, a nominal constituent of urine, thus indicating that it adds force to the body. Salicylic acid steals force away, by being excreted as salicyluric acid, a combination of itself and glycol.

The Decomposition of Ergotin Solutions. M. Engelmann. (*Deutsche Medicinische Wochenschrift*, Sept. 30, 1886. From *Med. News.*) As a result of elaborate bacteriological studies, the author presents the following conclusions:

1. Pure ergotin, unmixed, and dispensed in sterilized glass, may be preserved almost indefinitely.

2. Aqueous solutions of ergotin undergo a more or less speedy decomposition. This is due to the action of micro-organisms.

3. Such solutions, when introduced subcutaneously, induce varying degrees of inflammation.

4. The addition of antiseptic agents to such solutions, as ordinarily practised, only delays the decomposition.

5. In order completely to prevent the development of living ferments, the antiseptic must be added in quantities which are directly irritating, and are not indifferent in their action upon the organism of the patient.

6. Ergotin solutions may be quite far advanced in decomposition before the eye can detect such change.

7. Ergotin may be most advantageously administered subcutaneously, when dissolved in water previously sterilized by a half hour's boiling.

8. The solution may be best effected in the syringe itself.

9. The distilled water in general use often contains bacteria, often to such an extent that from a single drop there may be cultivated upon the gelatin plate many thousands of colonies.

10. In all solutions of drugs to be used subcutaneously, it is

therefore advisable that the water should be sterilized by prolonged boiling just previous to its use.

11. The decomposition of pure ergotin has been found to be due to bacterial impurities on the glass vessels used. A large number of micro-organisms cause decomposition in the solutions; the ordinary bacteria of decomposition, however, are the most active.

Liquid Paraffin as an Excipient for Hypodermic Injections. M. Lyon. (*Pharm. Post*, xx. 207. From *Amer. Journ. Pharm.*) The author has discovered that several substances which, owing to their irritating properties, could not be used hypodermically, lose this disagreeable property when dissolved in liquid paraffin, which to be suitable for hypodermic use must be neutral to litmus-paper; heated to 180° C. no vapours should be evolved, sp. gr. at 150° C. = 0·870—0·895; it should be odourless and tasteless. If corresponding with the aforesaid properties a slight fluorescence does not impair its efficacy, although the German Pharmacopœia condemns it. Liquid paraffin dissolves only a limited number of oxygenated compounds, but readily dissolves hydrocarbons, ether, chloroform, fats and fatty oils; menthol, thymol, terpinol, etc., are soluble in all proportions. Large quantities of iodine, bromine, phosphorus, and iodoform are also soluble in liquid paraffin. According to Bocquillon, it dissolves four times its volume of sulphuretted hydrogen gas, *i.e.*, more than water is capable of dissolving. Oil of eucalyptus produces abscesses when injected subcutaneously, hence eucalyptol (so-called absolute eucalyptol, obtained by distilling oil of eucalyptus at a temperature of 170–180° C.) only should be used. 1 part of eucalyptol is mixed with 4 parts of liquid paraffin. 5 grams of this mixture are injected twice daily. The same proportions are used for myrtol. For iodoform the following method is used: 1 gram of iodoform is dissolved in 20 grams of eucalyptol and 100 grams of liquid paraffin. Of this mixture 5 grams are injected twice daily. Carbon bisulphide, 2 to 100 of paraffin oil, is used in like doses.

Liquid paraffin will not dissolve water, strong or diluted alcohol, glycerin, methylic alcohol, amylic alcohol, salicylic acid, salts of mercury, terpin, chloral, naphthol, alkaloids, glucosides, and iodol. It dissolves but a small quantity of carbolic acid.

Sterilising Hypodermic Solutions. R. N. Girling. (*New Orleans Med. and Surg. Journ*, Oct., 1886.) A. Poehl in a recent article published in the *Pharm. Zeitung*, comments on the desirability of preparing solutions of the alkaloidal salts, for hypodermic use, which shall remain free from bacteria or ferment bodies, and

remarks that solutions for subcutaneous injections are generally made without any antiseptic precautions.

A process which has given good results, and which is not open to the objection of introducing foreign substances, such as salicylic or boric acid, is described by the author as follows :—

Water, which has been re-distilled from a mixture of about 2 per cent. of caustic soda and permanganate of potash (the first portions of the distillate, if showing traces of ammonia when tested by Nessler's reagent, having been rejected), is mixed with about 1 per cent. of pure chloroform. The alkaloidal salt is to be added, and the solution heated in a flask, furnished with a thermometer, to a temperature of 60-62° C., until all traces of chloroform have been dissipated. The resulting solution is to be filtered through paper which has been folded ready for use, and afterwards been sterilized by heating to a temperature of 125–130° C. in an air-chamber or drying oven for at least one hour. Sufficient of the re-distilled water is to be poured through the filter to make the filtrate either weigh or measure accurately the desired quantity. Last, but by no means least, the solution is to be preserved in vials which have been washed with some of the same water and dried at a temperature of 125–130° C. or over. The cork used should also be washed in the re-distilled water, and dried in the same manner as the vials.

Solutions thus prepared have been kept for months without showing signs of change.

NOTES AND FORMULÆ.

PART III.

NOTES AND FORMULÆ.

Hydrogen Peroxide as a Remedy for Whooping Cough. B. W. Richardson. (*Pharm. Journ.*, from *Asclepiad*, February, 1887.) The author speaks very highly of peroxide of hydrogen as a remedy in whooping cough. In his opinion it acts in a manner very similar to dilute nitric acid, but with more effect, subduing the spasmodic paroxysm, checking the secretion in the throat, and shortening the duration of the malady. His formula for prescribing it is:—Hydrogen peroxide (10 vols.), ʒvj.; glycerin, ʒiv.; water to ʒiij. Dose, half a fluid ounce in a wineglassful of water five or six times a day.

Hydrogen Peroxide in Catarrhal Affections. J. N. Mackenzie. (*Phil. Med. Times.*, 1887, 268.) The author directs attention to the use of hydrogen peroxide in 4 per cent. solution for catarrhal affections attended by profuse muco-purulent discharge, used in doses of a fourth to half an ounce three, four, or even six times a day; for topical use he prefers a 6 per cent. solution. By some persons even weaker solutions cannot be used, on account of their irritating effect upon the air passages. A marked improvement in the gastric functions was incidentally observed during its administration. Indeed, so striking has been its effects in this regard that it is worthy of more extended trial in obstinate stomachic derangement.

Ethereal Oxygen. B. W. Richardson. (*Chemist and Druggist*, February 12, 1887.) The author places in a Wolff's bottle, with an inhaling mouthpiece attached to one neck, 2 ounces or more of ozonic ether, the ethereal solution of peroxide of hydrogen. To this he adds, gradually, a solution of permanganate of potash—8 grains to 1 ounce of water—by the other neck of the bottle, and then corks that neck. As the fluids commingle, oxygen gas and ether vapour are given off freely, and can be inhaled from the mouthpiece. The compound of gas and vapour, anæsthetic, antispas-

modic, and respirating, is applicable to a large class of cases of disease, such as pertussis, asthma, and phthisis.

Terpine in Neuralgia. M. Ducroux. (*Brit. Med. Journ.*, January 8, 1887, 79.) The author recommends the use of terpine in some forms of neuralgia. He has given it in doses of 60 centigrams in three pills, to be taken between meals.

Cannabis Indica in Headache. S. Mackenzie. (*Brit. Med. Journ.*, January 15, 1887.) Indian hemp is recommended by the author as being very useful in headaches of a continuous or chronic character. He has used the extract with success in doses of half a grain night and morning, gradually increased to two grains at night and one and half in the morning.

Diuretic Effects of Calomel. Dr. Jendrafsik. (*Therapeutic Gazette*, 1886, 471.) The author states that he accidentally discovered that calomel produced a powerfully diuretic effect in a case of dropsy, and that he has since then tried it in a number of cases, and always with success. He gives 3 grains three or four times in twenty-four hours.

Cocaine in Dysentery. R. L. Hinton. (*Therapeutic Gazette*, August, 1886, 489.) The author directs attention to the value of cocaine hydrochlorate to relieve pain and tenesmus in dysentery. He administered it in the form of an injection of 2 or 3 drachms of a 4 per cent. solution, with the most successful results.

Chloroform as a Styptic. Dr. Ipaak. (*Pharm. Journ.*, from *Brit. Journ. Dental Science*, Aug. 1886, 704.) The author recommends the use of chloroform as a hæmostatic in dentistry. The solution used consists of 2 parts of chloroform in 100 parts of water. The use of chloroform applied to the crown of the tooth on cotton-wool, to deaden the pain caused by the pressure of the forceps on the sensitive dentine, has therefore the double advantage, since a hæmostatic action will also be obtained.

Chloroform as a Tapeworm Remedy. (*Chemist and Druggist*, Feb. 19, 1887.) Chloroform has been found very efficient against tapeworms. Doses of 30 grains have been given, repeated after twenty or thirty minutes; but troublesome cardiac symptoms may be avoided by giving smaller doses (a few drops) every five minutes for a few times. Thompson successfully prescribed chloroform, ʒj. (by weight), simple syrup to ʒj., to be given in three doses, at intervals of two hours, in the morning, fasting, with castor oil to follow.

Application of Boric Acid in Throat Diseases. A. D. Macgregor. (*Pharm. Journ.*, 3rd series, xvii. 46.) The author

recommends a gargle containing boric acid and glycerin, with either tannic acid or alum in addition, in *pharyngitis* and *relaxed conditions of the throat.*

Application of Quinine as Oleate. R. Rother. (*Druggists' Circular*, July, 1886.) The method of administering quinine by inunction is coming into practice. For this purpose it is usually exhibited in the form of an ointment prepared by mixing some salt of quinine, usually the sulphate, with a fatty medium. Since the oleate presents superior advantages in this manner of application, such an article has of late appeared in the market. As the quality of the commercial article is variable, and frequently not of good quality, the author recommends the following process for its preparation :—

Quinine, Anhydrous	324 parts.
Oleic Acid.	282 „
Acohol,	
Water	of each sufficient.

Mix the oleic acid with its volume of alcohol, and gradually add the quinine, finally warming the mixture, if necessary to effect complete combination, and filter if desirable. Expel the alcohol with a gentle heat, and incorporate a little water with the residue. Set it aside in the open air, occasionally stirring it, until the salt has become firm and perfectly dry.

Piperine in Ague. C. S. Taylor. (*Pharm. Journ.*, from *Brit. Med. Journ.*, September 4, 1886, 449.) Some cases of refractory intermittent fever, in which, after the failure of quinine, piperine has been administered with advantage, are reported by the author. In one case, immediately on the appearance of an attack, three grains of piperine were given every hour until eighteen grains had been taken, and on the following day, when the intermission was complete, the same dose was given every three hours. The author remarks also that piperine does not produce the unpleasant symptoms in the head which sometimes follow the use of quinine.

Cantharides as a Preventive of Hydrophobia. J. M. Maisch. (*Amer. Journ. Pharm.*, March, 1887.) According to the *Brit. Med. Journ.*, a Russian physician, Dr. Karchewski, has treated three persons, who had been bitten by a rabid wolf, with cantharides plaster applied to the wounds, giving at the same time one grain of powdered cantharides daily for one week. After seven months no symptoms of rabies had appeared.

This method of treatment was recommended as being always

successful by Dr. J. N. Rust, of Berlin, in the early part of this century; for internal use he ordered,—

Cantharid.	gr. xij.
Lapid. Cancror.,	
Sacchari	āā ʒ jss.

M. ft. pulv. xij.

One powder to be taken twice or thrice daily.

Cocaine as a Remedy for Hydrophobia. Dr. Keegan. (*Les Nouveaux Remèdes*, 1886, 525.) The author reports from India that he has successfully treated several cases of hydrophobia by the local application of a four per cent. solution of *cocaine* to the back part of the throat.

Heliotropin as an Antiseptic. M. Fraggani. (*Pharm. Centralhalle*, xxviii. 253.) Heliotropin, also known by the term piperonal, is recommended by the author as an antiseptic and antipyretic. It is given in doses of 1·0 gram every two or three hours, or four times a day, or even in larger doses. It may be prepared by the oxidation of piperic acid with potassium permanganate in alkaline solution.

Menthiodol. (*Pharm. Rundschau*, 1886, 368.) This remedy has been recommended in neuralgia. It is prepared by carefully heating 4 parts of menthol in a small glass or porcelain vessel, adding 1 part of finely powdered iodol, and triturating well until a homogeneous mass is produced, which is converted into cones or pencils of suitable size. Should the mass become too hard for certain purposes, it is remelted, with the addition of a minute quantity of camphor.

Anæsthetic Properties of Hydrochlorate of Caffeine. Dr. Terrier. (From *Journ. de Méd. de Paris.*) Hydrochlorate of caffeine has been observed by the author to possess an anæsthetic action almost identical with that of cocaine.

Orcin, a New Dermatological Remedy. (*Pharm. Rundschau*, xii. 955. From *Amer. Journ. Pharm.*) Orcin is a white, stable powder having a mild, aromatic odour and a sweet-bitter taste, dissolves readily in the ordinary solvents and crystallizes easily from aqueous solutions. Orcin is a dihydroxyltoluol, and is closely related to resorcin. It is prepared synthetically by fusing hydroxylate of potassium with chlorocresylsulphonic acid. Like resorcin and ichthyol, it is a keratoplastic remedy. In burns it eases pain quicker than resorcin or cocaine, and is worthy of further dermatological experiments.

Antipyrine, as a Hæmostatic. M. Chéron. (From *Revue d. Mal. d. Femmes.*) Antipyrine is stated to be a most valuable hæmostatic, and to be preferable to iron solutions and to ergot as a local application in uterine hemorrhages, a 4 per cent. solution being usually of sufficient strength.

Calcium Santonate. J. M. Maisch. (*Amer. Journ. Pharm.*, November, 1886.) This salt is prepared, according to Heldt, by digesting calcium hydrate with santonin in alcoholic solution until the red colour has disappeared, evaporating the filtrate at a moderate temperature, exhausting the dry residue with water, and concentrating. The salt forms white satiny, crystalline crusts, is permanent in the air and sunlight, has an alkaline taste and reaction, and is soluble in water and in alcohol. The compound has recently been recommended as possessing anthelmintic properties without being absorbed in the digestive tract. The dose is 1 grain.

Oil of Erigeron. R. Bartholow. (*Physic. and Surg.*, April, 1887.) This oil has been observed by the author to check the waste of albumen, to lessen the irritability of the bladder in cystitis, and to afford considerable relief in bronchial catarrh and similar affections. It was usually given in doses of five drops every three or four hours.

Eulyptol. Dr. Schmeltz. (*Bull. Gén. de Thérap.*, 1886.) Eulyptol is a mixture of 6 parts of salicylic acid, 1 part of carbolic acid, and 1 part of oil of eucalyptus, which the author believes to be preferable to most other antiseptics. Since carbolic acid cannot be detected by the usual tests in this mixture, the formation of a chemical compound seems to be indicated. It has a strong, aromatic odour, and an acrid, burning taste, dissolves readily in alcohol, ether, chloroform, and a mixture of equal parts of alcohol and glycerin, also in alkalies, but is sparingly soluble in water. Urine to which a small quantity of eulyptol has been added remains unchanged for fully a month.

Hypodermic Injection of Cocaine and Mercury. Dr. Mandelbaum. (*Monatsh. für prakt. Dermat.*) This injection, which is useful in syphilitic disorders, is recommended by the author to be prepared as follows :—

Cocaine Hydrochlorate . .	0·050 gm. (gr. $\frac{3}{4}$).
Mercuric Cyanide . . .	0·010 „ (gr. $\frac{1}{7}$).
Distilled Water	15 drops.

Application of Iodoform Collodion for Neuralgia. (*Nouv. Remèdes*, 1886, 525.) Iodoform collodion has been successfully used for the relief of neuralgia, and is usually prepared by dissolving 1 part of iodoform in 15 parts of collodion. Occasionally 10 per cent., and even 25 per cent. solutions have been employed. An older formula consists of 5 parts of iodoform, 5 of balsam of Pern, 5 of powdered soap, and 85 of collodion.

Naphthalin as a Vermifuge. M. Koriander. (*Pharm. Zeitschr. für Russl.*, xxv. 786.) The author gives children from one to three years old 0·15 to 2·0 grams twice daily; to adults he gives from 1·25 to 6·0 grams per day, in powders with sugar. He has frequently noticed excellent results from naphthalin when given for tapeworm.

Therapeutic Application of Bismuth Subiodide. A. S. Reynolds. (*Medical News*, October 9, 1886.) This salt is regarded by the author as being very valuable in the treatment of chronic ulceration; he states that the salt will control inflammation, allay irritation, suppress suppuration, promote granulation, and induce cicatrization. He has also employed it internally in doses of five and ten grains. The salt may be prepared by diluting an acid solution of bismuth subnitrate with water as far as it is possible without causing reprecipitation, and then adding this solution gradually to a solution of potassium iodide. The brown precipitate of subiodide thus formed may be purified by dissolving it in hydriodic acid and reprecipitating with water.

Use of Subnitrate of Bismuth for Antiseptic Dressings. (*Amer. Journ. Pharm.*, March, 1887.) Subnitrate of bismuth possesses antiseptic properties at least equal to those of iodoform. No poisonous effects are to be apprehended, as in the employment of the latter. The subnitrate of bismuth, being a chemically indifferent substance, does not irritate the wounds; secretion is diminished. Its action is very prolonged, although not vigorous, so that the dressings do not need to be frequently changed, and rest is insured for the wounds. It does not afford protection against erysipelas and other wound diseases, at least no more than iodoform. It is no disinfectant, but as an antiseptic it keeps the wounds pure. It also represents an excellent material for forming scabs under which epidermis can grow over the wound. Its use on granulating wounds has not, however, been sufficiently studied as yet.

Boro-Phenol. (*Quart. Therap. Rev.*, 1887, 3.) This new disinfectant is a combination of borax and carbolic acid, and is intended

for antiseptic and disinfecting purposes. It has a more agreeable odour than the ordinary carbolic acid preparations, and has the further advantage of being completely soluble in water, and that it forms a solution which may be used for all the purposes for which the ordinary carbolic acid disinfectants are applicable. The new combination has, however, to be used in very much smaller quantities than the carbolic acid disinfecting powder.

Tannin as a Remedy in Consumption. MM. Raymond and Arthaud. (*Quart. Therap. Rev.*, 1887, 9.) The authors have made some comparative researches on the action of tannic acid in tuberculous patients. Having found that when tannin had been administered to animals for a month, they were more refractory to the effects of the tubercular virus, it was used in more than fifty cases of tuberculosis, in doses of from two to four grams daily. In less than a fortnight half of the patients showed an increased weight, which continued during the treatment. In acute tuberculosis, both of the child and the adult, the symptoms amended, and the disease retrograded in some cases which had been looked on as hopeless.

Physiological Action of Vanillin. J. Grasset. (*Arch. de Pharm.*, August, 1886.) The author has found vanillin fatal to frogs in doses of from three-quarters to nine-tenths of a grain, but has not ascertained that there is a toxic dose for the higher animals. In frogs it acts chiefly on the spinal cord, its action being like that of strychnine, but much milder. It seems to delay putrefactive fermentation. It is counteracted by chloral. Therapeutically, it may be used in doses of three-quarters of a grain, as an aid to digestion, especially in atonic and putrefactive dyspepsia, or as a corrigent of drugs which, like chloral, are not well borne by the stomach; also, in doses of from three to four grains, in mucilage, as an excito-motor.

Antifungin. (*Pharm. Centralh.*, June 2, 1887, 281.) A white sweet-tasting powder, said to consist of a soluble borate of magnesia, prepared by a special process, has been introduced under the name of "antifungin," as possessing extraordinarily powerful disinfecting properties, and as being a specific against diphtheritis. It is said to be soluble in four parts of boiling water, and it is used as a 15 per cent. solution. From five to twenty drops, according to age, are administered every one or two hours, and about a teaspoonful is sprayed hourly in the sick-chamber. Further, the diphtheritic growth is painted with the solution every one or two hours until it disappears.

Snuffs for Coryza. (*Chemist and Druggist*, August 14, 1886.) Rabow (*Deutsch. Med. Wochenschrift*, 5, 1886) has repeatedly seen benefit from the following powders, used like ordinary snuff, which also they resemble in appearance, and appear to be more pleasant to use than Ferrier's white bismuth snuff:—(1) Menthol, 2 parts; roasted coffee, 50 parts; white sugar, 50 parts. Mix. (2) Cocaine hydrochlorate, 1 part; roasted coffee and white sugar, of each 50 parts. Mix.

Pulvis Pepsini Compositus (Pulvis Digestivus.) (*Chemist and Druggist*, January 29, 1887.)

Saccharated Pepsin	15 parts.
Pancreatin (undiluted)	15 ,,
Diastase (ptyalin)	1 ,,
Lactic Acid (U.S.Ph.)	1 ,,
Hydrochloric Acid	1½ ,,
Sugar of Milk	65½ ,,

To the sugar of milk add the acid gradually, and triturate until a uniform mixture is produced. After having mixed the diastase with the pepsin and pancreatin, incorporate them with the aid of sugar of milk. Finally, rub the mixture through a sieve, and preserve the powder in bottles.

Chloral Hydrate as a Vesicant. (*Chemist and Druggist*, January 29, 1887.) A blistering plaster, in which the well-known hypnotic is the active ingredient, may be made as follows:—Cut a piece of adhesive plaster of the desired size and sprinkle it freely with powdered chloral, leaving the edges free. Then warm the back of the adhesive plaster gently, until the chloral liquefies. The strip is then applied to the skin, previously well oiled. After ten to fifteen minutes a large blister is formed, and the plaster should be removed, else ulceration may follow. The vesication is attended with little pain.

Osmic Acid as a Remedy for Neuralgia. Dr. Schapiro. (*Journ. de Pharm. et de Chim.*, xiv. 519.) The author uses the following solution:—

Osmic Acid	0·455
Glycerin	11·20
Distilled Water	24·60

This solution should be kept in a black bottle, and if carefully sealed will keep for two or three weeks.

For neuralgic affections five drops of the above solution are

injected hypodermically near the seat of pain. In some cases the injection must be renewed, but does not produce any dangerous results.

Osmic Acid as a Remedy in Epilepsy and Sciatica. (*Chemist and Druggist*, February 19, 1887.) Osmic acid has been successfully used in these cases. Administered in pill form, made up with American bole. The dose is $1\frac{1}{2}$ grain, which may be repeated several times a day.

Salol in Sciatica. Dr. V. Aschenbach. (*Chemist and Druggist*, March 19, 1887.) The author reports that, suffering from sciatica, for which all known remedies had been tried in vain, he at last resolved to try salol. In the evening he took a dose of half a gram, and at midnight one gram, after which he fell asleep, and remained perfectly free from pain.

Tetanic Effects of Sodium Sulphocyanide. H. Paschkis. (*Schmidt's Jahrbücher*, April, 1886.) This salt has been found by the author to have an action similar to that of strychnine, but less rapid, producing in frogs prolonged tetanic convulsions, with inhibition of the respiratory and cardiac movements. Injected into the arteries of mammals, a marked increase in the blood pressure is produced.

Antiseptic Cottons. J. W. England. (*Amer. Journ. Pharm.*, April, 1887.)

Borated Cotton.—This is best made as follows:—

Boric Acid	80 grams.
Boiling Water	1,814 ,,
Absorbent Cotton	453·5 ,,

Dissolve the acid in the boiling water, impregnate the cotton, express and dry by exposure to the air or slight heat. Borated cotton thus made contains exactly, in the finished product, 15 per cent of its weight of acid. The use of a Trœmner solution balance will greatly facilitate the weighing of quantities in this as well as in all the remaining formulæ.

Benzoated Cotton.—The following formula yields a preparation containing 15 per cent. of acid:—

Benzoic Acid	90 grams.
Boiling Water	1,814 ,,
Glycerin	57 ,,
Absorbent Cotton	453·5 ,,

Proceed as before.

Salicylated Cotton.—This is generally made 10 per cent. in strength, with water, alcohol, and a small proportion of glycerin to prevent the shaking out, after drying, of the crystals contained in the interstices of the fibres. The following is the formula used:—

Salicylic Acid	57 grams.
Alcohol	453·5 ,,
Hot Water	2,268 ,,
Glycerin	57 ,,
Absorbent Cotton	453·5 ,,

Mix the acid, in a porcelain or wedgewood mortar, with the glycerin, dissolve with the addition of alcohol, place the solution in a large, flat, open vessel, and lay upon the surface of the liquid the cotton in thin layers. After standing for ten minutes in this liquid, and absorption is completed, remove, express, and lay aside to dry upon a frame. Pilcher observes that the antiseptic qualities of the cotton may be still further enhanced if, before using, a thin layer of it be dipped in a 10 per cent. solution of the acid, with glycerin, applying this to the wound first, and then covering with a thick layer of dry salicylated cotton, sufficiently wide to extend beyond the outer limits of the wound on all sides.

Naphthalinated Cotton is made by soaking absorbent cotton, in thin layers, in a saturated solution of naphthalin in petroleum benzin, expressing and drying. The following is the formula:—

Naphthalin	453·5 grams.
Petroleum Benzin	2,732 ,,
Absorbent Cotton	453·5 ,,

Iodoformized Cotton.—Lister accords little value to the antiseptic qualities of iodoform in this shape. It may be made, however, by this formula:—

Iodoform	24 grams.
Ether	250 ,,
Alcohol	750 ,,
Absorbent Cotton	453·5 ,,

Dissolve the iodoform in the ether, add the alcohol, and proceed in the usual way; or, if desired, the cotton may be prepared, extemporaneously, by rubbing the iodoform thoroughly into it, and shaking out any excess. As made above, it contains 5 per cent., but can be increased to a much greater strength if required.

Carbolized Cotton.—Cheyne states that this can best be made by soaking sufficient absorbent cotton in a one per cent. solution of

carbolic acid in ether, drying at once and using immediately. Any value that it may possess at first, which is questioned, is almost *nil* after keeping for a time, from the volatility of its active constituent, and it is seldom, if ever, employed, especially in view of the great superiority of the carbolized gauze.

Sublimated Cotton.—This cotton is readily made by the following modification of Rümmel's formula, and contains one-half per cent. of the poisonous mercuric chloride :—

Corrosive Sublimate	2·5 grams.
Alcohol	57 ,,
Water	1,814 ,,
Glycerin	57 ,,
Absorbent Cotton	453·5 ,,

Dissolve the sublimate in the alcohol, add the water and glycerin, impregnate the cotton, and proceed in the usual way.

Antiseptic Gauzes. J. W. England. (*Amer. Journ. Pharm.*, April, 1887.) *Carbolized Gauze.*—The formula employed by the author is based to a certain extent upon that of Von Brun's (carbolic acid, 10 parts; resin, 40 parts; castor oil, 8 parts; and alcohol, 200 parts), but it varies in containing glycerin in the place of the oil, and, in addition, petroleum benzin. The finished product contains 10 per cent. of its weight of carbolic acid.

Carbolic Acid	239 grams.
Alcohol	1,200 ,,
Glycerin	150 ,,
Resin	300 ,,
Benzin	1,400 ,,
Gauze	1,700 ,,

Triturate the resin in a mortar with the benzin, add the alcohol, in which has been dissolved the carbolic acid, and then add the glycerin. Lastly, soak the gauze, in three or six-yard pieces, in this mixture, kneading well, to secure uniform diffusion; express and hang the gauze on frames to dry. It dries very quickly, after which fold in rolls and wrap up in paraffin paper. In order to increase the efficiency of the gauze, it has been recommended that the layers of gauze, prior to application, be dipped in a 1 to 40 aqueous solution of carbolic acid. The resin is used to prevent the washing away of the acid by the discharges from the wound, while the glycerin in employed to make the resin less brittle, and assist also the retention of the acid in a more than ordinary soluble form.

Sublimated Gauze.—This dressing is occasionally employed, but

not nearly to the same extent as carbolized gauze. It contains 1 part in 2,000 or $\frac{1}{20}$ per cent. of its active constituent.

Corrosive Sublimate	0·85 grams.
Alcohol	28·5 ,,
Water	2,268 ,,
Gauze	1,700 ,,

Dissolve the sublimate in the alcohol, dilute with water, and treat the gauze, in layers, with the liquid. Hang up to dry.

Medicated Tablets. G. H. Dubelle. (*Druggists' Circular*, March, 1887.)

Preparation of the Tablets.—Make a "bay" with the prepared sugar (medicated, fruit, conserve) on a marble slab, into which pour the mucilage by degrees, and mix thoroughly into a paste, flavouring the mass with the flavouring extract. Roll out the paste on a marble slab until it has the required thickness, using starch powder to dust it with to prevent the sticking to the slab and pin. Before pressing them out, strew or dash over the surface with starch powder mixed with sifted sugar, and rub it over with the heel of the hand, which gives it a smooth face. This operation is termed "facing up." Brush this off, and again dust the surface with starch powder, cut out square tablets of 15 grains, and place in wooden trays. Put them in the hot closet to dry. All tablets are finished in the same manner.

Asthma Tablets.

	Parts.
Powdered double-refined Sugar	600
Extract of Grindelia Robusta	150
Extract of Yerba Santa	150
Mucilage	70
Tincture of Tolu	30

Bronchine Tablets.

Powdered double-refined Sugar	600
Extract of Liquorice	220
Powdered Cubebs	80
Mucilage	70
Tincture of Tolu	10

Catarrh Tablets.

Powdered double-refined Sugar	600
Extract of Liquorice	120
Mucilage	70
Powdered Senna Leaves	60
Powdered Anise Seed	60
Flowers of Sulphur	60
Essence of Fennel	30

Catechu Tablets.

	Parts.
Powdered double-refined Sugar	700
Powdered Catechu	120
Mucilage	70
Powdered Orris Root	60
Powdered Vanilla	20
Triple Extract of Roses	10

Cachous'n Tablets.

Powdered double-refined Sugar	400
Powdered Vanilla Chocolate	400
Powdered Willow Charcoal	100
Mucilage	70
Tincture of Cinnamon	20

Constipation Tablets.

Powdered double-refined Sugar	300
Powdered Vanilla Chocolate	300
Calcined Magnesia	300
Mucilage	70
Tincture of Vanilla	20
Essence of Cinnamon	10

Digestive Tablets.

Powdered double-refined Sugar	600
Subnitrate of Bismuth	120
Saccharated Pepsin	90
Pancreatin	90
Mucilage	70
Essence of Aromatic Spice	30

Dyspepsia Tablets.

Powdered double refined Sugar	600
Powdered Fennel Seed	200
Powdered Calamus Root	100
Mucilage	70
Essence of Peppermint	30

Eucalyptine Tablets.

Powdered double-refined Sugar	700
Extract of Eucalyptus	120
Rose Conserve	80
Mucilage	70
Triple Extract of Rose	20
Tincture of Eucalyptus	10

Gingerine Tablets.

	Parts.
Powdered double-refined Sugar	800
Powdered Jamaica Ginger	80
Mucilage	70
Grated fresh Lemon Peel	20
Tincture of Vanilla	20
Essence of Cinnamon	10

Ginger-Malt Tablets.

Powdered double-refined Sugar	600
Extract of Malt	200
Powdered Ginger	70
Mucilage	70
Grated fresh Lemon Peel	30
Essence of Lemon	20
Triple Extract of Roses	10

Indian Tamar Tablets.

Powdered double-refined Sugar	600
Pulp of Tamarinds	200
Powdered Senna Leaves	100
Mucilage	70
Essence of Coriander	20
Essence of Lemon	10

Japanese Cinnamon Tablets.

Powdered double-refined Sugar	800
Powdered Cinnamon	80
Mucilage	70
Powdered Vanilla	20
Triple Extract of Roses	20

Pancreatine Tablets.

Powdered double-refined Sugar	600
Extract of Malt	150
Pancreatin	150
Mucilage	70
Essence of Aromatic Spice	30

Pepsin-Bismuth Tablets.

Powdered double-refined Sugar	600
Powdered Vanilla Chocolate	120
Subnitrate of Bismuth	120
Mucilage	70
Saccharated Pepsin	60
Essence of Cinnamon	30

Pepsin-Malt Tablets.

	Parts.
Powdered double-refined Sugar	600
Extract of Malt	180
Saccharated Pepsin	120
Mucilage	70
Essence of Aromatic Spice	30

Tonic Malt Tablets.

Powdered double-refined Sugar	600
Extract of Malt	150
Mucilage	70
Extract of Cinchona	60
Grated fresh Orange Peel	60
Citrate of Iron	30
Compound Tincture of Cinnamon	30

Vanilla-Malt Tablets.

Powdered double-refined Sugar	600
Extract of Malt	200
Mucilage	70
Powdered Vanilla	70
Powdered Cinnamon	30

Terebene Tablets. (*Pharm. Zeitschr. für Russland*, xxvi. 191.)

Terebene	15 grams.
Powdered Gum Arabic	12 ,,
Distilled Water	60 ,,
Pulverised Sugar	180 ,,
Powdered Tragacanth	80 ,,

Make 100 tablets. The terebene is emulsified with gum and water, and then the mixture of sugar and tragacanth added.

Tablets of Aconite. P. Vigier. (*Amer. Journ. Pharm.*, September, 1886, from *Gaz. Hebdom. Méd.*) These tablets are recommended by the author as a convenient form for administering aconite, and to be made of

Tragacanth	0·5 gram.
Orange-flower Water	5·0 grams.
Sugar	50 ,,
Tincture of Aconite Root (French Codex)	200 drops.

To be divided into 100 tablets, of which five to ten may be taken in twenty-four hours.

Drops for Earache. (*Chemist and Druggist*, August 28, 1886.) Pavesi recommends a mixture of camphor chloral, $2\frac{1}{2}$ parts; glycerin, $16\frac{1}{2}$ parts; and oil of almonds, 10 parts. This is to be well

mixed and kept in a well-closed bottle. A pledget of absorbent cotton is to be soaked with the drops, and then introduced as far as possible into the affected ear; two applications being made daily. Applications may also be made each day with the preparation behind the ear. The pain is almost immediately relieved.

Ricinus Communis as an Insect Powder. (*Chemist and Druggist*, September 25, 1886.) Castor-oil plants have been found efficacious in freeing rooms from insect life, the leaves of the plant containing a substance which is fatal to flies and other insects. The leaves should be dried and powdered, and the powder used as an insect-powder. A decoction of the leaves would be serviceable for destroying insects.

Salicylated Plastermulls and Salvemulls. H. Unna. (*Lancet*, September 25, 1886, 574. From *Pharm. Journ.*) The local application of strong salicylic acid "plastermulls" in the treatment of lupus is strongly recommended by the author. The name "plastermull" has been given to a dressing consisting of a very thin sheet of gutta-percha, coated on one side with an adhesive substance containing one or more medical compounds, and backed on the other side with mull or undressed muslin. The name of "salvemull" also has been given to a similar kind of dressing, in which the medicaments are of a more soothing character, consisting of ointments, having a basis of suet and lard, spread upon mull. In experimenting with a strong salicylic acid plastermull to remove the cuticle and prepare lupoid tissue for other more destructive agents, the author observed that salicylic acid itself exercises a most beneficial influence upon the new growth. The chief drawback is the great and lasting pain caused by salicylic acid when applied to a thin epidermis or raw surface. In order to obviate this various combinations were tried; but cocaine failed to give relief, while opium and cannabis indica required an hour or two to develop their anodyne effect. The best results were obtained when genuine beech-wood creasote was combined with salicylic acid, in the proportion of two parts of creasote to one of acid. Even then there is a painful stage lasting from ten to fifteen minutes, but a previous application of cocaine is sufficiently lasting in its effect to cover this period. The plastermulls are prepared in strips one metre long and twenty centimetres wide, the superficial area equalling one-fifth of a square metre. The salicylic acid plastermulls used by the author are of five different strengths, containing respectively, 10, 20, 30, 40, and 50 grams of salicylic acid, and 20, 40, 50, 40, and 50 grams of creasote to each strip.

Syrupus Ferri Superphosphatis Oxygenatus. B. W. Richardson. (*Pharm. Journ.*, 3rd series, xvii. 970.) This syrup consists of a mixture in equal parts of "syrup of superphosphate of iron," solution of peroxide of hydrogen (10 volume strength), and pure glycerin, and the dose for an adult is from one to two fluid drachms, two or three times a day, in three ounces of water. It is mentioned that it has been observed by M. Robbins that if the peroxide of hydrogen be added in excess to the syrup, and glycerin be not used, the product is of a beautiful red colour, which, however, is unstable. Made according to the improved formula, it is described as very stable, of an agreeable taste, and as capable of being prescribed with tincture of nux vomica, strychnine, morphine, codeine, quinine, salicin, or any other compound that does not liberate the oxygen from the peroxide.

Syrup of Lactophosphate of Calcium and Iron. M. Thyssen. (*Pharm. Rundschau*, 1886, 517.) Syrup of lactophosphate of iron is first made as follows:—Dissolve 5 parts of lactate of iron in 40 parts of phosphoric acid. Add simple syrup, 160 parts; oleo-saccharate of lemon, 4 parts; and simple syrup enough to make 1,000 parts. To this syrup is added the syrup of lactophosphate of calcium made as follows: calcium lactophosphate, 3 parts; citric acid, 1·2 part; simple syrup to make 1,200 parts. Flavour with oil of lemon.

Iodol Ointment and Lotion. M. Trousseau. (From *L'Union Méd.*, 1886.) The ointment may be made of 2 grams of iodol, and 10 grams of soft paraffin.

The lotion is prepared with 3 grams of iodol, 32 grams of alcohol, and 65 grams of glycerin.

Confectio Copaibæ. (*Chemist and Druggist*, August 7, 1886.) The following formula is recommended:—

Copaiba	1 ounce.
Milk, Condensed	½ ,,
Oleo-resin Cubeb	1 drachm.
Licorice Root Powder	4 drachms.
Tincture of Vanilla	½ drachm.
Sugar	1 ounce.

Emulsify the copaiba with the milk, mix the oleo-resin and the other ingredients, and finally add the vanilla.

Chlorodyne. B. L. Maltbie. (*Chemist and Druggist*, January 29, 1887.) The author recommends the following formula as yielding a transparent and inseparable preparation of elegant appearance:—

Morphinæ Hydrochlor.	gr. 16
Spirit. Rectificat.	ʒxiij
Tinct. Cannabis Indicæ	ʒiij.
Ol. Menthæ Piperitæ	♏vj.
Tincturæ Capsici	♏xx.
Chloroform	ʒivss.
Acid. Hydrocyanic, dil.	ʒj.
Glycerini ad	ʒiv. ʒiss.

Dissolve the morphine in the alcohol, and the tinct. cannabis indicæ and other ingredients in their order.

Salol Mouth Wash. (*Amer. Journ. Pharm.*, April, 1887.) The following formula is recommended :—

Salol	1 gram.
Alcohol	100 grams.
Tincture of Cochineal	3 to 5 ,,
Oil of Rose	1 drop.
Oil of Peppermint	2 drops.

Mix. One teaspoonful to be mixed with a glass of water for use as a mouth-wash.

Toothache Drops. (*L'Union Médicale* and *Amer. Journ. Pharm.*)

Camphor	1 gram.
Balsam of Peru	1 ,,
Alcoholic Extract of Opium	1 ,,
Mastic	2 grams.
Chloroform	20 ,,

A pellet of cotton moistened with this liquid is introduced into the cavity of the tooth.

Dr. Gaudet recommends the following formula :—

Mastic	8 parts.
Balsam of Peru	5 ,,
Chloroform	14 ,,

To be applied in the same manner.

Notes on the Administration of Thalline. M. Mayrhofer. (*Med. and Surg. Reporter*, August 7, 1886.) The author, during an epidemic of enteric fever occurring in a Bavarian regiment, employed thalline in three different forms,—namely, the sulphate, the tannate, and the tartrate,—and obtained highly satisfactory results from them all. He gave the drug according to Ehrlich's continuous system, the doses being generally 0·2 gram, repeated when the temperature rose. From 1·0 to 2·0 grams were given per diem. The total quantity required varied from 8 grams in

mild cases to 26 grams in severe cases with relapses. After taking the medicine, a profuse perspiration occurred, which invariably appeared to improve the patient's condition. No unpleasant effects were ever observed. There were altogether eighty-eight cases, of which three (that is, 3·4 per cent.) died. It is not possible to say that one of the three preparations presented any marked difference in its action from the other two.

Remedy for Frost-bite. M. Züboff. (*N. Y. Med. Journ.*, Oct. 2, 1886.) Potassium permanganate has been found very serviceable by the author as a local application for frost-bite, a solution of 1 or 2 grains to the ounce of water being used; it relieves pain, allays inflammation, and prevents suppuration in blisters. For burns a half-grain has been employed.

Superiority of Sodium Iodide over Potassium Iodide as a Therapeutic Agent. (From *Brit. Med. Journ.*) The following advantages are claimed for the sodium salt:—

(1) It can be used therapeutically for almost all, certainly the chief, purposes for which potassium iodide is used, and with similar beneficial results.

(2) Sodium iodide is more assimilable than the iodide of potassium, both locally, as to the digestive organs, and to the general system.

(3) Many of the local and general undesirable effects which are produced by potassium iodide do not follow the use of sodium iodide.

Stannous Chloride as a Disinfectant. D. Abbott. (*Amer. Journ. Pharm.*, September, 1886.) Stannous chloride may be used as a disinfectant, instead of corrosive sublimate; it is comparatively safe, does not corrode lead pipes, and is cheap. A solution containing 1 per cent. kills spores after an exposure of two hours. It is considerably more active than zinc chloride, copper sulphate, and sulphate of iron. When intended to be kept for use, it should be mixed with an equal weight of ammonium chloride, which prevents the formation of the insoluble oxychloride of tin.

Beeswax as a Pill Excipient. G. H. Ochse. (From *Pharm. Centralhalle*, xxviii. 75.) Powdered beeswax is a good excipient for pill masses containing balsams or ethereal oils. Beeswax is readily powdered by triturating with an equal quantity of granulated sugar, adding several drops of alcohol. Two parts of this mixture and a small quantity of starch, etc., yield with one part of oil or balsam a good, non-voluminous mass.

Permanent Solution of Mercuric Chloride. A. C. Bernays. (*Weekly Med. Rev.*, May 14, 1887, 558.) The author states that the addition of 7½ grains of citric acid to each quart of water used in making solution of mercuric chloride will effectually prevent any reduction and also the formation of precipitates in the preparation of an albuminated solution.

Removal of Iodine Irritation. P. Carles. (*Journ. de Pharm.*, 1886, 315.) The author points out that the irritation caused by the external application of preparations containing free iodine may be readily removed by the application of alkalies and alkaline salts; dilute ammonia or soda crystals being permissible where the epidermis is robust, as on the hands, whilst alkaline sulphites, bisulphites, or hyposulphites are preferable for more delicate skin. But the best agent, in the author's opinion, is sodium sulphydrate, an aqueous solution containing one to ten per cent., according to circumstances, giving relief in a few minutes. It may also be used for removing iodine stains.

Casein as an Emulsifier. M. Léger. (*L'Union Pharm.*, May 16, 1887, 193. From *Pharm. Journ.*) Considering that natural emulsions, such as vegetable juices, milk, etc., owe their peculiar condition to the influence of albuminoid substances, the author inferred that these substances might be utilized in preparing artificial emulsions if they could be separated in a form convenient for manipulation and preservation. Casein, which so perfectly emulsifies butter in milk, was chosen for the experiment. It was separated by adding 60 grams of ammonia to 4 litres of milk, and after twenty-four hours' contact removing the soapy layer that collected at the top, and then precipitating the serum with acetic acid. The magma of casein, after being strongly pressed, was mixed with 10 grams of sodium bicarbonate and sufficient sugar so that the product should contain 10 per cent. of its weight of casein. This "saccharide of casein," when powdered, is said to be easily soluble in water, and capable of being employed in the same proportion as gum in making almost any emulsion, without requiring the use of a mortar. The sole defect admitted by the author is that the "saccharide" gives off a slight animal odour.

Charcoal and Camphor. M. Barbocci. (*Brit. Med. Journ.*) A mixture of equal parts of camphor and animal charcoal is recommended by the author for preventing the offensive odour and removing the pain of old excavated ulcers. The camphor is stated to act as a disinfectant, and the charcoal absorbs the offensive odours.

Sedative Cough Mixture. (*Chemist and Druggist*, November 27, 1886.)

Potassi Citratis	ʒj.
Succi Limonis	ʒij.
Vin Ipecac	ʒij.
Syr. Simplicis	ʒiss.
Aq. Chloroformi	ʒij.
Aq. ad.	ʒvj.

Fiat mistura.

A tablespoonful four to six times a day.

Koumiss. H. W. Wiley. (*Amer. Chem. Journ.*, viii. 200–206.) For the manufacture of koumiss, cow's milk may be used in place of mare's milk, if the greater proportion of the cream is first removed. As mare's milk contains 5·3–7·26 per cent. of milk-sugar, and cow's milk only 4·8 per cent., it is sometimes advisable to add some milk-sugar to the latter.

Unguentum Cretæ Præparatæ. D. Duckworth. (*Practit.*, Jan., 1887.) This ointment is recommended by the author as an application in erysipelas. It is prepared from equal parts of prepared chalk and lard, and to each ounce of the ointment is added 30 grains of carbolic acid. An equally serviceable ointment is obtained with precipitated calcium carbonate, and this is of a pure white colour.

Ointment for Skin Diseases. Dr. Behrend. (*Amer. Journ. Pharm.*, November, 1886.) This ointment, recommended by the author, and employed by him with success in the Berlin Hospital for skin diseases, is prepared according to the following formula :—

Sublimed Sulphur	8 parts.
Liquid Tar	8 ,,
Soft Soap	16 ,,
Lanolin	16 ,,
Powdered Pumice Stone	5 ,,

Ointment Pencils and Paste Pencils. H. C. Brooke. (*Amer. Journ. Pharm.*, November, 1886.) Dr. P. G. Unna describes in the *Monatshefte für prakt. Dermat.*, two forms of application to the skin by means of ointment pencils and paste pencils, which have the advantage of being more convenient and more economical than those ordinarily in use. The *ointment pencils* are based on the model of the ordinary lip-salve pencils, and may, when suitably medicated (with zinc oxide, tar, chrysarobin, etc.), be rubbed quickly into any limited dry eruption of the skin, which thus

becomes covered with a coating of hard ointment. The paste pencils were made after the idea of the nitrate of silver sticks, and are intended for use in those cases in which the epidermis is broken or destroyed, as in eczema, chancre, or the various forms of ulcer; also in such cases as condylomata, where the horny layer is thin and fatless, or where the surface is moist, as is the case with the mouth, anus, conjunctiva, and urethra. By moistening the pencil and stroking it over the surface of the lesion, a thin paste layer of the medicament is left behind.

The following formulæ are selected as examples :—

Stilus acidi salicylici dilubilis.

	Parts. 10 per cent.	40 per cent.
Precipitated Salicylic Acid	10	40
Powdered Tragacanth	5	5
Powdered Starch	30	10
Powdered Dextrin	35	25
Powdered White Sugar	20	20

Stilus arsenico-sublimatus dilubilis.

	Parts.
Powdered Arsenious Acid	10
Corrosive Sublimate	5
Powdered Tragacanth	5
Powdered Starch	30
Powdered Dextrin	30
Powdered Sugar	20

Stilus iodoformi dilubilis.

Iodoform	40
Powdered Tragacanth	5
Powdered Starch	10
Powdered Dextrin	30
Powdered White Sugar	15

Stilus ichthyoli dilubilis.

Sodium Sulpho-ichthyolate	20
Powdered Tragacanth	5
Powdered Starch	30
Powdered Dextrin	35
Powdered White Sugar	10

Stilus saponatus kalinus dilubilis.

Anhydrous Potash Soap	60
Powdered White Bole	40

Stilus acidi carbolici unguens.

	Parts. 10 per cent.	30 per cent.
Carbolic Acid	10	30
Powdered Olibanum	20	20
Yellow Wax	40	50
Olive Oil	30	—

Stilus acidi borici unguens.

	Parts.
Boric Acid	10
Yellow Wax	40
Benzoated Olive Oil	35
Colophony	5

Stilus cantharidini unguens.

Cantharidin	0·5
Colophony	10
Yellow Wax	45
Benzoated Olive Oil	45

Stilus creasoti.

Creasote	40
Powdered Olibanum	20
Yellow Wax	40

Stilus iodoformi unguens.

Iodoform	40
Colophony	5
Yellow Wax	30
Olive Oil	25

Stilus iodi unguens.

Pure Iodine	20
Colophony	5
Yellow Wax	40
Olive Oil	35

Stilus plumbi oleatis et acidi salicylici unguens.

Precipitated Salicylic Acid	20
Lead Plaster	40
Yellow Wax	20
Olive Oil	20

Stilus saponis, picis et ichthyoli unguens.

Anhydrous Potash Soap	10
Liquid Tar	10
Sodium Thioichthyolate	5
Colophony	5
Yellow Wax	40
Benzoated Olive Oil	30

Stilus zinci sulphocarbolatis unguens.

	Parts.
Sulphocarbolate of Zinc	5
Powdered Castile Soap	15
Colophony	5
Yellow Wax	40
Olive Oil	35

Arnica Opodeldoc. (*Chemist and Druggist*, August 28, 1886.)

Sapon. Mollis	20 grains.
Camphor	8 ,,
Menthol	2 ,,
Aquæ Destillat.	2 drachms.
Tinct. Arnicæ ad.	1 ounce.

Digest for a day, and filter.

Ceratum Camphoræ Compositum (Camphor Ice). (*Chemist and Druggist*, January 1, 1887.)

Camphor	3 parts.
Benzoated Lard	15 ,,
White Wax	10 ,,
Spermaceti	4 ,,
Alcohol	a sufficient quantity.

Triturate the camphor with a sufficient quantity of alcohol to dissolve it. Then, having melted the white wax and spermaceti on a water-bath, gradually add the solution of camphor, and continue stirring until the alcohol has evaporated. Then withdraw the heat, and having stirred the mixture occasionally until it has somewhat cooled, mix it, while still liquid, intimately with the benzoated lard (which should have been prepared from purified and washed lard), and pour it into suitable moulds.

Boroglyceride Ointment. C. E. Downes. (*Amer. Journ. Pharm.*, November, 1886.) Such an ointment is made by heating one part of boroglyceride, containing 50 per cent. of boric acid, and while hot adding it slowly to three parts of petrolatum, the stirring being continued until the mixture has thoroughly cooled, in order to avoid separation of the ingredients. The ointment is a very convenient vehicle for atropine, physostigmine, chloride of zinc, and other remedies.

Mollin. Dr. F. A. Kirsten. (*Monatsh. für prakt. Dermat.*, August, 1886.) Mollin is a soft soap containing 17 per cent. of uncombined fat, and is stated to be prepared by saponifying without heat 100 parts of cocoa nut oil or of fresh fat with 40 parts

of solution of caustic potash (sp. gr. 1·145, containing 15 per cent. of K H O), mixing intimately with 30 parts of glycerin, and heating carefully. If properly made, mollin is yellowish white, and of a smooth and soft consistence, not readily altered by exposure, free from rancidity and from irritating properties, and easily removed from the skin by warm or cold water.

Mollin is highly recommended by the author as a vehicle for the application of mercury and its compounds, balsam of Peru, storax, phenol, thymol, naphthol, naphthalin, chrysarobin, iodoform, salicylic acid, and other substances used for inunction.

Preparation of Lanolin. F. Fialkowski. (*Amer. Journ. Pharm.*, November, 1886, from *Wiad. Farmac.*) The author recommends soaking sheep's wool in cold water for twenty-four hours, and afterwards washing it well until the water remains clear. The wool is then boiled twice with water, and pressed while hot, when the lanolin is obtained of a whitish colour, much lighter than the commercial article. Twelve pounds of wool yielded 18 ounces of lanolin, or about 11 per cent.

Antineuralgic Liniment. G. de Mussy. (*Amer. Pharm. Journ.*, November, 1886.) The author recommends a mixture of 4 parts of oil of peppermint, 2 parts of tincture of aconite root, and 1 part of chloroform.

Gelatin Bougies, Suppositories, etc. (*Pharm. Rundsch.*, 1887. 101. From *Amer. Journ. Pharm.*) The proportions of gelatin, glycerin, and water cannot be the same for all such preparations, because the action of the medicament on the mass, deliquescence or coagulation, must be taken into consideration.

Where gelatin preparations are frequently dispensed, it is best to have a definite mass in stock. This is made in large quantities. After removing the scum from the solution, it is poured into suitable bottles, and when thoroughly cooled covered with alcohol, to prevent it from becoming mouldy. When wanted for use, the bottle is placed in a water-bath, and the required quantity is poured off. The mass is made as follows:—The accurately-weighed gelatin is allowed to macerate over night in distilled water, and strained through a sieve. The gelatin adhering to the sieve is collected, the whole placed in a tared porcelain capsule, and sufficient water added to make the weight four or five times as much as the original quantity of gelatin used. The capsule is placed on the upper ring of a retort-stand, and heated over wire-gauze with a gas or spirit-lamp flame, care being taken not to

burn the gelatin. The glycerin is added, and the whole evaporated to the consistence mentioned in the following table:—

	I. Evaporated to 60 parts.	II. Evaporated to 25 parts.	III. Evaporated to 50 parts.	IV. Evaporated to 60 parts.	V. Evaporated to 104 parts.
Gelatin	20	10	10	10	30
Water	80	40	40	40	120
Glycerin . . .	40	15	20	30	15

The anhydrous mass No. I is intended for preparations kept in stock, and for those which are to retain their transparency; mass No. 2, for hygroscopic drugs; No. 3, for suppositories; No. 4, for vaginal balls, ear-almonds, and bougies; No. 5, for crayons or bougies containing a large percentage of iodoform.

Bougies.—Bougies containing sulphate of zinc, sulphate of copper, nitrate of silver, extract of opium, hydrochlorate of morphine, bichloride of mercury, etc., are made as follows:—One part of sulphate of zinc, or any of the above-mentioned medicaments, is first dissolved in a little water and then added to 99 parts of mass No. IV., and poured into moulds. If it is desired to make a large quantity of sulphate of copper bougies, it is best to mix not more than the mould will hold at a time, because by frequently heating the mass the bougies acquire a yellowish green colour instead of a blue-green.

Bougies of carbolic acid (5 *per cent.*) and similar medicaments, soluble in a small quantity of alcohol, are made by adding 3 parts of carbolic acid, previously dissolved in alcohol, to 7 parts of glycerin and 50 parts of mass No. III.

Bougies of iodoform (50 *per cent.*), and of similar medicaments insoluble in water and alcohol, are made by adding 27 parts of powdered iodoform to 54 parts of mass No. V. When taken from the mould, the bougies are placed in a drying closet until they weigh about two-thirds of their original weight.

Bougies of ferric chloride (5 *per cent.*), and of similar hygroscopic drugs, are made by dissolving 1 part of sesquichloride of iron in 9 parts of water, and adding to 19 parts of mass No. II.

Alum bougies (2 *per cent.*), 25 parts of mass No. III. and 10 parts of distilled water are liquefied in a water-bath. To this is added a *hot* solution of 7 parts of alum, 10 of glycerin, and 5 of distilled water. The whole is then evaporated with slight agitation to 35 parts. The mixture becomes thick and turbid on adding

the solution of alum, but on heating over a water-bath and stirring carefully, the mixture soon becomes clear and transparent. *Hot water* must be added from time to time to replace that lost by evaporation.

Bougies containing tannin (0·2 *per cent.*), 0·66 of tannin is dissolved in 8 parts of glycerin, and the hot solution added to 39 parts of mass No. II., the whole evaporated to 33 parts. The mass will coagulate on the addition of the tannin solution, but becomes clear when slowly stirred for five or ten minutes on a water-bath. By this process, 2 grams of tannin may be incorporated with 5 grams of gelatin. This formula is a very good one, and yields bougies which are very soluble. Schreiber states that he has met with tannin bougies which on boiling with water for half an hour did not dissolve.

Bougies of extract of krameria are not made with gelatin, but with white glue. The requisite quantity of extract is dissolved in 40 parts of glycerin, and added to the hot solution of 15 parts of glue in 20 parts of water, stirring constantly until the mass is evenly distributed.

Bougies of salicylate and chloride of sodium are made by adding the finely triturated chemicals to 30 parts of gelatin mass No. II.

For *rectal suppositories* mass No. III. is used, excepting for hygroscopic drugs, which require where possible an anhydrous mass, either No. I. or No. II.

For *vaginal balls* use about the same mass as is used for bougies. Suppositories or balls containing iodide or bromide of potassium, bromide, chloride, or salicylate of sodium or ergotin, require mass No. II.

Suppositories of chloral hydrate are made with gelatin mass No. II., the chloral being added dissolved in a little water.

A Substitute for Gum Arabic. (*American Druggist*, May, 1887, 94.) The following process is stated to produce a good substitute for gum arabic for technical purposes:—20 parts of powdered sugar are boiled with 7 parts of fresh milk, and this is then mixed with 50 parts of a 36 per cent. solution of silicate of sodium, the mixture being then cooled to 122° F. and poured into tin boxes, where granular masses will gradually separate out which look very much like pieces of gum arabic. This artificial gum instantly reduces Fehling's solution, so that if mixed with powdered gum arabic as an adulterant, its presence could be easily detected.

The presence of silicate of sodium in the ash would also confirm the presence of adulteration.

Note on Pulvis Camphoræ. (*Chemist and Druggist*, October 23, 1886.) According to the *Deutsch-Amerikanisch-Apotheker Zeitung*, powdered camphor may be prevented from lumping by the addition of 20 per cent. of sugar of milk.

Hair Tonic. (*Coll. and Clin. Rec.*, May, 1887, and *Med. News*, January 8, 1887.) The following local application has been recommended by Bartholow:—

Fluid Extract of Pilocarpus,	
Tincture of Cantharides . . .	of each ʒss.
Glycerin,	
Petrolatum	of each ʒi.

T. Fox uses in incipient baldness a wash composed of,—

Tincture of Nux Vomica	ʒiv.
Tincture of Cantharides	ʒiiss.
Lanolin	ʒiiss.
Acetic Acid	ʒiv.
Rose Water	ʒvj.

Crystal Pomade. (*Chemist and Druggist*, January 1, 1887.) A very good pomade is, according to the *Deutsch-Amerikanisch-Apoth. Zeit.*, made from the following formula:—

Ol. Ricini	500 grams.
Ol. Olivæ	380 ,,
Spermaceti	120 ,,
Ol. Jasmini	20 ,,
Ol. Rosæ	0·5 ,,
Ol. Bergamott	0·5 ,,
Ol. Neroli	5 drops.
Ol. Geranii Gal.	2 ,,
Ol. Iridis	1 drop.
Cumarini	0·02 gram.
Heliotropini	0·1 ,,

Melt the first three ingredients over a water-bath, add the perfumes, then pour into bottles which are standing in hot water, and allow to cool slowly.

Hair Lotion. (*Chemist and Druggist*, January 29, 1887.) Bouchard recommends the following lotion to stop falling of the hair after typhoid fever:—

Ol. Ricini	7 grams.
Tar	2 ,,
Tinct. Benzoini (simpl.) . . .	20 ,,
Chloroformi	30 ,,
Alcohol	1,000 ,,

Add a little perfume.

Talc Tooth Powder. (*Chemist and Druggist*, August 7, 1886.)

Powdered Talc	12 drachms.
,, Cochineal	2 ,,
,, Cream of Tartar	1 drachm.
,, Alum	1 ,,
Oil of Peppermint	15 drops.

Mix thoroughly.

Antiseptic Tooth Powder. Dr. A. D. Macgregor. (*Brit. Med. Journ.*, July 10, 1886.) A good antiseptic tooth powder is made by mixing the following ingredients:—

Boric Acid	4 parts.
Potassium Chlorate	3 ,,
Guaiacum Resin	2 ,,
Prepared Chalk	6 ,,
Magnesium Carbonate	33 ,,

New Formulæ for Perfumes. (*Amer. Journ. Pharm.*, April, 1887.) The following are recommended by Soxhlet:—

Eau de Cologne.

Oil of Neroli	5 parts.
Oil of Bergamot	45 ,,
Oil of Lemon	20 ,,
Oil of Lavender	1 ,,
Oil of Rosemary	1 ,,
Benzoin	0·50 ,,
Deodorized Alcohol	1,250 ,,

Court Bouquet.

Oil of Bergamot	10 parts.
Oil of Neroli	1·50 ,,
Alcohol, Deodorized	150 ,,
Orris Root	30 ,,
Storax	0·50 ,,
Musk	0·20 ,,

Ess. Bouquet.

Ext. Jasmin	50 parts.
Ext. Reseda	50 ,,
Ext. Violets	50 ,,
Orris Root.	30 ,,
Liquid Storax	0·50 ,,
Ambergris.	0·50 ,,
Oil of Curaçoa	5 ,,

New Formulæ for Perfumes. H. Soxhlet. (*Pharm. Zeit. für Russland*, xxvi. 249.)

Extract of New Mown Hay.

Cut Tonka Beans	5·0 grams.
Orris Root	10·0 ,,
Vanillin	0·05 ,,
Oil of Bergamot	30 drops.
Oil of Neroli	2 ,,
Oil of Rose	2 ,,
Oil of Lavender	2 ,,
Oil of Cloves	1 drop.
Patchouly Leaves	0·20 grams.
Benzoic Acid	0·50 ,,
Herb Urticaria	2·0 ,,
Cologne Spirit	207·0 ,,

Digest for fourteen days, and filter.

Millefleurs Oil for Perfuming Hair Oil and Pomade.

Oil of Cinnamon	10 drops.
Oil of Neroli	20 ,,
Oil of Rose	20 ,,
Oil of Cloves	2 grams.
Oil of Orange	2 ,,
Oil of Calamus	20 drops.
Oil of Geranium	10 grams.
Oil of Lemon	15 ,,
Oil of Bergamot	15 ,,
Oil of Verbena	5 ,,

Extract of Reseda.

Cut Tonka Beans	2·0 grams.
Liquid Styrax	1·0 ,,
Orris Root	50·0 ,,
Oil of Neroli	10 drops.
Oil of Rose	10 ,,
Oil of Bitter Almonds	2 ,,
Oil of Bergamot	20 ,,
Ambergris	1·0 gram.
Musk	·50 ,,
Herb of Urticaria	2·00 grams.
Cologne Spirit	250·00 ,,

Digest from eight to fourteen days, and filter.

Preservation of Flowers. (*Pharm. Journ.*, from *Chronique Industrielle.*) It is stated in this paper that flowers may be preserved, with all their brilliancy and freshness, in the following way:—

In a well-corked bottle dissolve six drachms of coarsely powdered, clear gum copal, mixed with the same weight of broken glass, in $15\frac{1}{2}$ ounces (by weight) of pure rectified ether. Soak the flowers in this mixture, take them out slowly, and expose them to the air for ten minutes; then immerse them anew, and again expose them to the action of the air. Repeat this operation four or five times. The flowers thus treated will keep for a long time if care be taken not to handle them too much.

Odontalgic Essence. (*Chemist and Druggist*, August 28, 1886.)

Camphor	gr. 20
Chloroformi.	♏ 10
Ol. Caryophylli	♏ 5
Ol. Cajeputi.	♏ 5
Spt. Vini Rect	♏ 20

Solve.

Chartreuse Liquor. (From *Pharm. Rundschau.*) To prepare this liquor none but spirit free from fusel oil should be used. Angelica seed, 125 grams; angelica root, 30 grams; arnica flowers, 15 grams; coriander, 250 grams; hyssop, 125 grams; melissa, 500 grams; wormwood, 125 grams; cardamom, 15 grams; Ceylon cinnamon, 15 grams; mace, 20 grams; and cloves, 15 grams; are digested for twenty-four hours in 36 litres of 95 per cent. alcohol and 20 litres of water, and then distilled. To the distillate are added 25 kilograms of sugar previously boiled with water, 2 litres of finest cognac, 25 grams of citric acid previously dissolved in water, and sufficient water to make 100 litres. Chartreuse is coloured golden yellow with tincture of saffron, and should be two years old before using.

Preservation of Honey. C. S. Commings. (*Amer. Journ. Pharm.*, November, 1886.) Honey may be kept from crystallizing or candying by suspending the vessel containing it in water, applying heat, and stirring the honey constantly until the water is heated to the boiling point, when the vessel is taken from the fire, the scum removed, and, after cooling, the honey is placed in jars or other suitable vessels, tightly covered and kept in a cool cellar. Treated in this manner, the author has kept honey from twelve to sixteen months without crystallizing.

Sumach Ink. O. J. Lache. (*Amer. Journ. Pharm.*, 1887, 335.) The author states that a good ink may be prepared from sumach leaves. A decoction is made by boiling 1 oz. of the bruised leaves for half an hour in 1 pint of water, and straining; 90 grains of sulphate of iron and 60 grains of gum arabic are added. The ink

has at first a brownish cast, which disappears in a few days; after about two weeks it can scarcely be distinguished from ink made from nutgalls.

Bleaching Liquid. (*Chem. Tech. Centr. Anzeiger*, iv. 839.) The addition of a small quantity of glycerin to a bleaching mixture of chlorinated lime and soda makes the fabric whiter, does not affect the fibres, and does not require the use of acid to remove the chlorinated lime.

Polishing Paste. (*Pharm. Rundschau*, 1886, 435.) The following formula is said to yield a good product:—Oxalic acid, 1 part; ferric oxide, 25 parts; tripoli, 20 parts; palm oil, 60 parts; soft paraffin, 4 parts.

Sticky Fly-Paper. (*Chemist and Druggist*, August 28, 1886.)

Resin in clean pieces	4 troy ozs.
Castor Oil	2 fl. ozs.

Melt together by means of a water-bath, and spread on sized paper. Sized paper must be used, or the oil will produce the characteristic transparent stain of fixed oils. If glucose, mixed with dextrine, is added, to attract the flies, the paper should be paraffined. The following has also been highly recommended:—

Resin	10 parts.
Gum Thus	5 ,,
Linseed Oil	7 ,,

Dissolve by a gentle heat, and apply as directed above.

Violet-Phosphorent Calcium Sulphide. (*Chemisch Technischer Centr. Anzeiger*, iv. 845.) The following formula is recommended as yielding the best product:—20 grams of lime prepared from the shells of *Hypopus vulgaris* are finely powdered and intimately mixed with 6 grams of roll sulphur and 2 grams of starch. About 8 c.c. of a solution prepared by mixing 100 c.c. of absolute alcohol, 0·5 gram of subnitrate of bismuth, and several drops of hydrochloric acid, are dropped on the mixture, and, the alcohol having been allowed to evaporate spontaneously, it is then heated in a crucible to bright cherry redness for twenty minutes. The crucible is allowed to cool, the thin layer of calcium sulphate removed, and the contents of the crucible powdered and again heated for about half an hour. If the heat was not too intense, the mass will be granular, breaking readily on slight pressure. When powdered again it loses considerably in phosphorescence.

Luminous Paper. (*Pharm. Zeitschr. für Russland*, xxv. 712.) The following formula yields a paper which is impervious to wate-

and luminous in the dark. Water, 100 parts; paper, 40; phosphorescent powder, 10; gelatin, 1; bichromate of potassium, 1 part. The bichromate of potassium makes the paper impervious.

Impervious Shoe Blacking. (*Pharm. Zeitschr. für Russland*, xxv. 792.) Wax, 10; spermaceti, 6; oil of turpentine, 66; asphalt varnish, 5; pulverized borax, 1; nitrobenzol, 1; grape-vine charcoal, 5; Prussian blue, 2. Melt the wax, add the borax, and stir until a jelly is formed. In another vessel melt the spermaceti, add the asphalt varnish previously mixed with the turpentine, stir well, and add to the wax; lastly, add the colouring previously mixed with a small quantity of the mass; perfume with nitrobenzol, and fill in boxes. Apply a small quantity with a rag and brush. To be used only once a week.

Liquid Glue. (*Pharm. Rundschau*, December, 1886.) A very good preparation is obtained as follows:—1 part of sugar is dissolved in 3 parts of water; to this solution is added one-fourth as much slaked lime as sugar used, and the whole heated to 75° C. The mixture is frequently agitated for several days, or until the greater portion of the lime is dissolved. The thick solution is then poured off, and is ready for use. If 3 parts of ground glue are allowed to swell in 13 parts of the sugar solution, and then warmed, the glue soon liquefies, and remains liquid without impairing its adhesiveness. A thicker or thinner consisteney is obtained by adding more or less glue to the solution. Concentrated liquid glue remains turbid, thin solutions become clear on standing. The adhesive properties of this liquid glue are excellent.

Paste for Labels. L. Eliel. (*Pharm Journ.*, 3rd series, xvii. 469.)

1.

Gum Tragacanth	1 ounce.
,, Arabic	4 ounces.
Dissolve in—	
Water	1 pint.
Strain, and add—	
Thymol	14 grains.
Suspended in—	
Glycerin	4 ounces.
Finally add—	
Water	to make 2 pints.

This makes a thin paste suitable for labelling bottles, wooden or tin boxes, or for any other purpose paste is ordinarily called for. It makes a good excipient for pill masses, and does nicely for emulsions. The very small percentage of thymol present is not of any consequence. This paste will keep sweet indefinitely, the thymol preventing fermentation. It will separate on standing, but a single shake will mix it sufficiently for use.

2.

Rye Flour	4 ounces.
Powd. Acacia	½ ounce.

Rub to a smooth paste with 8 ounces of cold water, strain through a cheese cloth, and pour into 1 pint of boiling water. Continue the heat until thickened to suit. When nearly cold add—

Glycerin	1 ounce.
Oil of Cloves	20 drops.

This is suitable for tin or wooden boxes or bottles, and keeps sweet for a long time.

3.

Rye Flour	4 ounces.
Water	1 pint.
Nitric Acid	1 drachm.
Carbolic Acid	10 minims.
Oil of Cloves	10 ,,
Glycerin	1 ounce.

Mix the flour with the water, strain through a cheese cloth, and add nitric acid. Apply heat until thickened to suit, and add the other ingredients when cooling. This is suitable for bottles, tin or wooden boxes, and will not spoil.

4.

Dextrin	8 parts.
Acetic Acid	2 ,,
Alcohol	2 ,,
Water	10 ,,

Mix the dextrin, water, and acetic acid to a smooth paste, then add the alcohol. This makes a thin paste, and is well suited for labelling bottles and wooden boxes, but is not suitable for tin boxes.

Determination of Indigo in Dyed Woollens. M. Taverne. (*Zeitschr. für Analyt. Chem.*, xxv. Part 4.) The author exhausts a given square surface of the material with chloroform in Soxhlet's

extraction apparatus, evaporates the extract to dryness, weighs the residue, dissolves it in sulphuric acid, and determines colorimetrically or by titration with solution of chloride of lime.

The Drying of Oils. A. Livache. (*Comptes Rendus*, cii. 1167–1170.) The best method of accelerating the drying of oils is to agitate the oil with a mixture of finely divided lead (precipitated on sheets of zinc or iron from solutions of lead salts) and manganese nitrate, and then to decant and agitate with lead oxide to decompose the manganese salt. When treated in this way, a thin layer of linseed oil dries completely in less than four hours at the ordinary temperature.

Clarification of Fruit Juices. (*Chemist and Druggist*, April 2, 1887.) To clarify fruit juices which are difficult of filtration, add to them while warm a little skimmed milk. The acid of the juice coagulates the casein of the milk, which quickly fines the liquor. This may be afterwards easily filtered.

Sugar as a Cattle Food Condiment. M. Holdefleiss. (*Bied. Centr.*, 1886, 303–305.) The low price of sugar has caused many experiments to be made as to its value in cattle feeding; in previous experiments its theoretical nutritive value was calculated, and it was mixed with the food in regular proportions; in the present experiment it was given as an extra ration or condiment.

Thirteen oxen were the animals chosen for experiment, they were all fed in the same way, except that two of them daily received a ration of one kilo. of sugar extra; these animals showed a considerably larger increase of live-weight than the other eleven—amongst the latter there were great differences in fattening capacity. The sugar-fed oxen received each, during the whole period, 112·5 kilos. of raw sugar, from which the author calculates that 50 kilos. of sugar is capable of producing an increase of 15·75 kilos. live-weight, leaving a large money profit. The butchers who slaughtered the animals pronounced the meat of all equally good.

With young cattle, the results were not so satisfactory; they did not eat freely, and suffered so much from scour that the supply of sugar had to be stopped.

Manufacture of Artificial Oil of Gaultheria. C. Bullock. (*Amer. Journ. Pharm.*, January, 1887.) This oil is prepared by G. M. Berringer, in accordance with the following formula:—

Salicylic Acid	½ ounce.
Methylic Alcohol absolute . .	2 fl. ounces.
Sulphuric Acid	1 fl. ounce.

Dissolve the salicylic acid in the alcohol, then add gradually the sulphuric acid; warm gently during twenty-four hours; then distil from a retort into which a current of steam is introduced.

The distillate is to be well washed and separated by decantation. The odour of the product improves by keeping.

New Method of Distinguishing Vegetable from Animal Fibre. H. Molisch. (*Dingl. polyt. Journ.*, cclxi. 135–138.) The following process depends on the application of two new reactions for sugar lately discovered by the author (see this volume, p. 108):— About 0·01 gram of the sample, previously well boiled and washed with water, is mixed first with 1 c.c. of water, then with 2 drops of an alcoholic solution of α-naphthol (15 to 20 per cent.), and finally with an equal volume of concentrated sulphuric acid. In the case of vegetable fibre, the solution assumes, immediately after shaking, a deep violet colour, the fibre being dissolved. If, however, the fibre is of animal origin, the liquid assumes a colour varying from yellow to reddish brown. By substituting a solution of thymol for α-naphthol, a fine carmine colour is obtained in the place of the violet.

The author has successfully applied this test to different vegetable fibres, such as cotton, hemp, jute, china-grass, etc.; also to the cellular tissues of wood, cork, and fungi.

Moreover, in the case of dyed fabrics, the colouring matters present do not appear to interfere with the success of the reaction.

Polishing Powder for Metals. (*Chemist and Druggist*, January 1, 1887.) A powder very suitable for cleaning gold, silver, and other metals, is prepared as follows:—

Chalk	250 parts.
White Bole	100 ,,
Carbonate of Lead	125 ,,
Magnesia	20 ,,
Oxide of Iron	20 ,,

The mixture must be absolutely free from gritty particles.

Bronzing of Metals. (*Amer. Journ. Pharm.*, February, 1887.) Very handsome colours may be imparted to metals by the use of cold solutions of the sulphides of arsenic or antimony. The articles are thoroughly cleaned and dried; a thin layer of a dilute solution of polysulphide of ammonium is applied with a soft brush, allowed to dry, and after brushing off the separated sulphur, a dilute ammoniacal solution of sulphide of arsenic is applied. The colour thus produced resembles that of mosaic gold,

and becomes deeper, and ultimately dark brown, by repeating the application of the arsenic solution. A solution of sulphide of antimony produces a rose-coloured tint, which may be deepened to dark red.

By polishing, the coating acquires a bright metallic lustre, and by the use of mordants the colour is altered. Brass or bronze left for a long time in contact with the mordant becomes superficially greenish grey, and quite glossy on being polished with cloth; if now treated with the above solutions, a dull yellow colour is produced.

The bronzing layer may be re-dissolved by ammonia or sulphide of ammonium, and the sulphides of antimony and arsenic may be dissolved in hydrate or sulphide of potassium or sodium.

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PART IV.

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TRANSACTIONS

OF THE

British Pharmaceutical Conference

AT THE

TWENTY-FOURTH ANNUAL MEETING

AT

MANCHESTER,

1887.

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British Pharmaceutical Conference.

CONSTITUTION.

Art. I.—This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.
2. The subscription shall be 7*s.* 6*d.* annually, which shall be due in advance upon July 1.
3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.
4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.
5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.
6. At each Conference it shall be determined at what place and time to hold that of the next year.
7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.
8. The Executive Committee shall present a report of proceedings annually.
9. These rules shall not be altered except at an annual meeting of the members.
10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

*** *Authors are specially requested to send the titles of their Papers to The Hon. Gen. Secs. Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.*

FORM OF NOMINATION.

I Nominate

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Date .....

This or any similar form must be filled up legibly, and forwarded to *The Asst. Secretary, Brit. Pharm. Conf.*, 17, Bloomsbury Square, London, W.C., who will obtain the necessary signature to the paper.

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Willan, Mr. W., 3, Friargate, Preston, Lancs.
Willey, Mr. W., New Clee, Grimsby.
Williams, Mr. C. E., 38, St. Peter's Road, Great Yarmouth.
Williams, Mr. E., Cerrig-y-Druidion, Denbighshire.
Williams, Mr. E., 10, Wrexham Street, Mold.
Williams, Mr. H., 9, Bull Ring, Birmingham.
Williams, J., F.I.C., F.C.S., 16, Cross Street, Hatton Garden, E.C.
Williams, Mr. J., Victoria Road, Aldershot.
Williams, Mr. J. D., Turret House, Bodmin, Cornwall.
Williams, Mr. J. V., 95, Old Town Street, Plymouth.
Williams, Mr. J. W., 6, Giltspur Street, E.C.
Williams, M. Whitley, F.I.C., F.C.S., Queenwood College, Stockbridge, Hants.
Williams, Mr. R., St. Clears, Carmarthenshire.
Williams, Mr. T., 11, Bute Street, Cardiff.
Williams, Mr. T. H., 58, Lady Margaret Road, Kentish Town, N.W.
Williams, Mr. W., 265, Crown Street, Liverpool.
Williams, Mr. W., 80, Upper Street, Islington, N.
Williams, Mr. W. J., 123, Cannon Street, E.C.
Williamson, Mr. W. H., 54, Dantzie Street, Manchester.
Willis, Mr. C., 55, High Street, King's Lynn.
Willmott, Mr. W., King's College Hospital, W.C.
Willmott, Mr. W. Address unknown.
Wills, Mr. G. S. V., Trinity Square, S.E.
Wilson, Mr. C. F., 23, Liverpool Road, Stoke-on-Trent.
Wilson, Mr. E., Silverdale, Staffordshire.
Wilson, Mr. J., General Infirmary, Derby.
Wilson, Mr. J., Penrith, Cumberland.
Wilson, Mr. J., 11, George Street, Bath.
Wilson, Mr. J. H., 6, West Park, Harrogate.
Wilson, Mr. James Milton, 16, Leven Street, Edinburgh.
Wilson, Mr. T., Stowmarket.
Wilson, Mr. T. W., Bootham, York.
Wilson, Mr. W., 69, Market Street, Manchester.
Wing, Mr. G. N., Melton Mowbray.
Wing, Mr. Lewis, Chislehurst, W. Kent.
Wink, Mr. J. A., 2, Devonshire Square, Bishopsgate Street, E.C.
Wise, Mr. J. N., 11 & 15, Claypath, Durham.
Wood, Mr. A., New Brentford.
Wood, Mr. A. W., 3, James Street, Harrogate.
Wood, Mr. C. G., 64, Coppice Street, Oldham.

Wood, C. H., F.I.C., F.C.S., 46, Loraine Road, Holloway, N.
Wood, Mr. R., 50, High Street, Windsor.
Wood, Mr. R., 25, Mill Street, Macclesfield.
Woodland, J., F.L.S., F.C.S., etc., St. George's Hospital, S.W.
Woodward, Mr. J. L., Bridgewater.
Woolford, Mr. J., 61, Kirkgate, Leeds.
Woollcombe, R. L., M.A., LL.D., Howth View, Blackrock, Co. Dublin.
Woolley, Mr. G., Sparkenhoe Street, Leicester.
Woolley, Mr. G. S., 69, Market Street, Manchester.
Woolley, Mr. Harold, 69, Market Street, Manchester.
Woolley, Mr. Hermann, Knowsley Street, Cheetham, Manchester.
Woolley, Mr. S. W., 146, High Street, Southampton.
Woolrich, Mr. C. B., Uttoxeter, Staffs.
Wootton, Mr. A. C., 42, Cannon Street, E.C.
Wootton, Mr. P., Market Place, Luton, Beds.
Worfolk, Mr. G. W., Brook Street, Ilkley.
Worth, Mr. E., Town Hall, Bournemouth.
Wright, A., A.K.C., 8, Bentinck Crescent, Elswick Road, Newcastle-on-Tyne.
Wright, C. R. A., D.Sc., F.R.S., F.I.C., F.C.S., St. Mary's Hospital, W.
Wright, Mr. G., 102, High Street, Burton-on-Trent.
Wright, Mr. H. C., 50, Southwark Street, S.E.
Wright, Mr. T. D., 26, Chapel Street, Southport.
Wyass, Mr. W., 90, St. Leonard Gate, Lancaster.
Wyatt, Mr., H., 20, Derby Road, Bootle, Liverpool.
Wyborn, J. M., F.C.S., 59, Moorgate Street, E.C.
Wyles, Mr. W., 1, New Bridge, Dover.
Wyley, Mr. W. F., Hertford Street, Coventry.
Wylie, Mr. D. N., 1, South College Street, Edinburgh.
Wyman, Mr. J., Charles Street, Farringdon Road, E.C.
Wynne, Mr. E. P., 7, Pier Street, Aberystwith.

Yates, Mr. D., 32, Darwen Street, Blackburn.
Yates, Mr. F., 64, Park Street, Southwark, S.E.
Yates, Mr. G. A., Birch Villa, Lees, via Oldham.
Yates, Mr. R., 64, Park Street, Southwark, S.E.
Yeomans, Mr. J., 22, Petty Cury, Cambridge.
Yorath, Mr. T. V., Canton, Llandaff.
Young, Mr. J., 20, High Street, Newport, Mon.
Young, Mr. J., Folds Road, Bolton.
Young, Mr. J., Elgin.
Young, J. R., F.C.S., Sankey Street, Warrington.
Young, Mr. J. R., 17, North Bridge, Edinburgh.
Young, Mr. R. F., New Barnet.

NOTICE.

Members are requested to report any inaccuracies in these lists by letter, addressed as follows:—

THE ASST. SECRETARY,
BRIT. PHARM. CONF.,
17, *Bloomsbury Square,*
London, W.C.

SOCIETIES AND ASSOCIATIONS

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

The Pharmaceutical Society of Great Britain.
The North British Branch of the Pharmaceutical Society of Great Britain.
The Pharmaceutical Society of Ireland.

ABERDEEN AND NORTH OF SCOTLAND.—Society of Chemists and Druggists (1839). Mr. A. Strachan, 138, Rosemount Place, Aberdeen.

BIRMINGHAM.—Midland Counties Chemists' Association (1869). Messrs. Chas. Thompson and F. H. Alcock, F.C.S., 159, Stratford Road, Birmingham. Chemists' Assistants' Association (1868), Birmingham.

BRIGHTON.—Association of Pharmacy (1861). Mr. Marshall Leigh, 46, Dyke Road, Brighton.

BRISTOL.—Pharmaceutical Association (re-established 1869). G. F. Schacht, F.C.S., 7, Regent Street, Clifton, Bristol.

COLCHESTER.—Association of Chemists and Druggists (1845). Mr. J. C. Shenstone, 13, High Street, Colchester.

COVENTRY.—Coventry and Warwickshire Pharmaceutical Association (1877). Messrs. Wyleys & Co , Coventry.

DOVER.—Chemists' Association. Mr. R. M. Ewell, 37, Town Wall Street, Dover.

DUNDEE.—Chemists and Druggists' Association (1868). Mr. J. Russell, 111, Nethergate, Dundee.

EDINBURGH.—Chemists' Assistants' Association. Mr. J. R. Hill.

EXETER.—Exeter Pharmaceutical Society (1845). Mr. J. Hinton Lake, 41, High Street, Exeter.

GLASGOW.—Chemists and Druggists' Association (1854). Mr. J. Arnot, 34, Virginia Street, Glasgow.

HALIFAX.—Halifax and District Chemists and Druggists' Association (1868). Mr. J. B. Brierley, Halifax.

HASTINGS.—Chemists' Association (1884). Mr. A. N. Beck, 11, York Buildings, Hastings.

HAWICK.—Pharmaceutical Association. Mr. Thomas Maben, 5, Oliver Place, Hawick.

HULL.—Chemists' Association (1868). Mr. C. B. Bell, 6, Spring Bank, Hull.

LEEDS.—Chemists' Association (1862). Mr. F. W. Branson, 14, Commercial Street, Leeds.

LEICESTER.—Leicester and Leicestershire Chemists' Association. Mr. J. J. Edwards, 43, The Newarke, Leicester.

LIVERPOOL.—Chemists' Association (1868). A. H. Samuel, F.C.S., 145, Upper Parliament Street, Liverpool.

LONDON.—Chemists' Assistants' Association. Mr. E. J. Millard, 103, Great Russell Street, W.C.

MANCHESTER.—Chemists and Druggists' Association (1853). F. B. Benger, F.C.S., 7, Exchange Street, Manchester.

NEWCASTLE-UPON-TYNE.—North of England Pharmaceutical Association. Chas. B. Ford, St. Nicholas' Chambers.

NOTTINGHAM.—Nottingham and Notts Chemists' Association (1863). Mr. W. Widdowson, Sherwood Street North, Nottingham.

OLDHAM.—Chemists' and Druggists' Assistants and Apprentices' Association (1870). Mr. C. G. Wood, Secretary, Church Institute, Oldham.

PLYMOUTH.—Association of Chemists for Plymouth, Devonport, and Stonehouse (1868). Mr. G. Breeze, Catherine Street, Devonport.

SCARBOROUGH.—Chemists' Association (1870). J. Whitfield, F.C.S., Scarborough.

SHEFFIELD.—Pharmaceutical and Chemical Society (1869). Mr. Jno. Humphrey, Sheffield.

SUNDERLAND.—Chemists' Association (1869). Mr. J. Harrison, 33, Bridge Street, Sunderland.

YORK.—Chemists' Association (1865). Mr. Montague Folkard, 9, High Ousegate, York.

PRESENTATION COPIES OF THE YEAR-BOOK OF PHARMACY ARE FORWARDED TO THE FOLLOWING :—

The Honorary Members.

Libraries.

American Pharmaceutical Association; Chemical Society of London; Ecole de Pharmacie, Montpellier; Ecole Supérieure de Pharmacie, Paris; Massachusetts College of Pharmacy; The Mason College, Birmingham; Missouri College of Pharmacy; New Zealand Board of Pharmacy; North British Branch of the Pharmaceutical Society; Pharmaceutical Society of Great Britain; Pharmaceutical Society of Ireland; Pharmaceutical Society of New South Wales; Ontario College of Pharmacy, Toronto; Pharmaceutical Society of Australasia; Royal Society of London; Société de Pharmacie, Paris; State of Illinois Board of Pharmacy; Yorkshire College of Science.

Provincial Associations (having Libraries).

Aberdeen Society of Chemists and Druggists; Brighton Chemists' Association; Bristol Pharmaceutical Association; Colchester Association of Chemists and Druggists; Coventry and Warwickshire Pharmaceutical Association; Dover Chemists' Association; Dundee Chemists and Druggists' Association; Edinburgh Chemists' Assistants' Association; Glasgow Chemists and Druggists' Association; Halifax and District Chemists and Druggists' Association; Hastings Chemists' Association; Hawick Chemists' Association; Hull Chemists' Association; Leeds Chemists' Association; Leicester and Leicestershire Chemists' Association; Liverpool Chemists' Association; London Chemists' Assistants' Association; Manchester Chemists and Druggists' Association; Midland Counties Chemists' Association; North of England Pharmaceutical Association; Nottingham and Notts Chemists' Association; Oldham Chemists and Druggists' Assistants and Apprentices' Association; Plymouth, Devonport, and Stonehouse Chemists' Association; Scarborough Chemists' Association; Sheffield Pharmaceutical and Chemical Association; Sunderland Chemists' Association; York Chemists' Association.

Journals.

American Druggist; American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; Lancet; Medical Press and Circular; The Microscope; Nature; Pharmaceutical Journal; Pharmaceutische Centralhalle; Pharmacist; Répertoire de Pharmacie; Revista Farmaceutica.

THE FOLLOWING JOURNALS ARE RECEIVED FROM THEIR RESPECTIVE EDITORS :—

American Druggist; American Journal of Pharmacy; Archives de Pharmacie; Archiv der Pharmacie; Australasian Journal of Pharmacy; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; National Druggist; Pharmaceutical Journal; Pharmaceutical Record; Pharmaceutische Centralhalle; Pharmacist; Proceedings of the American Pharmaceutical Association; Répertoire de Pharmacie; Revista Farmaceutica.

PROGRAMME OF THE PROCEEDINGS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

TWENTY-FOURTH ANNUAL MEETING, MANCHESTER, 1887.

OFFICERS.

President. S. R. ATKINS, J.P.

Vice-Presidents.

(Who have filled the office of President.)

PROF. BENTLEY, F.L.S., M.R.C.S., London.
H. B. BRADY, F.R.S., F.L.S., F.C.S., Newcastle-on-Tyne.
THOS. B. GROVES, F.C.S., Weymouth.
PROF. REDWOOD, Ph.D., F.I.C., F.C.S., London.
G. F. SCHACHT, F.C.S., Clifton, Bristol.
R. REYNOLDS, F.C.S., Leeds.
PROF. ATTFIELD, Ph.D., F.R.S., F.I.C., F.C.S., London.
J. WILLIAMS, F.I.C., F.C.S., London.
J. B. STEPHENSON, Edinburgh.
T. GREENISH, F.C.S., F.R.M.S.

Vice-Presidents.

M. CARTEIGHE, F.I.C., F.C.S., London.
S. PLOWMAN, F.R.C.S., London.
C. SYMES, Ph.D., Liverpool.
G. S. WOOLLEY, Manchester.

Treasurer. C. UMNEY, F.I.C., F.C.S., London.

Honorary General Secretaries.

W. A. H. NAYLOR, F.I.C., F.C.S., London.
JOHN C. THRESH, D.Sc., F.C.S., Buxton.

Local Secretary. F. BADEN BENGER, F.C.S., Manchester.

Other Members of the Executive Committee.

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DOTT, D. B., F.R.S.E., Edinburgh.
ELBORNE, W., F.C.S., Manchester.
GERRARD, A. W., F.C.S., London.
MABEN, T., Hawick.
SYMONS, W. H., F.C.S., F.R.M.S., London.

Auditors.

C. J. ARBLASTER, Birmingham.
W. WILKINSON, Manchester.

Assistant Secretary.

W. H. INCE, A.I.C.

Editor of Year-Book.

LOUIS SIEBOLD, F.I.C., F.C.S.

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BAMFORD, J. W., Rochdale.
BARNABY, F., Manchester.
BELL, J. CARTER, Higher Broughton.
BENGER, F. B. (*Hon. Local Secretary*), Manchester.
BILLINGE, M., Hyde.
BLAIN, W., Bolton.
BYLTON, JOHN, Manchester.
BOOR, F., Fallowfield.
BOOTH, W. G., Manchester.
BOTHAM, J., Manchester.
BOSTOCK, W., Ashton.
BOWDEN, W., Patricroft.
BOWKER, E., Bury.
BREADNER, C. G., Manchester.
BROWN, W. S., Manchester.
BURN, THOS., Manchester.
CARTER, W., Manchester.
CLAYTON, E., Manchester.
ECKERSLEY, F., Wigan.
ELBORNE, W., Owens College.
ESTCOURT, C., Manchester.
FORRES, J. W., Bolton.
GIBBONS, T. G., Manchester.
GIBBONS, W., Manchester.
GIBSON, R., Manchester.
HALL, H. S., Manchester.
HARDIE, G. H., Manchester.
HART, J., Manchester.
HAY, A., Salford Hospital.
HEDLEY, T., Ramsbottom.
HOLT, J., Manchester.
HUDDLESTONE, R. O., Manchester.
HUGHES, E. G., Manchester.
HUNT, L., Manchester.
JACKSON, G., Manchester.
JOHNSTONE, C. A., Manchester.
KAY, S., Stockport.
KAY, T., Stockport.
KEMP, H., Manchester.
KEEFOOT, T., Manchester.
LATEWARD, J. R., Manchester
MCCORMICK, F. H., Manchester.
MASON, W. B., Bolton.
MATHER, W., Manchester.
MAUNDER, ROBT., Manchester.
MAYOR, D., Manchester.
MIDGLEY, C., Manchester.
MORTON, I., Ramsbottom.
OLDFIELD, A. C., Manchester.
OLDFIELD, H., Hyde.
PAINE, S., Manchester.
PEATSON, H. R., Manchester.
PHILLIPS, J., Wigan.
POLLITT, J. M., Radcliffe.
PRATT, G. W., Manchester.
RAMSDEN, W., Fallowfield.
ROBINSON, B., Pendleton.
SCAIFE, S., Manchester.
SHAW, THOS., Manchester.
SIEBOLD, L., Walmersley.
SLACK, J. L., Manchester.
SLEGG, J. T., Chorlton.
SMITH, A., Sale.
SMITH, J. R., Radcliffe.
STEVENSON, J. C., Todmorden.
STONES, W., Manchester.
SWINDLES, T., Manchester.
SWINN, C., Manchester.
TAYLOR, E., Manchester.
THRESH, DR., Manchester.
TURNER, W. S., Manchester.
TWEMLOW, R., Manchester.
WATKINSON, J. W., Farnworth.
WATERHOUSE, W. H., Ashton.
WESTMACOTT, G., Manchester.
WHEELDON, J., Manchester.
WILD, J., Hyde.
WILD, J., Clayton-le-Moors.
WILD, JNO., Manchester.
WILKINSON, G., Manchester.
WILKINSON, J. F., Pendleton.
WILKINSON, W., Manchester.
WOOLLEY, G. S. (*Chairman*), Manchester
WOOLLEY, HERMAN (*Treasurer*), Manchester.
WOOLLEY, HAROLD, Manchester.
YOUNG, J. R., Warrington.

THE SITTINGS OF THE CONFERENCE WERE HELD IN THE

CHEMICAL LECTURE THEATRE, OWENS COLLEGE, MANCHESTER,

ON TUESDAY & WEDNESDAY, AUGUST 30TH AND 31ST, 1887,

Commencing at Ten a.m. each day.

MONDAY, 29th AUGUST.

The EXECUTIVE COMMITTEE met, according to notices from the Honorary General Secretaries, at 10 p m., at the Grand Hotel, Manchester.

TUESDAY, 30th AUGUST.

The CONFERENCE met at 10 o'clock a.m., adjourning at 1 p.m.; and at 2 o'clock p.m., adjourning at 4 p.m.

Order of Business.

Reception of Delegates.
Report of Executive Committee.
Financial Statement.
Report of Treasurer of the "Bell and Hills Library Fund."
President's Address.
Reading of Papers and Discussions thereon.

PAPERS.

1. *Report on Strophanthus and Strophanthin.* By W. Elborne, F.C.S.
2. *Contribution to our Knowledge of Catha Leaves.* By Prof. Flückiger and J. E. Gerock.
3. *A New Method of Preparing Aconitine.* By John Williams, F.I.C., F.C.S.
4. *Mackay Beans, the Seeds of Entada Scandens.* By John Moss, F.I.C., F.C.S.
5. *Note on the Estimation of Ipecacuanha.* By F. Ransom.
6. *Report on Blaud's Pills.* By T. Maben.
7. *Note on the Cultivation of English Rhubarb.* By W. Elborne, F.C.S.
8. *On Two Species of Vesicating Beetles from South Africa.* By J. O. Braithwaite.
9. *Oil of Erodia, a New Deodorant for Iodoform.* By H. Helbing.
10. *Cryptopine and its Salts.* By Dr. E. Kauder.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon on the College premises.

At 4 p.m. members were conveyed by omnibus to the Exhibition, Old Trafford.

WEDNESDAY, 31st AUGUST.

The CONFERENCE met at 10 o'clock a.m., adjourning from 1 p.m. till 2 p.m. The whole of the business of the Conference was completed this day by about 4 p.m.

Order of Business.

Reception of Delegates.
Reading of Papers and Discussions thereon.

PAPERS.

11. *The Relation of Pharmacy to Medicine.* By Prof. Leech, F.R.C.P.
12. *A Method of Detecting and Estimating Salicylic Acid in Wines.* By W. H. Ince, A.I.C.
13. *Note upon the Testing and Purification of Hydrochlorate of Cocaine.* By John Williams, F.I.C., F.C.S.
14. *Pharmaceutical Notes on Some Synthetical Compounds Recently Introduced into Medicine.* By H. Helbing.
15. *Note on Camphor Oil.* By Peter MacEwan, F.C.S.
16. *Some Fundamental Errors in the Pharmacopœia.* By C. R. C. Tichborne, LL.D., F.I.C., L.A.H.I.
17. *A Spurious Cubeb.* By W. Kirkby, F.R.M.S.
18. *On the Chemistry and Pharmacy of some of the Morphine Derivatives.* By D. B. Dott, F.R.S.E., and G. R. Stockman, M.D.
19. *Note on the Pharmacy of Logwood.* By Louis Siebold, F.I.C., F.C.S.
20. *Notes on the Application of Dyewoods in Chemical Analysis.* By Louis Siebold, F.I.C., F.C.S.
21. *Examination of Commercial Samples of Cocoa Butter.* By E. J. Millard.
22. *Nitrites and Nitro-Glycerine.* By G. A. Atkinson, M.D.
23. *Quinological Work in the Madras Cinchona Plantations.* By David Hooper, F.C.S.

Place of Meeting for 1888.
Election of Officers for 1887-88.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon on the College premises.

THURSDAY, 1st SEPTEMBER.

A large party of members and friends, accompanied by the Local Committee, travelled by special train to Matlock Bath. Here they inspected the caverns and petrifying wells, for which the place is famous, and ascended the High Tor and the Heights of Abraham. After luncheon at the Royal Hotel, they were taken for a drive round the neighbourhood. On their return they again refreshed themselves, and afterwards paid flying visits to the Pavilion and Gardens. They were then conveyed by train back to Manchester.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING AT MANCHESTER, 1887.

The Twenty-fourth Annual Meeting of the British Pharmaceutical Conference commenced its sittings on Tuesday, August 30th, in the Chemical Theatre of the Owens College, Manchester. S. R. Atkins, Esq., J.P., in the chair.

The following members and visitors were present during the meetings :—

Aberdare—Thomas, W. J.
Aberdeen—Belfield, W.; Broomhead, G. E.; Giles, W.; Johnson, J.
Ashton-under-Lyne—Bostock, W.
Barnet—Young, R. F.
Barnsley—Lister, T.
Barnstaple—Symons, Miss Sophie.
Birmingham—Alcock, F. H.; Haydon, W. F.; Perry, G. E.; Thompson, C.
Bolton—Mason, W. B.
Bombay—Phillips, A.; Phillips, B.
Bournemouth—Spinney, F.
Brighton—Kernot, C. F.; Leigh, M.; Savage, W. D.
Bury—Siebold, L.
Buxton—Thresh, J. C.
Cambridge—Church, H. J.; Deck, A.
Carlisle—Thompson, A.
Cheltenham—Barron, W.
Chester—Baxter, G.; Hodges, W.; Tupham, T.
Clifton—Berry, W.; Schacht, G. F.
Coleraine—Baxter, W. J.
Cork—Lester, T. R.
Coventry—Hinds, J.; Jones, H. J.; Wyley, W. F.

Crewe—Harrop, W. H.

Dalkley (Ireland)—Begg, G. D.

Denton—Arrandale, W.

Droitwich—Harry, S.

Dublin—Browne, Harriet E.; Brunker, J. E.; Simpson, R.; Tichborne, C. R. C.; Wells, Miss Mary A.; Wells, W. F.

Edinburgh—Dott, D. B.; Purves, S.; Symington, T.; Young, J. R.

Farnworth—Wilkinson, J. W.

Glasgow—Nicoll, J.

Gloucester—Jenkins, H.; Stafford, W.; Ward, J

Halifax—Alexander, W.

Hastings—Winter, H.

Hawick—Maben, T.

Heaton-Morris—Williams, Miss.

Hindley—Hart, A. M.

Hold—Cheetham, G.

Huddersfield—Bell, J. H.

Hull—Bell, C. B.; Metcalfe, C. S.

Hurstpierpoint—Mitten, Miss F.; Mitten, Miss R. E.

Hyde—Billinge, M.

Ilkley—Worfold, G. W.

Leamington—Pullen, W. H.

Leeds—Branson, F. W.; Fairley, T.; Jefferson, P.; Reynolds, R.; Ward, G.

Leicester—Butter, E. H.; Burford, S. F.; Clark, J. W.; Meadows, J.

Leighton—Richmond, R.

Leven—Gibson, A.

Liverpool—Abraham, A. C.; Conroy, M.; Fraser, A.; Greenall, A.; Lee, T. W.; Neuman, J.; Samuel, A. H.; Symes, C.

Llanelly—Evans, G.

London—Baldock, J. H.; Bindloss, G. F.; Bird, F. C. J.; Burroughs, S. M.; Christy, T.; Clarke, C. G.; Collier, H.; Crawshaw, E.; Davies, R. H.; Dyson, W. B.; Dymond, T. S.; Eastes, E. G.; Fowler, Mrs.; Gerrard, A. W.; Glazier, W.; Gurnelle E.; Hampson, R.; Helbing, H.; Holmes, E. M.; Lascelles-Scott, W.; Long, H.; MacEwan, P.; Maitland, P. C.; Martindale, W.; Mason, W.; Moss, J.; Naylor, W. A. H.; Parry, W. P.; Passmore, F.; Pedley R. D.; Pretty, C.; Robinson, R.; Robinson, W. P.; Roberts, W. P.; Sangster, A.; Saul, J. E.; Smith, F. J.; Symons, W. J.; Taylor, G. S.; Tingle, J. G.; Tompsett, L.;

Watson, T. D.; White, W.; Williams, Mrs.; Williams, T. H.; Williams, J.; Wootton, A. C.; Wright, T. R.; Wright, C. R. A.

Louth—Simpson, H. T.

Lynn—Evans, J. H.

Manchester—Benger, F. B.; Butcher, C. G.; Blyton, T.; Burn, T.; Balmforth, A.; Bowden, W.; Cooper, F. R.; Cornish, W.; Deacon, F. W.; Dickson, R. J.; Elborne, W.; Le Neve Foster, R.; Gibbons, W.; Hart, J.; Huddleston, R. O.; Hardy, G. H.; Hughes, E. G.; Johnstone, C. A.; Johnston, E. S.; Jackson, G.; Kemp, H.; Kidd, J. C.; Kirkby, W.; Leech, D. J.; Lowe, W.; Marsden, W.; Mayor, D.; Morris, W.; Needham, C. T.; Owles, T.; Pidd, A. J.; Pirin, J.; Pratt, G. W.; Paine, S.; Russell, W. M. J.; Roberts, H. R.; Robinson, B.; Smith, J. L.; Slugg, J. T.; Stamp, A. K.; Swinn, C.; Slack, J. L.; Scarfe, S.; Tyson, J.; Turner, W. S.; Tatham, M. D.; Woolley, G. S.; Wyatt, W.; Wild, J.; Wilkinson, G.; Wild, G. F.; Woolley, H.; Wheeldon, J.; Wishmark, G. H.

Mansfield—Adams, B.

Newcastle-on-Tyne—Brady, H. B.; Martin, N. H.; Spargo, H. A.

Newton Heath—Carr, W.

Northampton—Hayger, W. D.

Nottingham—Patchitt, E.

Oldham—Geddes, W.

Peterborough—Lipscomb, S.; Lipscomb, Miss.

Plymouth—Balkwill, A. P.

Preston—Hargreaves, M.

Radcliffe—Smith, J. T.

Ramsbottom—Hulley, T.

Rochdale—Bamford, J. W.; Wilson, H.

Rothesay—Duncan, E.

Salisbury—Atkins, S. R.

Saltaire—Bayley, G. H.; Bayley, Mrs.

Scarborough—Whitfield, J.

Sheffield—Allen, A. H.; Furness, J. M.; Newsholme, G. T. W.

Shepton Mallett—Cottrell, G. J.

Shrewsbury—Cross, W.

Smethwick—Gibbs, R. D.

Southampton—Chipperfield, J.

Southport—Ashton, W.; Radley, W. V.

Stalybridge—Simpson, A.

St. Leonards—Rossiter, F.

Stockport—Hart, T.

Swansea—Davies, J. T.; Grose, N. M.; Morgan, W.
Tarporley—Aston, W.
Todmorden—Lord, B.; Lord, C.
Wantage—Candy, C. G.
Warrington—Young, J. R.
Wigan—Johnstone, T.
Withington—Terry, T.
York—Clark, J.

Meeting of the Executive Committee.

A meeting of the Executive Committee was held at the Grand Hotel, Manchester, on Monday, August 29, at 10 p.m.

Present:—Mr. Atkins, President, in the chair; Messrs. Benger, Brady, Brunker, Conroy, Davies, Dott, Elborne, Gerrard, Maben, Reynolds, Schacht, Symes, Symons, Williams, and Woolley, Dr. Thresh and Mr. W. A. H. Naylor, Hon. Gen. Secs., and Mr. W. H. Ince, Assist. Sec.

The minutes of the previous meeting were read and confirmed.

A draft report, for presentation at the annual meeting, was submitted by the Hon. Gen. Secs., and after a slight alteration, was agreed to.

The order in which papers should be read at the general meeting was discussed, and the programme arranged.

The Treasurer's financial statement for the year 1886–7 was read and approved.

A proposed list of officers for the ensuing year was discussed and adopted for recommendation to the general meeting for election.

The MS. of the *Year-Book* for 1887, so far as it could be completed, was laid on the table.

The place of meeting for 1888 was considered. The Committee was of opinion that the Conference should adhere to its usual custom in following the British Association, and go to Bath.

A report of the Formulary Committee was presented through its Chairman, and read by Mr. Naylor.

The report was accepted, and it was agreed to recommend to the General Meeting the reappointment of the Committee.

A letter was then read from Messrs. Dott and Stockman, requesting a grant of £5 for the purchase of materials to carry out an investigation on morphine derivatives.

Proposed by Mr. Naylor, seconded by Mr. Conroy, and carried unanimously, that the grant be accorded.

Mr. J. C. Nightingale was elected Assistant Secretary in the room of Mr. W. H. Ince, who found it impracticable longer to fulfil the duties of this office.

It was announced that Mr. Ryder Horton had resigned the office of Honorary Secretary for New South Wales, and that steps had been taken for appointing a suitable successor.

The following sixty gentlemen were duly nominated and elected to membership:—

Balmforth, Mr. Alfred, Manchester.
Bates, Mr. F. W. Brooks, Manchester.
Billinge, Mr. Mark, Hyde.
Birks, Mr. G. N., Adelaide, South Australia.
Blain, Mr. W. Rushton, Bolton.
Bowker, Mr. Ellis, Bury.
Brookes, Mr. Josh., Manchester.
Burn, Mr. Thos., Manchester.
Butcher, Mr. G. S., Manchester.
Candy, Mr. J. W. G., Wantage.
Chipperfield, Mr. R., Southampton.
Condon, J. H.; M.D. L.S.A., Cawnpore, India.
Cripps, Mr. T. H., Madras, India.
Cullinan, Mr. E., London.
Cunynghame, Mr. G. F., Sydney, N.S.W.
Fairclough, Mr. R. A., London.
Foster, Mr. R. Le Neve, Manchester.
Gibbons, Mr. Walter, Manchester.
Hardie, Mr. G. H., Manchester.
Harrington, Mr. J. F., London.
Hedley, Mr. Thos., Ramsbottom.
Herbert, Mr. H. S., Wavertree.
Huddlestone, Mr. R. O., Manchester.
Jackson, Mr. Urban Arthur, Manchester.
Johnston, Mr. J., Aberdeen.
Johnstone, Mr. C. A., Whaley Bridge.
Jones, Mr. William H., Liverpool.
Kay, Mr. Saml., Stockport.
Kidd, Mr. James Cassie, Manchester.
Knight, Mr. R., Manchester.
Lee, Mr. S. W., Liverpool.
Mason, Mr., London.
Midgley, Mr. C., Manchester.
Mitchell, Mr. E. D., Manchester.
Morgan, Mr. J. D., Bideford.
Morton, Mr. J., Ramsbottom.
Munday, Mr. H., Manchester.
Parry, Mr. W. P., London.
Peatson, Mr. H. R., Manchester.
Pedley, Mr. G., London.
Phillips, Mr. J. J., Ashton.
Platt, Mr. W., Matlock Bath.
Pretty, Mr. C., London.
Rand, Mr. E., Wayga Wayga, N.S.W.
Roberts, Mr. W. R., Manchester.

Royse, Mr. Alfred, Manchester.
Simpson, Mr. R., Dublin.
Slack, Mr. Jno. L., Manchester.
Smith, Mr. Allen, Sale.
Spargo, Mr. H., Newcastle-on-Tyne.
Wardrop, Mr. W. Dunedin, N. Z.
Wellings, Mr. William, Liverpool.
West, Mr. J., Bangalore, India.
Whitfield, Mr. C., Manchester.
Wild, Mr. John, Manchester.
Williamson, Mr. H. B., Wanganai, N. Z.
Wilson, Mr. W., Manchester.
Woollcombe, Mr. Rd., Dublin.
Woolley, Mr. S. W., Southampton.
Wyass, Mr. W., Lancaster.

At a meeting of the Executive Committee held on Thursday, September 1, it was agreed to offer for sale, through Messrs. J. and A. Churchill, the British Pharmaceutical Conference Unofficial Formulary, at a cost of 6*d.* per copy in paper covers, and 1*s.* per copy bound in cloth. It was further agreed that the 1*s.* copies should be interleaved.

GENERAL MEETING.

Tuesday, August 30th.

Mr. G. S. Woolley opened the proceedings by offering, on behalf of the pharmacists of Manchester and the district, a cordial welcome to the Conference on its first visit to Manchester. At the same time he expressed the hope that the meeting would prove to be, as it promised, a very successful one; and that the arrangements made by the Local Committee would render the visit to Manchester both interesting and agreeable. His pleasure in standing forward on this occasion was somewhat marred by the thought that the gentleman whose place he occupied, Mr. William Scott Brown, was prevented by the state of his health from being present. Those who knew Mr. Brown best knew how delighted he would have been to have stood there and welcomed the Conference. The pharmacists of the district owed Mr. Brown a large debt of gratitude, for whenever any movement was on foot for the progress of pharmacy or the welfare of pharmacists, Mr. Brown had always been in front. After acknowledging the kindness of the authorities of Owens College, and of the Executive Committee of the Royal Jubilee Exhibition, who had placed at the disposal of the Local Secretary a number of tickets

for the Conversazione on Thursday evening, he remarked that the Executive Committee had determined to avail themselves of the facilities for studying the industries of the district in the machinery annexe of the Exhibition rather than to seek for opportunities of visiting various works, and he believed that those who visited the Exhibition would be of opinion that the Committee had in this matter acted for the best. In conclusion, he trusted that every member would carry away very pleasant recollections of the visit to Manchester.

Professor LEECH said he had great pleasure, on behalf of the authorities of Owens College, as well as his own, in welcoming the Conference. The authorities of the College had great pleasure in putting at their disposal all the accommodation required, and were wishful to do everything which could increase the pleasure of the meeting. It was not the first time that they had shown an interest in the progress of pharmacy, that being the first college of the kind to institute a system of pharmaceutical education. In that College were provided lectures and laboratories, giving an education which would fit pharmacists not only to pass examinations, but for the scientific work of their lives. On his own behalf, he need hardly say that as Professor of Materia Medica, he took a deep interest in the progress of pharmacy, and he trusted that the present meeting would be successful in every respect, and especially that it would advance the true interests of scientific pharmacy.

The PRESIDENT, on behalf of the Conference, thanked Mr. Woolley and Professor Leech for the welcome they had given. The Conference met under very favourable auspices, in every respect, and he felt sure that the meetings would be promotive of the great purposes for which the Conference existed. He was certain that those who were visitors to Manchester would gain much pleasure and no small intellectual profit, and if they could leave behind them any pleasant recollections with their hosts, they would have largely accomplished the object of their visit.

Reception of Delegates.

Dr. THRESH (Hon. Gen. Sec.) then read the following list of delegates to the Conference:—

Pharmaceutical Society of Great Britain.—The President, Vice-President, and Messrs. S. R. Atkins, W. G. Cross, R. Hampson, G. T. W. Newsholme, W. V. Radley, W. D. Savage, G. F. Schacht, C. Symes, and G. S. Woolley.

Pharmaceutical Society of Great Britain (North British Branch).—Messrs. D. B. Dott, Daniel Frazer, Adam Gibson, and Alexander Kinninmont.

Pharmaceutical Society of Ireland.—Mr. J. E. Brunker, M.A., Messrs. G. D. Beggs, F. J. Minchin, R. Simpson, J. Wells, and Professor Tichborne.

Aberdeen and North of Scotland Society of Chemists and Druggists.—Messrs. G. E. Broomhead, W. Giles, J. Johnson, and D. Ritchie.

Brighton Association of Pharmacy.—Messrs. Marshall Leigh and W. D. Savage.

Bristol Pharmaceutical Association.—Mr. G. F. Schacht.

Hawick Pharmaceutical Association.—Mr. T. Maben.

Hull Chemists' Association.—Messrs. C. B. Bell and W. H. Hammond.

Leeds Chemists' Association.—Messrs. F. W. Branson, P. Jefferson, R. Reynolds, and G. Ward.

Leicester and Leicestershire Chemists' Association.—Messrs. S. F. Burford, E. H. Butler, J. W. Clark, and J. G. F. Richardson.

Liverpool Chemists' Association.—Messrs. A. C. Abraham, J. F. Abraham, M. Conroy, A. H. Samuel, and W. Wellings.

London Chemists' Assistants' Association.—Messrs. F. C. J. Bird, T. S. Dymond, and J. E. Saul.

Manchester Pharmaceutical Association.—The members of the Council of the Manchester Pharmaceutical Association.

Midland Counties Chemists' Association.—Messrs. Perry, Wyles, Thompson, Alcock, Haydon, Pullen, Hinds, and Jones.

North of England Pharmaceutical Association.—Messrs. N. H. Martin and J. Harrison.

Sheffield Pharmaceutical and Chemical Society.—Messrs. J. M. Furness, G. T. W. Newsholme, and A. R. Fox.

Dr. THRESH also said that letters of apology for non-attendance, and expressing good wishes for the success of the Conference, had been received from Mr. Carteighe, President of the Pharmaceutical Society of Great Britain, Professor Bentley, Professor Attfield, and Messrs. Greenish, Barclay (Birmingham), J. B. Stephenson (Edinburgh), A. Strachan (Aberdeen), and F. Ransom (Hitchin).

The PRESIDENT said he had himself received similar letters from Professor Dunstan, Mr. Plowman, and others.

Mr. W. A. H. NAYLOR (Hon. Gen. Sec.) then read the report of the Executive Committee, as follows:—

Report of the Executive Committee.

Your Committee, in presenting its Annual Report of the business which it has transacted during the past year, feels that it has not altogether been an uneventful period in the history of the Conference. Following closely upon the retirement of the senior Honorary General Secretary, Mr. Sidney Plowman, F.R.C.S., at the Birmingham meeting, came the sudden resignation of the paid officer. At the meeting of the Executive in October last, it was announced that in consequence of failing health, Mr. Princep had applied to be immediately relieved of his duties as Secretary, and that in consideration of the urgent demand of his case, his application had been immediately granted. The acceptance of his resignation was marked by an entry in the record of the proceedings of that meeting of the following minute:—"That the Honorary General Secretaries convey to Mr. Princep an expression of regret at the circumstances under which he was compelled to leave the service of the Conference, together with an appreciation of the satisfactory manner in which he had performed his duties as paid Secretary since February, 1881."

In selecting an officer in succession to Mr. Princep, a favourable opportunity was afforded your Committee of considering the most suitable conditions under which the appointment should be made. The choice lay between one of two courses, either to proceed to the lines on which the late Secretary was appointed, or return to the system in vogue prior to 1880. Of those who had made application for the vacancy, two had declared their willingness to accept election in accordance with the latter alternative, a fact which was largely instrumental in eliciting for it a renewed trial. It was accordingly decided to adopt this line of procedure, and Mr. W. H. Ince was appointed Assistant Secretary for one year at a salary of £40. It was further agreed that a sum not exceeding £10 should be allowed him for expenses incurred in attending the annual meeting. Mr. Ince is now nearing the close of his year of office, but will not be able to accept re-election in consequence of his leaving England at an early date to prosecute his studies at a Continental university. He requests that his services may terminate after the present meeting.

Your Committee regret to have to announce the resignations of two Colonial Secretaries, that of Mr. H. Shillinglaw, for Victoria, and of Mr. Ryder Horton, for New South Wales. During the

three years and a half which Mr. Shillinglaw has exercised his office, he has steadily and successfully laboured to promote the interests of the Conference. To Mr. Horton, whose appointment is of recent date, is due the acknowledgment of having rendered hearty and useful service.

Early in the present year a series of circulars, setting forth the objects of the Conference, and inviting to its membership, was posted to those unconnected with it, who had registered as chemists and druggists in Great Britain and Ireland since January, 1886.

A more numerous issue of a like kind has been circulated in India and the Colonies, the distribution having been effected severally by the Colonial Secretaries throughout the colonies in which they respectively reside.

Although sufficient time has not elapsed to justify a numerical statement of the results of the home and foreign issue, there is already the prospect of an encouraging return. To those members who had promised to provide themselves with a copy of the General Index, and who up to the beginning of the year had neglected to do so, a circular note was addressed requesting them to fulfil their engagement as promptly as their convenience would allow. It is satisfactory to be able to announce that 188 of those addressed suitably responded to the appeal.

The report last year included a fitting reference to a new feature which characterized the proceedings of the Conference at Birmingham. The departure there taken was expressly intended to further the social objects of this association, and the results of the project were such as to leave no doubt of its success.

Your Committee, in conference with the Local Committee, arranged to repeat the experiment this year; accordingly last evening there was a reception by the President and officers of the Conference at the Grand Hotel.

Many members availed themselves of this opportunity of renewing friendships and forming new ones. The whole spirit of last night's gathering encourages the inference that a Conversazione will henceforth find a permanent place in the proceedings of Conference.

It is with great pleasure your Committee is able to report that two applications for grants in aid of research have been made. A sum of £10 has been handed over to Mr. E. M. Holmes for defraying the costs connected with the purchase and cultivation of authentic specimens of *Aconitum Napellus*, with a view subse-

Financial Statement for the year ending June 30th, 1887.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1886.	Dr.	£	s.	d.	£	s.	d.
July 1.	To Assets forward from last year—						
	,, Balance in hand at Bank . .	219	7	0			
	,, Balance in hand of Secretary .	3	9	10			
	,, Messrs. J. and A. Churchill's Account	114	10	6			
1887.					337	7	4
June 30.	,, Sale of Year-Book by Publishers .	17	13	4			
	,, Sale of Year-Book by Secretary .	0	7	6			
					18	0	10
	,, Advertisements	124	1	0			
					124	1	0
	,, Members' Subscriptions . .	611	13	9			
	,, Surplus Cash left by late Secretary	0	4	1			
					611	17	10
	,, Index to Year-Book, sale by Secretary	78	7	6			
	,, Index to Year-Book, sale by Publishers	1	10	4			
					79	17	10
	,, Outstanding Liabilities, W. I. Richardson's Account unpaid .	11	5	6			
	,, McCorquodale & Co. . . .	16	8	6			
					27	14	0
					£1198	18	10

1887.	Cr.	£	s.	d.	£	s.	d
June 30.	By Expenses connected with Year-Book:—						
	Printing, Binding, Publishing .	384	13	11			
	Postages and Distributing .	42	10	0			
	Advertising and Publishers' charges	34	7	3			
	Foreign Journals . . .	5	15	6			
	Editor's Salary	150	0	0			
					617	6	8
	,, Expenses connected with Index to Year-Book:—						
	Postages and Distributing .	1	10	0			
	Preparing, etc.	53	3	0			
					54	13	0
	,, Salary of Secretary . . .	.	.		65	2	3
	,, Blue Lists:—						
	Printing	5	15	0			
	Postages	9	6	4			
					15	1	

1887.	Cr.	£	s.	d.	£	s.	d.
June 30.	By Printing and Stationery				39	8	6
	,, Postages				46	12	11
	,, Formulary Committee				10	0	0
	,, Expenses of Birmingham Meeting:—						
	Mr. Princep	5	0	0			
	Mr. Plowman	3	15	0			
	Printing	9	13	6			
					18	8	6
	,, Petty Cash				10	7	10
	,, Grant to Mr. Elborne, Manchester				5	0	0
	,, Bank Charges				0	1	0
	,, Outstanding Liabilities on last year—						
	Messrs. Butler & Tanner's Account paid				137	2	0
	,, Outstanding Assets — Messrs. J. and A.						
	Churchill's Account, since paid				108	17	5
	,, Balance at Bank	63	14	8			
	,, Balance with Secretary—						
	Petty Cash	3	2	0			
	Postage	4	0	9			
					70	17	5
					£1198	18	10

The Bell and Hills Fund.

1886.	Dr.	£	s.	d.
July 1.	To Balance (forward from last year)	22	4	5
,, 6.	,, Dividend on Consols, £350	5	1	6
1887.				
Jan. 6.	,, ,, ,, ,,	5	2	0
		£32	7	11

1886.	Cr.	£	s.	d.
Oct. 26.	By Books for Birmingham	10	13	7
1887.				
June 30.	,, Balance at Bank	16	12	4
	,, Dividend accrued, but not received till July 20	5	2	0
		£32	7	11

1887.		£	s.	d.
July 1.	To Balance	16	12	4
		5	2	0
		£21	14	4

Examined and found correct, securities viewed. C. J. ARBLASTER, Birmingham. A. WILKINSON, Manchester.

quently to the extraction and chemical examination of its alkaloidal constituent.

This undertaking is a practical outcome of a suggestion offered by Mr. T. B. Groves, when discussing the valuable paper on "Crystallized Aconitine," contributed by Mr. John Williams at the last General Meeting.

The sum of £5 has been placed at the disposal of Mr. W. Elborne, for a further research on Strophanthus and Strophanthin. The results of his investigation will be embodied in a report, to be presented to this meeting.

A year ago the Conference at its Annual Meeting appointed a Committee of ten of its members to prepare a formulary of unofficial remedies.

This Committee, through its Chairman, has handed in the draft of what it recommends for publication as the first edition of an Unofficial Formulary. The Executive Committee will now lay these results before the Conference.

Your Committee advises the reappointment of the Sub-Committee.

Mr. Siebold, F.I.C., F.C.S., was last December reappointed editor of the *Year-Book* for 1887, and the manuscript of the forthcoming volume, so far as it can be completed, is now on the table.

The number of papers which have been received for the present meeting is a little in advance of last year, and it is believed that the several contributions will provide ample scope for profitable discussion.

In the absence of Mr. Umney (Treasurer), Mr. W. A. H. Naylor read the financial statement (*see* pp. 400, 401) :—

Mr. Wilkinson, Auditor, testified to the correctness of the accounts, which he had examined, and the securities.

The President moved the adoption of the report and the accounts. He remarked that, like all records of human labour, the report contained mingled experiences of sunshine and shadow; that there were shades in the form of resignations in the list of active workers could not be denied, but the impression produced on his mind was, that on the whole the Conference was in a thoroughly sound, healthy, and flourishing condition. He believed he was only expressing the general opinion of the members, ladies as well as gentlemen, in saying that the idea of a preliminary conversazione, inaugurated last year at Birmingham, had proved a

decided success. One of the purposes of the Conference was the promotion of social intercourse, and the advantage of meeting together before the business meetings commenced, and renewing old friendships and making new ones, could hardly be overestimated. With regard to the Unofficial Formulary, he would only say that the result of the Committee's work up to the present time had been printed, and he commended it to the careful examination of the members.

Mr. KEMP seconded the motion, which was at once carried unanimously.

The German Apotheker-Verein.

The PRESIDENT said it had been suggested that a telegram of congratulation should be sent to the German Apotheker-Verein, which was then sitting at Munich, and asked if it were the will of the meeting this should be done.

The suggestion was unanimously agreed to.

The PRESIDENT then delivered the following address:—

THE PRESIDENT'S ADDRESS.

The honour you have conferred on me in electing me as your President is one that I most highly appreciate, although it entails responsibilities I shrink from trying to discharge.

At any time I should have felt my inability worthily to introduce and conduct your deliberations, but in this year, so memorable in the history of our country, and in the city of Manchester, I am most deeply sensible of the difficulty of my position.

Enough, and perhaps more than enough, has already been said respecting the Queen's Jubilee, and yet it would ill become me to omit all reference to it. Interested as we all are in the progress of science and in the development of the industries of our country, we cannot but be thankful that during fifty years stability has attached to the throne, and life and health have been continued to the monarch of these realms.

Other and neighbouring lands have been agitated by revolutions, and have tried all possible varieties of government, but Great Britain has remained devoted to the House of Brunswick, and the recent celebrations have in a most remarkable manner brought to light the real depth of this devotion.

There is another topic on which I feel bound to say a few words

as in some measure preparatory to the remarks that follow. We are assembled in the city of Manchester, a city whose history is strikingly illustrative of the progress of our country during the last fifty years.

As the railways converging hither carry us through the dense forest of chimneys; as on our way through the streets we gaze on the long rows of warehouses, and at length stand before the majestic town hall, it is difficult for us who are comparative strangers to the place to imagine what Manchester must have been half a century since.

The mail coach to London, first started in 1787, leaving Manchester at 4 a.m., and professing to reach London "early next evening," had indeed been superseded by the railway, but who could have supposed that in the course of fifty years the power of locomotion could have been so increased, and the trade and industry of the nation have been so developed as to make it possible that in 1887 as many as fifteen or twenty express trains should be running up to the metropolis every day, and performing the journey in four and a quarter or four and a half hours?

This one fact speaks volumes.

Again, fifty years ago, the amount of traffic between Manchester and Liverpool was such as to tax to their utmost extent the carrying powers of river, road, and rail; but what must the trade have grown to, and what must be the energy inherent in this great manufacturing centre, when it has become possible to float an enterprise which is to convert Manchester into one of the sea-ports of the kingdom?

And while the magnitude of industries pursued in this district has become such as no one could have dreamt of in 1837, it is gratifying to observe that intellectual has kept pace with material progress. Educational and scientific institutions have been extended. Manchester has proved itself worthy of its Quaker citizen, John Dalton, who fifty years ago was Professor of Chemistry and Mathematics in the George Street Academy, and President of your Literary and Philosophical Society, but whom all the world now remembers as the discoverer of the Atomic Theory.

Owens College has developed a taste for learning, and has led to the creation of the Victoria University, whose graduates will doubtless, as time advances, do their part towards extending the fame of Manchester as one of the great centres of thought in the United Kingdom.

And as the patroness of Art, this city has taken a position not

surpassed by another city in the kingdom, except the metropolis itself.

Music and painting have abundant admirers here, while the Art Exhibitions of 1857 and 1887 show that admiration of all that is beautiful in design and execution is not a mere passing fashion among men whose marvellous success in business has made them ambitions of surrounding themselves with the works once found only in the mansions of the aristocracy; but that there is a desire to promote the advancement of high art, and to give to all classes of the community an opportunity of enjoying its pleasures.

In one word, the history of Manchester during the past fifty years forces upon us the lesson, that in all departments of life there must be incessant striving after progress.

Education must be pursued with even greater energy. Especially is this the case with regard to the science of chemistry and its allies—the sciences in which, as pharmacists, we are specially interested. Pressed as we are in our purely business relations by the severe competition of the age, it behoves us to develop, as far as possible, the purely scientific portion of our work.

I invite your attention to a brief review of the Victorian Era as it more especially affects ourselves as pharmacists.

Within this half century chemistry has made vast progress. The foundation of its success had been well and truly laid in the latter half of the eighteenth century and the beginning of the present century by a band of distinguished experimentalists scattered over Europe. Scheele, Lavoisier, Berzelius, Berthollet, Priestley, Davy, etc., were succeeded in our time by such eminent specialists as Faraday, Tyndall, Stokes, Hofmann, Perkin, Roscoe and Crookes, etc.

In 1775 Bergmann, of Upsala, carefully examined the law of simple elective affinity. In 1803 Berthollet carried the inquiry still further.

In 1766 Cavendish discovered hydrogen.

In 1774 Priestley discovered oxygen.

In 1819 Oersted discovered the law of electro-magnetism.

In 1822 Seebeck, of Berlin, discovered thermo-electricity. Nobili, in 1826 observed that electric currents were produced by animal tissues. With these and similar tools in the workshop of research in physical science, Faraday proceeded to accomplish his own grand work.

In 1802 Wollaston noticed the dark bands in the solar spectrum. In 1815 Fraunhofer produced a map of six hundred of them.

Then follow Herschell, Miller, Wheatstone, and others, until Swan detects by spectrum analysis $\frac{1}{2500000}$ of a grain of sodium.

And five new bodies are admitted to the sacred college of the elements, amongst which our distinguished President of the Chemical Society contributes thallium.

In 1760 Black lectures on a new discovery—latent heat. Seguin, in 1839, and Mayer, in 1842, perfect their researches in the same direction.

From 1822 to 1845 Faraday is employed in his researches on the relation of magnetism to light.

These illustrations are taken from the realm of *physics*. But the truth equally applies to *physic;* a lengthened period of preparation has enabled the latter half of this century to reap magnificent results. And if I may be permitted still further to moralize as we pursue our way, I would remark how prone we are, dazzled with a brilliant victory, to forget the patient and laborious toil—often extending over long, long years—that preceded it.

The change of the old order to the new is equally manifest if we contemplate for a minute the science of botany.

Since 1837 botany has made such rapid strides as to have become almost revolutionized, except so far as relates to the simple description of plants and their parts and organs; although here much progress has been made.

Nearly all is new in reference to vegetable histology, the bases of which were laid by Schleiden and Mohl in their researches on "The Development and Structure of the Cell."

To improvements in the construction of the microscope and its use, are due in a great measure the important advance in our knowledge of the internal structure and development of plants and their parts.

In the physiology of plants very much is also new, but much still remains to be done, for which we must look in the future to the combined work of the vegetable physiologist, chemist, and physicist.

In this age, in connection with botanical study, it is necessary to make a passing reference to the great researches of Darwin as to the origin of species, fertilization of orchids, climbing and twining plants and tendrils, etc., etc.

Passing to systematic botany, or the classification of plants, we notice that in 1837 the artificial system of Linnæus was in common use in this country, the only attempt to introduce a natural system having been made by Lindley about 1830; but it was not until

1845 that he propounded his views fully in his great work on the "Vegetable Kingdom." But at the present time the Linnæan system, which even Linnæus himself regarded as but an introduction to the natural system which he designated as the "præmium et ultimum in botanicis desideratum," has been entirely superseded by the natural systems founded more especially upon the arrangement of De Candolle, Lindley, and Bentham and Hooker.

Our knowledge of flowerless plants in 1837 was entirely cryptogamic, but immense strides have since been made in all that relates to the structure of the cryptogamia, and the whole subject as regards these plants is now regarded with intense interest, owing to the great light it has thrown and is throwing on the cause of propagation and treatment of diseases as evinced especially by the formation of the new science of bacteriology and the antiseptic treatment of disease.

Let us turn to another topic, and one in which we have a vital interest.

In 1841 an association composed of the leading London and provincial pharmacists was formed, which resulted in the creation of "the Pharmaceutical Society of Great Britain," a society which has done more to raise the position of the chemist and druggist of this country than has been achieved by any other corporate body for its constituents.

The condition of pharmacy in 1841 and succeeding years explains the motives and the conduct of our founders. Our very existence was threatened; expansion and growth on the better side—the scientific and semi-professional—was attacked from a groundless suspicion as to our secret ambitions. Hence self-defence was the cry of the hour.

History, in one respect at least, is ever repeating herself—the hour reveals the man.

Pharmacy may well be proud of the men who then came to the front and championed her cause.

A veritable galaxy of high-principled, self-sacrificing men they were, and as fixed stars they are destined to abide in the pharmaceutical heavens.

Provincial chemists should never forget how much they owe to those men. The story has been well told, but I feel deeply, and at times sorrowfully, that it has not received the recognition it deserves. It may be we are yet too near the actors and the stage accurately to assess the value of their work; but I am strongly convinced in my own judgment that as time flies the founders of

our Society will stand forth prominently revealed, not simply as the benefactors of their own order, but of society.

I am none the less conscious of the fact that to-day, struggling as we are with a competition as fierce as it is unprecedented, we can scarcely expect a fair and dispassionate appreciation of the philosophy of forty-six years since.

Disinterestedness was the prominent characteristic of those metropolitan pharmacists who headed the new movement, though self-preservation was the all-powerful instinct on which they played.

The Bayard of pharmacy, "le bon chevalier, sans peur et sans reproche," was Jacob Bell, a man to whom we might apply the laureate's words:—

> "He seemed the thing he was, and joined
> Each office of the social hour
> To noble manners, as the flower
> And native growth of noble mind."

Jacob Bell was a man of whom we may be proud. Naturally diffident and retiring, circumstances forced on him a prominence and a responsibility he neither sought nor coveted. Endowed mentally and socially with every qualification which to most men would have induced a let-alone policy, he threw himself with impassioned ardour into the cause, first of defence and then of progress.

I remember, as a lad, meeting him about this time, and I gratefully cherish the recollection of the impression he produced on my mind as to the purity and nobility of his aims.

Jacob Bell united in himself, to an unwonted degree, the faculties, rarely combined, of breadth of view and attention to detail. Do we adequately appreciate the humbler of these virtues?

Canova once excited the surprise of an onlooker that he was so careful as to the delicate touches in the less prominent parts of a statue.

> "In the elder days of art
> Builders wrought with greatest care
> Each minute and unseen part,
> For the gods see everywhere."

Jacob Bell possessed a mind stored with rich and varied culture and a conscience sensitive to the slightest touch.

His position was unique for usefulness in the direction to which

he specially applied himself; wealthy, and hence not suspected of a money-making ambition; occupying a position equally exceptional in his business relations with the medical profession; the intimate friend, and alternately the host and the guest of the recognised leaders in science and art, he stepped out from the ease and affluence in which he was placed, down into the arena of hard and oft of factious fight in the interests not of the privileged few but of the entire body of chemists and druggists in Great Britain.

Bell was loyally supported and seconded by such eminent men as Allen, Payne, Savory, Morson, Dinneford, and others.

Indeed, my time and your patience preclude the briefest possible reference either to their worth or their work.

But there are two eminent pharmacists, happily still with us, to whom pharmacy and this Conference are deeply indebted, and whose names I venture to mention—Messrs. Thomas Hyde Hills and George Webb Sandford.

The Pharmaceutical Society found "a local name and habitation" at 17, Bloomsbury Square—the fountain-head of a river destined to widen and deepen as time rolls on. Growth follows on life: the movement was instinct with vital energy and development was correspondingly rapid. A Library and Museum were provided; a small laboratory was furnished; lectures were instituted, and fortunate in the highest degree was the Society in securing the services of such men as Thomson, Ure, Pereira, Fownes, and Redwood.

The heart beating vigorously, the result is active circulation throughout the extremities of the body. At that time pharmaceutical literature was conspicuous for its absence; we had no journal or newspaper in which our policy could be expounded—hence the necessity of holding meetings in the principal towns of the kingdom to explain the movement and secure adherents. A large measure of success crowned the effort: chemists at length began to perceive and appreciate the necessity of combination.

The Society secured its Charter of Incorporation in 1843—the most important recognition the State could give—and secured at the cost of much forethought, labour, and anxiety.

That document defines the objects of the newly incorporated body as *education*, *protection of interests*, and *relief of distress*.

I have always thought that our founders were right as to these objects, and, likewise, as to the order in which they placed them.

It may not be uninstructive to inquire, some forty years afterwards, to what extent have these objects been realized?

Within the term of nearly half a century, not only have nearly all the founders passed away, but so also have the major part of the rank and file then in business.

The Act of 1868 rendered examination a necessary condition of registration. For nearly twenty years the relative proportions of examined to unexamined men have been changing, and now are scattered all over the kingdom pharmacists with the hall mark of the Society, whose competency I have no right to question.

I have no wish to utter any sentimental nonsense about the "good old times," for I do not believe that they were better than the present. On the other hand, we need not be ashamed of those days. As apprentices we worked harder and longer than our youth do now; no doubt because we were obliged; and, it must be admitted, much of the work might have been done by the porter. There were as many incompetent and idle apprentices then as now; none the less, I fear that the conditions of apprenticeship in changing have not improved. The term of apprenticeship was longer, and the relations between pupil and principal closer, in so far as moral and intellectual influence is concerned. It is true there were no examinations to reveal our ignorance; few books to read and no lectures to attend, so that in theory we were thinly clad, but in practical manipulation we were thoroughly equipped. The preparations of the Pharmacopœia were respectably turned out, so far as the appliances of a fairly well-appointed country laboratory would admit of. They were not always elegant by the light of modern standards, but they were known to be *genuine*, and they were *home-made!!* In short, the principal of an establishment having covenanted to teach his pupil as much of his craft as he knew, honourably fulfilled his part of the covenant.

Such is the personal testimony I bear to a contract I duly signed, sealed, and delivered—an indenture I am startled to find dating from 1843; my own humble charter of incorporation in pharmacy dating from the same year as the Charter of our Society.

Under the old order of things there were chemists in every part of the country of superior culture, and possessing a fair acquaintance with scientific research, but they were only a small minority.

Much *then* remained to be done, and, I regret to add, much *remains* to be done.

The question of education continues to be *the* question of the hour, and like other pressing questions of the day brooks no delay. It has been before the country for a long time; it has been the

theme of more than one presidential address to the Conference; it has been discussed from every point of view by some of our ablest thinkers, and at length has secured a fairly strong consensus of opinion in favour of a *compulsory training*. In that verdict I heartily concur.

I shall not pursue the question as to the methods by which that training shall be secured; it has been carefully treated by my predecessor in the chair, and by Mr. Barclay, of Birmingham. I have confidence in the law of supply and demand; at the present moment the former is in excess of the latter.

The voluntary principle, valuable in many respects, has in this matter proved inadequate. The wreck of fondly-cherished but illusive hopes in our examination rooms is a melancholy fact, but the victims deserve more pity than anger. I speak from an intimate knowledge of the Board of Examiners when I say that they do their duty fearlessly and fairly. But no examining body can be popular unless it pass all candidates, or we get within measurable distance of the millennium.

In one word, the mischief lies not in examination, but in the absence of training.

I have for a long time felt that it is desirable to raise the standard of the Preliminary examination.

The middle-class education of England is in a most unsatisfactory state; the education imparted in our national schools has so improved since the passing of the Elementary Education Act, that the errand boy is often more accurately grounded in knowledge than the apprentice; hence the desirability of making the initial test more stringent, and a correcter index of subsequent experience.

I do most emphatically protest against the injustice of allowing youths to enter a calling, the conditions of which have never been explained to them.

There is a tendency amongst a certain section of our *confrères* to speak of the times through which we are passing as merely a temporary crisis, the immediate phase of which will shortly disappear; hence the spirit of opportunism so prevalent.

The sooner the error is recognised and rectified, the better.

We *may* see again in Great Britain the days of commercial, industrial, and agricultural prosperity we so long enjoyed, but we shall never return to the easy-going times of the past. We have entered on a new if not a better order of things; the competition of the age must be reckoned with as a permanent factor; let us hope that the survival of the fittest may be the result.

The future condition of Pharmacy in this country in all probability will be developed on the scientific and semi-professional side. Pharmacists are trained to the manipulation of a large number of minute transactions involving much care and no small anxiety, but each one financially of small moment. Such operations have no tendency to develop the business man in the ordinary acceptation of the term. The conditions of the average pharmacy are opposed to the habit of broad generalization, so essential to success in other callings.

I am not despondent as to the future, but I feel that our hope lies in cultivating the scientific rather than the merely trading side of pharmacy, for in this direction from the nature of things competition will be less acute, and remuneration for service rendered on a higher scale.

Pharmacy has not wanted men who as true seers have perceived the nature of the coming struggle, and indicated the fashion in which it should be met. Such men were our founders, and such men are around me to-day. I honour a policy as beneficent as it is just.

The times of insular ignorance and independence are ending. Each decade of years is breaking down separating walls and erecting the international, in short the universal.

Continental nations are fast becoming our rivals. France, Germany, Austria, Russia, Scandinavia, and even Spain demand a prolonged and thorough curriculum before an arts degree can be obtained.

I am aware that I am within range of hostile fire; I shall be reminded that the countries I have mentioned protect the pharmacist when qualified. I admit both the force and the fairness of the retort.

We have just grounds of complaint; but this is neither the time nor the place for discussing our grievances. I merely remark that we shall not lessen them by maintaining the present standard of attainments.

At a recent interview with the Chancellor of the Exchequer, on the question of endowing or subsidizing the resources of our new universities, Sir Lyon Playfair uttered the following weighty words:—

"The experience of commercial nations throughout the world, was that the competition of industries was a competition of intellect."

We found ourselves on that statement, and urge that pharmacy will be no privileged exception to the law.

I do not ask for more stringency in the qualifying examination, but for more *solid* and *abiding* attainments; it would be an intellectual miracle if the work of years crowded into a few months could be made a life-long possession.

Beyond and above the qualifying examination, we must offer inducement to capable and aspiring students to *pursue* their studies. An honours degree—a Fellowship in Pharmacy—would be a suitable distinction.

Such men we have amongst us; indeed, what would become of the Conference without them?

I am not unsympathetic with the struggles of many excellent high-principled men who are perplexed as to the future, but the Conference discreetly declines to discuss the politics of pharmacy, a rock on which speedy shipwreck would ensue.

There is a Society whose function it is to guard their privileges, and if we have been unsuccessful in that direction, it has not been from the want of will but of power.

It must be frankly admitted that pharmaceutical legislation is not the brightest chapter in our history. It is the old old story of internal dissension and external hostility; reluctant to combine save under the pressure of impending danger, relaxing even that partial attempt so soon as the peril was passed, we have never yet succeeded in bringing to bear at one time on public opinion and on the Legislature the weight of the collective opinion of 14,000 associated men.

I long for the unity of pharmacists with an intensity I cannot express, and I am prepared to make any personal sacrifices to achieve this end. When the central body representing pharmacy in Great Britain speaks authoritatively, not simply for its members but for the entire corporation of registered men, then will the impact of that influence be felt irresistibly in Parliament.

Whilst referring to that assembly, I venture to express the hope that ere long pharmacy may be directly represented there; special interests, involving an acquaintance with many technical details require a trained specialist in the House to correct its judgment and assist in its special legislation. Manchester has placed science under an obligation in this respect.

The ancient fires of hostility I am thankful to believe have largely died out, but too frequently to be followed by a supineness equally paralysing.

I admit it to be a fairly debateable question whether our appeals to the superior courts have proved of any service to us; the judg-

ments of those courts seeming to us most illogical and inequitable.

We are tempted to exclaim with Goldsmith—

> "How small of all that human hearts endure,
> That part which laws or kings can cause or cure!"

Twenty-four years ago, in the busy, thriving town of Newcastle-on-Tyne, my valued friend, the late Henry Deane, presided over the first meeting of the British Pharmaceutical Conference.

We turn with unmingled satisfaction to the fact that we are "an organization established for the encouragement of pharmaceutical research, and the promotion of friendly intercourse and union amongst pharmacists."

Two forces at work in society are ever counteracting each other; the isolated action of the individual and the associated effort of the many. The value of the latter influence has been most happily and successfully illustrated in the history of the Conference; had it achieved nothing better, it would have justified its existence. Hospitality has been so charming and profuse as to need a little wholesome checking; life-long friendships have been formed, and slowly a much needed *esprit de corps* has been fostered.

But we exist chiefly and pre-eminently for the prosecution of original scientific research.

It is pertinent to inquire, how much of this work can we show after an existence of nearly a quarter of a century.

A review of the facts prohibits boasting, but may prove an abundant incentive to greater exertion. If the work accomplished be regarded in the light of the well-nigh limitless field of inquiry, it dwindles almost to a vanishing point. That, however, is true of all research. The vastness of area necessitaes division of labour; but before glancing at the special allotment in this field we are pledged to cultivate, it may be useful once again to ask what research means.

The attempt to compress into a sentence an answer to the question may only prove its partial truth. But may we not say *original scientific research* in its broad significance means *the investigation and revelation of all the facts and phenomena of universal nature! Creation is the domain of science.* There lies before each research worker not merely the boundless field of matter and law, but, if I may be pardoned the solecism, a field that actually tantalizes him by disclosing fresh realms as he pushes his own discoveries. Man stands thus with his own brief life, still briefer

when limited to the period in which his intellectual and physical powers by careful training are fitted for the enterprise, in face of this fascinating complex problem.

Enough to fire ambition and also teach humility.

It can only be by a division of labour and a strict limitation of it to special subjects we assist in the general result.

> "One science only will one genius fit,
> So vast is art, so narrow human wit."

Research as distinguished from invention, or the application of knowledge previously acquired, is surrounded with difficulties; hence the comparatively few who pursue it. Gifts of mind, knowledge of prior work, money and suitable appliances to work with are all needed.

An industry bordering on enthusiasm, an indifference to vulgar, unreflecting applause, the absence of lionizing and public dinners, the non-necessity of a mill-horse round of teaching others, such are favourable conditions for unlocking the secret casket of nature's inner mysteries.

The spirit of the age is not helpful to such results. We admit that the tendency to analyse is busy enough, and in its crusade neither institutions nor beliefs, however sacred or time-honoured, are spared; but of that we do not complain, so long as inquiry is exhaustive and inference not too rapid, for only falsehood shuns the light.

The restlessness of the age is alien to research. The life-long though often barren labours of the mediæval alchemist would be an absolute anachronism in our day. The desire to gather the harvest so soon after sowing is fatal to effort of the right sort. And yet, is it not strange that in an age that chafes under incertitude, the very accuracy and finality of real research does not exert a more fascinating power? Conscious, too, as the research worker well may be, that each conquest in nature he makes is the promoter of human welfare in some form or another.

Occasionally the world has been startled by a great discovery that has revolutionized the entire field of search. Bacon, with his philosophy of induction; Newton and the law of gravitation; Galileo and the telescope; Torricelli and the barometer; Lavoisier's researches in the gases; Berthollet's discovery of the chemical law of elective affinities; Dalton and atoms; Faraday and magnetism; Darwin and evolution; Pasteur and germs. These and many others, too numerous to mention, have been the pointsmen on the

line of research, diverting the train of inquiry into new territories. Working with laws revealed and with tools fashioned by the hands of such world-famous scientists, the educated pharmacist pursues his own investigation in pharmaceutical chemistry, etc.

And what are the records of the year that closes to-day?

We have not been surprised in the field of pure science by any great and startling discovery, but in pharmacology the year has not been barren. The principal facts to be mentioned are, an endeavour to supply remedial agents in a more presentable and agreeable form. To substitute for crude drugs their active principles. To eliminate from preparations of drugs, substances that are inert and which have been found to induce instability, or that would produce unsightliness, or that would be nauseous to the palate. To provide remedies of definite strength, or that at least would be more uniform in their composition. Primarily these improvements are due to an increase of scientific knowledge amongst those who practise pharmacy, and indirectly to the severity of commercial competition.

The relative position of England amongst the nations in regard to chemical research is a matter in which probably many divergent opinions exist in this assembly. My own impression is that, in relation to pure science, her position is on an equality with the continental nations, and in advance of that of the United States.

The discoveries in this field are probably fewer than those of the Germans, but they are not less important or less brilliant. Of this fact, the *Journal of the Chemical Society*, and the "Proceedings of the Royal Society," afford ample proof.

England I believe has a smaller number of professors of chemistry, but the *character of their researches* will bear favourable comparison with those of any civilized nation.

I do not think so favourable a judgment can be passed upon chemistry in relation to the various industries (applied chemistry).

In this country, the industrial chemist has confined his study too nearly to the *results* of research, to the neglect of *methods* of research; hence the employment of German chemists in a large number of English chemical works.

The need can only be met by supplying to English chemists the opportunity of a *systematic technical training*.

You are doubtless aware that continental nations provide these advantages, and an initial movement has been made in this country in the same direction.

The strictly pharmaceutical work in both English and foreign

laboratories during the past year is of a most interesting nature. Allow me to note some of it.

Cocaine.—The increasing extent to which cocaine is employed as a local anæsthetic, and the absence of uniformity in the various makes as they appear in commerce, justify a passing reference to the alkaloid.

Although recent investigations have considerably enlarged our knowledge of the chemistry of this base, there still remain obscure points which require for their settlement further experimental study.

Prominent amongst these is an inquiry now proceeding into the nature of the amorphous substance or substances which are commonly associated with the crystalline alkaloid.

Meanwhile, in view of the comparative ease with which cocaine can be obtained in a finely crystallizable condition, it seems needless to resort to other than the crystalline base.

Conine.—To Ladenberg, to whom chemical science is so largely indebted for its present knowledge of some of the alkaloids, belongs the proud distinction of having effected the first complete synthesis of a natural alkaloid. The amount of work done by this distinguished chemist, ere success attended his efforts, is most remarkable.

Indian Hemp.—Another important drug, which has been made repeatedly the subject of chemical inquiry, and which has yielded various results to different investigators, has been examined by Jahn. He reports that the base he has isolated from Indian hemp, he has identified as choline.

Lobelia Inflata.—The most recent attempts at effecting a separation of the proximate principles of the leaves and seeds of this plant have resulted in the isolation of a *solid* alkaloidal substance.

Not long ago Rosen announced that he had succeeded in extracting from this drug both a liquid and a solid base, identical with those he had previously obtained from *Lobelia Nicotianæ-folia*.

This statement of the existence of two alkaloids in lobelia seeds, J. U. and C. G. Lloyd in their latest investigations have been unable to confirm. For their alkaloid they have retained the name *lobeline*. They describe it as being colourless, odourless, and amorphous, forming non-crystallizable salts. Therapeutically it is among the most powerful emetics.

These results are of considerable interest, and lead to the inference that the supposed volatile alkaloid of previous investigators was a mixture of bases contaminated with oil.

Strophanthin.—During the year some further interesting facts have been disclosed relating to the chemistry of the cardiac principle first extracted from the seeds of the Kombé arrow poison by Professor Frazer.

It is noteworthy that of those who have devoted themselves to the isolation and examination of the bitter substance resident in the fruit of *Strophanthus Hispidus*, Professor Frazer alone has obtained it in a crystalline or semi-crystalline condition.

The difference, according to this eminent physiologist, appears to be due to some variation in the seeds operated on. It is satisfactory to observe that the records of the published results of various workers agree in pronouncing strophanthin to be a conjugated compound, and the latest recorded series of experiments show that under the influence of the yeast ferment it readily splits up into glucose and a crystallizable substance which has been named strophanthidin.

Pepperette, a clever imitation and adulteration of pepper, has at length surrendered to the joint attacks of chemist and microscopist, leaving little doubt that ground olive stones have been sometimes supplied to the English market as a domestic condiment.

The new chlorate process is interesting to us in chemical industry as a striking illustration of the tendency profitably to utilize otherwise waste products.

The cheaper production of sodium by Castner's process will in all probability be attended by important results in chemical manufactures.

The synthesis of pilocarpine by Messrs. Hardy and Calmels deserves a passing notice—a fact of recent interest, but of permanent value.

Gentlemen, I close this imperfect and I fear tedious sketch of the Victorian Era as it stands related to us as pharmacists, and especially as a Conference. I may be charged with being Utopian as to the position and aim of cultured pharmacy reflected by this association. I do not, however, anticipate such a verdict from its members; for as such you are interested in the progress of truth, and are seeking its advancement by its *discovery*.

I cherish the confident belief that the Manchester meeting of the British Pharmaceutical Conference will not merely promote generous sentiments, but specially that the papers which will be read and the discussions which follow, will inspire us with noble aims and fresh endeavours.

"Who are the great?
Those who have boldly ventured to explore
Unsounded seas, and lands unknown before—
Soared on the wings of science, wide and far,
Measured the sun, and weighed each distant star,
Pierced the dark depths of ocean and of earth,
And brought uncounted wonders into birth;
Repelled the pestilence, restrained the storm,
And given new beauty to the human form;
Wakened the voice of reason, and unfurled
The page of truthful knowledge to the world:
They who have toiled and studied for mankind,
Aroused the slumbering virtues of the mind,
Taught us a thousand blessings to create—
These are the nobly great."

Mr. F. Baden Benger, as Local Secretary, said he had the privilege of moving a vote of thanks to the President for his address. Mr. Atkins was already well known to them all, not only in connection with the Conference, but also in connection with the Pharmaceutical Society; some present had been associated with him on the council of that body, and he might remind them that on the last election Mr. Atkins came out at the head of the poll. Some members again had been associated with him on the Board of Examiners. Some might remember kindly congratulations from him on passing an examination or winning a prize, and possibly one or two might remember equally kind words of advice and recommendations to come up again when better prepared. To them all, however, the President was well known as a man of great experience, of very wide culture, and of polished eloquence, and those who had come with high anticipations as to the address they were going to hear, would not go away disappointed. He had himself listened to it with very great pleasure, and expected to renew that pleasure on reading it when printed.

Dr. Symes had much pleasure in seconding the motion. He did not feel competent to remark upon the long history of science through which the President had taken them, but he noticed that he remarked in one place that he felt some regret in seeing there was still so much to be done in the advancement of pharmaceutical science. Now it occurred to him that there was another side of that question, and that they might also feel a pleasure in knowing that there was so much to be done, and he thought there was evidence in the numbers present that there were those who were ready and willing to do it. Every increment of knowledge in

building up the great superstructure which they were all looking forward to, and which would probably never be perfect, though they all strove to make it so, would simply land them on a higher platform from which they would see that there was still more to be done. The President had thrown out some hints as to the direction in which their efforts should be made; he had referred to the advantages of microscopic study in association with pharmacy, and he (Mr. Symes) ventured to think that in the study of botany particularly, vegetable histology had not played so important a part in the past as it would do in future. This had been recently recognised at the School of Pharmacy in Bloomsbury Square, and in the appointment of a new professor of botany this had been especially borne in mind. The President had also enlarged on the advantages of scientific research, particularly as applied to pharmacy, and it must have occurred to the minds of many that in the new building now being erected in Bloomsbury Square, there were a number of rooms on the plan labelled "Research Laboratory." It was to be hoped that in the future an amount of useful work would be done there which would benefit them all. They had been reminded in the address of the importance of remembering that after all they were practical pharmacists, and that the end and aim of all their scientific education was the better conduct of the art of pharmacy. This led him to think of what he had been advocating for some time, viz., the teaching of practical pharmacy at Bloomsbury Square. It was now hoped that in the not very far distant future there would be the means of teaching in a scientific manner the practical part of their calling, and thus enabling students to prepare for the actual duties of their every-day life.

Mr. Brady, F.R.S., Vice-President, then put the motion, which was carried by acclamation.

The President, in acknowledging the vote of thanks, said he was perfectly sincere in stating that he fully appreciated the importance of the occasion, and his own want of fitness for the task which devolved upon him, but he was much reassured by the acknowledgment which had been made. The value of any acknowledgment depended on the source from which it came; not merely on the sincerity but on the capacity to judge of those who awarded it; and he might say, in no terms of flattery, that he valued more highly than he could express the mark of approval which had just been passed. He felt in sitting down to prepare this address that he had been preceded by a number of eminent men, who had so

carefully harvested the field that there were only a few stray corns left behind. His desire had been to gather up these, and present them in the form of a sheaf of gleanings, and he was very pleased to think that in this task he had not been altogether unsuccessful.

After the President's Address the reading of papers was then proceeded with, the first being :—

A REPORT ON STROPHANTHUS AND STROPHANTHIN.

By W. Elborne, F.L.S.,

Assistant Lecturer in Materia Medica and Pharmacy in The Owens College, Manchester.

The following is a continuation of a paper read at an evening meeting of the Pharmaceutical Society in the month of March,* since which period papers on this subject have likewise been published by Gerrard,† Fraser‡ and Merck.§

The interim has afforded me an opportunity of repeating some of the experiments detailed in my original paper with the view of their confirmation, and of submitting to your notice some further results concerning the preparation of strophanthin. The seed operated upon was the greenish brown variety known commercially as *S. Kombé*, but appeared a finer sample than that used in my previous experiments.

Moisture.—82 grams well powdered and exposed to the temperature of 140° F., until it ceased to lose weight, lost 6 grams = 7 per cent. (Gerrard, 5·5 per cent.; Helbing, 5 per cent.) It will of course be understood that these differences are due to variation in the seed operated upon.

Fixed Oil.—56 grams of dried seed exhausted with petroleum ether yielded 11·68 grams of brownish green oil = 20·8 per cent. on the dry seed, or 19·5 per cent. on the original. (Gerrard and Helbing, 31·0 per cent.) The oil was free from bitterness, and tested for the presence of a glucoside with negative results.

The brownish green colouring matter of the oil thus extracted is derived from the testa or external covering of the seed, the

* *Pharm. Journ.* [3], xvii. p. 743.
† *Ibid.* [3], xvii. p. 923.
‡ *Ibid.* [3], xviii. p. 69.
§ *Ibid.* [3], xviii. p. 72.

colour of the oil of the nucleus of the seed being pale yellow; the colour of the alcohol extract has likewise a similar origin.

Absolute Alcohol Extract.—2·5 grams of seed freed from moisture and oil were macerated in absolute alcohol for twenty-four hours and percolated to about 100 c.c., the alcohol being recovered by distillation; the dried residue weighed ·13 gram—3·23 per cent. on original seed. (Gerrard and Helbing, 5 per cent.)

Five grams of similar seed boiled with three successive portions of absolute alcohol yielded on recovery of the alcohol a residue of ·375 gram—5·5 per cent. on the original seed. In either case the seed is very imperfectly exhausted, a large percentage of the active bitter principle being left in the marc.

These alcoholic extracts did not contain nitrogen, and were soluble in water without turbidity, showing that they had not been decomposed during the process of evaporation and drying. The aqueous solution was precipitated by lead subacetate and also by tannic acid, with the latter insoluble in excess; in the former case the bitter principle is left in solution. The distinctive features exhibited by the precipitates yielded by these reagents are that on the application of heat the lead precipitates coagulates, whereas that with tannic acid dissolves and entirely disappears. The substance or some portion thereof, which is precipitated from the absolute alcohol extract by subacetate of lead, Fraser has termed *kombic acid*.

After the precipitation with lead subacetate, filtering, removing excess of lead with sulphuretted hydrogen (in the cold), and again filtering, the strophanthin may be removed from the filtrate by thorough agitation with two or three times the volume of amylic alcohol. The residue, after the removal of the supernatant layer and the recovery of the greater portion of the amylic alcohol by distillation, with final evaporation to dryness over a water-bath, is left in the form of a transparent film, which, on being scraped from the dish, occurs as a non-hygroscopic white powder.

If, instead of using amylic alcohol, attempts be made to obtain the strophanthin by evaporation of the filtrate by the application of heat, then partial decomposition of the glucoside into strophanthidin and glucose is effected, probably due to the acetic acid liberated by the sulphuretted hydrogen, and the dried residue will assume a brownish colour and possess a saccharine odour; that sulphuretted hydrogen alone is capable of decomposing strophanthin in aqueous solution is contrary to my experience. It is stated that

aqueous solutions of strophanthin give with tannic acid an abundant white precipitate soluble in excess of either reagent, but I find that such precipitate is only obtainable in very concentrated solutions, and is soluble on the application of heat.

Some seed *divested of seed-coat* was boiled with absolute alcohol, filtered, and the filtrate evaporated to dryness over a water-bath; after washing with ether to remove any oil, the residue was left in the form of nearly colourless micaceous scales; upon the addition of distilled water they immediately assumed a bright canary-yellow colour, readily dissolving and forming a clear yellow coloured solution. Upon the addition of lead subacetate a yellow precipitate was obtained, readily coagulated on boiling, yielding on filtration a clear colourless solution containing the bitter principle. Another portion of the original aqueous solution treated with tannin gave a precipitate immediately soluble in slight excess of the reagent, forming a colourless solution.

Process for Preparing Strophanthin.—The only process aiming at precision, which has yet been published, is that devised by Gerrard. It is as follows:—"Dissolve the alcoholic extract in water, filtering from any insoluble residue. To the solution add tannic acid in excess, collect and wash the grey precipitate with warm water, and while still moist mix with an excess of basic acetate of lead. The mixture is to be then carefully dried, exhausted with warm alcohol, filtered, and sulphuretted hydrogen passed through the filtrate. On filtering from traces of lead sulphide and evaporating off the alcohol, strophanthin is left as a coloured residue requiring purification with charcoal."

From the above remarks on the nature of the tannic acid precipitate with the alcoholic extract, the above process is, in my opinion, open to the following objections:—(1) By using the alcoholic extract prepared by boiling the seed, the mare retains a considerable portion of the bitter principle; (2) The use of tannin in excess as a precipitant is unsatisfactory, since on dilution with water it is more or less soluble, especially on the application of heat; (3) The evaporation of the alcoholic solution (containing the liberated acetic acid) by the application of heat is prone to decompose the glucoside and develop colouring matter which has to be removed by charcoal.

A process which I have used with good results is as follows:—Reduce the seed to fine powder, mix into a very thin paste with distilled water containing 10 per cent. of added alcohol, set aside for twelve hours, add six times the volume of absolute alcohol,

agitate well and set aside for six hours, filter, wash the residue with rectified spirit, from the combined filtrates recover four-fifths the volume by distillation, add solution of subacetate of lead in excess to the residue, raise to the boiling point, filter, wash the precipitate with a little distilled water, and allow the filtrate to cool; through the cold filtrate pass sulphuretted hydrogen until the whole of the lead is precipitated, and filter; agitate the filtrate thoroughly with three volumes of amylic alcohol, and set aside; separate the alcoholic layer, recover the greater portion of the alcohol by distillation over a water-bath, transferring the last 1 or 2 ounces left in the retort to an open dish; upon evaporation of the latter to dryness at the temperature of a water-bath the strophanthin will be left as a colourless film, which upon removal possesses the character of a non-deliquescent white powder.

Another Process.—Reduce the seed to a fine powder, macerate in four times the weight of distilled water containing 10 per cent. of added alcohol for twelve hours, strain through calico, agitate the mare with a similar menstruum, and again strain. Mix the strained liquids, agitate with one-sixth the volume of petroleum ether, remove and reject the ethereal layer, to the aqueous portion add solution of subacetate of lead in excess, raise to the boiling-point, and filter. Through the cold filtrate pass sulphuretted hydrogen in excess, filter. By thorough agitation of the filtrate with amylic alcohol the strophanthin may be recovered as in the process above.

Tincture of Strophanthus.—The following is a modification of the existing process, by the adoption of which the seed-mare is left in a more completely exhausted condition, the colour and specific gravity of the resulting tincture remaining practically the same.

Strophanthus Seed	1 ounce.
Absolute Alcohol	18 fl. ounces.
Distilled Water	3 fl. ,,
Rectified Spirit } Petroleum Ether }	q.s.

Reduce the seed to fine powder, dry at a temperature of 120° F., exhaust by percolation with petroleum ether until free from oil, dry the residue at 120° F. To the water add 3 fluid drachms of the absolute alcohol, mix thoroughly with the dried residue, and allow to macerate for six hours; now add the remaining absolute alcohol, shake well together, and set aside for twenty-four hours with occasional agitation. Filter, and when the fluid ceases to pass,

continue the filtration with rectified spirit until 20 fluid ounces have been obtained.

The PRESIDENT, in moving a vote of thanks to Mr. Elborne, remarked that the paper had a special value from the work having been done in the laboratories of Owens College.

Mr. GERRARD had listened with great interest to this paper, having himself contributed a paper on the same subject. It was only to be expected that different results should be obtained when there was so much natural difference in the seeds, and there might also be slight differences in the condition of the solvents employed. In his own experiments he used tannic acid as the precipitant, because the substance being a glucoside, it was very likely to go down as a pure body when precipitated by such an agent; and he was still inclined to favour the use of tannic acid. He thought they were likely to get a more definite chemical product when a body was thrown down as a precipitate than when obtained from the evaporation of a solution either in alcohol or amylic alcohol. He was glad to hear that Mr. Elborne had obtained by means of amylic alcohol a pure body, as far as appearance went, but he regretted they had not a specimen of crystalline strophanthin as prepared by Professor Fraser. He might say that in conjunction with Dr. Vorman Kane, of Bombay, who was working at University College, he had prepared a very small portion of crystalline strophanthin by a slight modification of Professor Fraser's process. It very soon, however, underwent decomposition, possibly due to some sulphuric acid present. The quantity obtained was exceedingly small, and looking to that fact, and the high price of the seeds, it seemed that crystalline strophanthin would be one of the most expensive chemical products known. Strophanthin when produced as an amorphous glucoside must be a very uncertain product, and the substance sold under that name was of that character. There was much work yet to be done before the nature of the glucoside could be said to be known definitely. He was working in that direction, and hoped Mr. Elborne would do the same. He did not notice much reference to the oily matter removed from the strophanthus seed, but he had found during the last month that on setting it aside a crystalline body separated from it, showing that this oil was worthy of further investigation, as was also the body known as kombic acid, which united itself readily to lead. This drug should also be further studied physiologically, and experiments made upon it. Tannic acid, although a good precipitant of the

glucoside, did not completely remove the whole of the bitter principle. Whether what remained behind was strophanthin or some other body he could not say, but on submitting a portion of the solution from which the strophanthin had been prepared to physiological experiment, it was found exceedingly active. If he understood Mr. Elborne rightly, he used subacetate of lead to precipitate the glucoside, and removed it by sulphuretted hydrogen; but in that case he must get free acetic acid as a product, though he had criticised him for using it. Then he used amylic alcohol to shake out the strophanthin, and he would ask him whether or not amylic alcohol would dissolve acetic acid; he was not sure about it, but should imagine it would, and in that case it would be almost impossible to evaporate in the presence of acetic acid without injuring the product. The Conference was much indebted to Mr. Elborne for the further information he had given.

Mr. Dott asked if Mr. Elborne had determined the point of decomposition of strophanthin by sulphuretted hydrogen, and also its decomposition in the presence of acetic acid and sulphuretted hydrogen combined. If he understood him rightly, he used alcoholic water, and afterwards added absolute alcohol, and he should like to know the object of doing this. He agreed with Mr. Gerrard as to the improbability of strophanthin itself becoming the preparation used in medicine, as the galenical preparation was sufficient for all requirements, and must necessarily be much less expensive.

Dr. Symes thought a word on this subject might be said from the pharmaceutical point of view. Being so expensive and rare, it was not likely that for a long time strophanthin would be much heard of in pharmacy or practical medicine; the medical profession at present had to depend on the tincture. Professor Fraser had given a formula by which the tincture might be prepared, a somewhat complicated process, consisting first in extraction by ether, and then treating with alcohol. It was admitted by him that a certain small portion of the strophanthin was really removed by the ether, or at any rate the ether acquired a bitter taste. Mr. Elborne had suggested as a modification of this method the use of petroleum ether, but it was also a complicated process. All who had separated strophanthin found that treatment with water removed the alkaloid, and added alcohol to preserve it, and the plan he had adopted in a good number of experiments in making the tincture was the simplest possible, viz., to mix the powdered drug

with proof spirit. He found that this exhausted the bitter principle; it did not dissolve out any appreciable quantity of oil, and as far as he was aware a perfect tincture could be made in this very simple manner. If this were so he did not see why a more complicated process should be followed.

Mr. ALCOCK asked if Mr. Elborne had examined the oily residue for strophanthin.

Mr. LONG remarked that this was a subject pre-eminently calling for scientific investigation. They had at present a great many remedies for almost every disease to which the human race was subject, but some of them did not give satisfaction, and therefore it was a pity to leave any stone unturned under which the desired product might be found. They were continually receiving communications from all parts of the world suggesting new matters for investigation, but the results of these investigations must be left to medical men to deal with and determine their value. Unfortunately they were also inundated with a lot of new remedies about which very little was known, and which were seldom required, and in their case further knowledge was required. If this turned out to be a useful remedy, the plant might probably be cultivated and greatly reduced in price, as had been the case with cinchona, which at one time was thought to be nearly exhausted.

Mr. MABEN asked if Mr. Elborne had noticed any difference in the commercial tinctures of strophanthin. Like most others he had obtained it from different sources, and had found one sample to be of a light yellow colour, while another was perfectly clear, both being stated to be prepared according to Professor Fraser's directions, and he should like to know the explanation of this difference.

Mr. MARTINDALE said there was a formula for the tincture in the new Unofficial Formulary. The Committee had adapted Professor Fraser's process, for it was found that by using alcohol alone to exhaust the drug, the process did not go on quite so rapidly or satisfactorily as by following Professor Fraser's directions. He would ask Mr. Elborne if he found that petroleum ether got rid of the oil only, as by ethereal exhaustion some bitterness was also abstracted, and he should be glad to know why he used petroleum ether instead of pure ether; because unless there was some good reason for varying Professor Fraser's process, it was better to have uniformity, and it seemed a pity to deviate from a formula given on such high authority. He had not tried Dr. Syme's process, but he had found in trying to mix the seed in

powder with water there was such a quantity of albuminous matter present that it checked its miscibility with water. It was a rather curious seed in this respect, the amount of albuminous matter being very large.

Mr. ELBORNE, in reply, said he agreed with Mr. Gerrard to a great extent, but with reference to the use of tannic acid as a precipitant, he found it unsatisfactory, because the precipitate thus formed was soluble in cold water by simply washing it, as was customary. Mr. Gerrard recommended warm water, but he found the precipitate with tannic acid was then much more soluble than in cold water. The great objection to tannic acid was that a concentrated solution had to be used, and when diluted it again began to dissolve. After the meeting he should be glad to show Mr. Gerrard a sample of crystalline strophanthin prepared by Merck; he had examined it under the microscope, and while the crystals had not perfect geometrical faces he had reason to believe that the substance consisted of crystals which had been broken up by ordinary manipulation. The white strophanthin, as shaken out with amylic alcohol and then evaporated to dryness, compared favourably with the crystalline product. It was also perfectly non-deliquescent, and was perfectly stable when exposed to the atmosphere. Mr. Gerrard also asked with reference to the decomposition of strophanthin in the presence of acetic acid, whether the amylic alcohol did not dissolve out the acetic acid from an aqueous solution as well as the strophanthin. He was not prepared to say whether it did or not; he could only judge from the result, which was that the product was perfectly white, and if any decomposition had taken place, the product due to the liberation of glucose would have a decided brownish colour. The first sample of fixed oil he separated from the seed yielded, on setting it aside for a few days, some perfectly formed crystals, but he presumed they were altogether different from the crystalline substance Mr. Gerrard alluded to, which was probably a crystalline fat. He had not himself observed that the oil would crystallize on the application of cold. He regretted that he had not yet had time to investigate the properties of kombic acid. The oil which he separated by means of petroleum ether did not contain any of the bitter principle. Mr. Dott had asked why he added absolute alcohol after having exhausted the seed with water; the object was to precipitate the very large quantity of albuminous matter, and thus bring the resulting mixed solution to the specific gravity of rectified spirit. Hence he obtained a better alcoholic extract by that

method than by exhausting with rectified spirit alone. The addition of subacetate of lead after precipitating the albumen by means of alcohol was to precipitate a substance—he was not prepared to say whether of albuminous nature or not—but at any rate a substance associated with strophanthin not precipitated by alcohol. Whether or not the subacetate of lead would precipitate the substance precipitated by alcohol he could not say definitely, but he was of opinion that it would. In reply to Dr. Symes, he might say that he had prepared several samples of tincture by means of proof spirit, but he could not say that the results were satisfactory, because on setting the tincture aside it became very cloudy, due, in his opinion, to a large quantity of albuminous matter which was extracted by the water in the proof spirit. He might also remark that a proof spirit tincture when diluted with a large volume of water, as might be the case in a mixture, and set aside for some days, underwent on escape of the alcohol a powerful decomposition, and developed a very fetid odour. In reply to Mr. Martindale, he used petroleum ether because of the extreme difficulty of obtaining in the ordinary routine of business an ether sufficiently pure for the purpose of exhausting the seed. If the ether contained a very small percentage of water or alcohol, then, as all investigators had found, some portion of the bitter principle was extracted by it. In fact, ether fit for this purpose would have to be specially prepared. Petroleum ether was recommended because the fixed oil thus removed did not contain any of the bitter principle. In reply to Mr. Maben, he might say that he had observed that some tinctures were more coloured than others, but that would be due probably to the kind of seeds used. There were two or three varieties of seed in the market, either one or the other of which might be used, although it was customary to use the greenish brown variety, which had been described as the *S. Kombé*. The white variety did not contain the same colouring matter as the brownish green, but for his part he had not noticed any great variation in the colour of tinctures.

In the absence of the authors the following paper was read by Mr. Naylor:—

CONTRIBUTIONS TO THE KNOWLEDGE OF CATHA LEAVES.

By Professor Flückiger and J. E. Gerock.

Catha edulis, Forskal, is a glabrous tree or shrub, widely distributed in the interior of eastern Africa, from Abyssinia to Port Natal,* which appears also to be largely cultivated throughout those regions as well as in the southern districts of Arabia.

The first scientific notice of catha is due to the Swedish botanist Peter Forskal, who died in Arabia, in July, 1768, after having explored the flora of that country and Lower Egypt. The statement referring to catha will be found in the "Flora Ægyptiaco-arabica," Havniæ, 1775, p. 63, edited by Carsten Niebuhr.

The short account of Forskal is as follows:—

"Catha. Arbor. Rami alterni, axillares; ramuli virides, annui, articulati. Folia bipoll. ovato-lanceolata, serrata, glabra, plana, nitida, patentia, rigida, opposita; in ramis magnis alterna. Petiolus supeme planus, brevis . . . . Pericarpium, capsula oblongo-cylindrica, trilocularis, monosperma in quovis loculo.

"Arab. 'Gat' vel 'Kat.'

"In Yemen colitur iisdem hortis cum caffea. Stipitibus plantatur.

"Arabes folia avide edunt, multum earum vires venditantes qui copiosius comederit, vel totam vigilet noctem; asseverant quoque pestem ea loca non intrare, ubi haec colitur arbor: et hominem ramum cathæ in sinu gestantem, tuto posse inter infectos peste versari. Gustus tamen foliorum tantem virtutem indicare non videtur."

Catha edulis is now the prevailing name, although we are not aware of Forskal's having bestowed it on the plant, which was described by Richard under the name of *Catha Forskalii*. The specific name of "edulis" would appear to be partly due to Vahl, who termed the plant *Celastrus edulis* in his "Symbolæ Botanicæ," i. (Havniæ, 1790), 21.

According to Bentham and Hooker, "Genera Plantarum," i. (1862–1867), 361, there is but one species known of the genus catha; the same is Baillon's opinion in his "Dictionnaire de Botanique," vol. ii. p. 655. So we may quote the diagnosis of the former work as an excellent diagnosis of the plant:—

"Calyx 5-lobus, parvus. Petala 5, erecto-patentia. Stamina

* Oliver, "Flora of Tropical Africa," i. 364.

5, margini disci inserta, filamentis subulatis; antheræ late didymæ. Discus tennis, margine undulato. Ovarium ovoideum, disco immersum, liberum, 3-loculare; stylus brevis, crassus, stigmatibus 3 brevibus, liberis v. basi connatis; ovula in loculis gemina, e basi erecta. Capsula lineari-oblonga, 3-gona, loculicide 3-valvis, 1-3-sperma, septis medio incrassatis. Semina immatura medio septo hilo lato affixa, compressa, testa minute tuberculata, foramine dilatato infero. Frutex glaberrimus, ramulis cinereis. Folia opposita, petiolata, lanceolata, coriacea, grosse serrata. Stipulæ e ciliis paucis . . . ."

Among modern travellers who became acquainted with kat in its native countries we may quote the following:—

P. E. Botta,* in 1837, found catha much in use, and largely and most carefully cultivated in the mountains of south-western Yemen, in the mountainous district of Saber, between 13° and 14° N. lat. Botta was presented by one of the sheiks of the country with a bundle of branches of kat, according to the rules of politeness of that people. He ascertained that the leaves when chewed had an agreeable, exciting action, which imparted the desire to spend the night rather in quiet conversation than sleeping. Botta expressly states that he thought extremely pleasant that kind of excitation and the lovely dreams provoked by the use of kat. He gives an account of its virtues much reminding those of coca leaves; in Yemen kat affords the same relief, chiefly to messengers while on hard journeys, as coca does in the Cordilleras.

Every visitor being presented, in good houses, with twigs of kat, chews the leaves and throws on the bottom of the reception room not only the stalks, but also those parts of the leaves which he has not swallowed. Botta, nevertheless, speaks in high terms of the green bundles of catha and their agreeable smell: he says that the leaves are strongly inebriating when freshly cut, but the intoxication does not last for a long time.

In the "Flora" of Regensburg, xxiv., part 2 (1841), p. 662, Ch. F. Hochstetter, describing some new African genera, supposed kat to belong to an undescribed plant, and, therefore, mentioned it under the name of *Trigonotheca serrata* in the following terms:—

"Frutex foliis oppositis simplicibus lanceolatis in petiolum brevem attenuatis obtuse serratis glaberrimis luridis discoloribus. . . . Colitur ad oppidum vel pagum Abba Gerima, prope Adana et in provincia Schiré nomine abyssinico Tschat, folia crude a

* "Relation d'un voyage dans l'Yémen, entrepris en 1837." Paris, 1841, pp. 45, 84, 99.

Muhammedanis comeduntur et infusione aquæ ferventis potum sapidum Theæ instar præbent."

In his exploration of Abyssinia and Shoa, Major Harris,* 1841–1843, repeatedly met with kat (chaat) or kath. He stated that the shrub or little tree, not exceeding 12 feet in height, was extensively cultivated in Shoa and the neighbouring countries of Kat and Kaffa (about 5° to 10° N. lat.), although it is indigenous in the western mountains, in a region of from 5,000 to 8,000 feet above the level of the sea, where the temperature, on an average, varies from about 15° to 16° (60° F.). The leaves of the kat are either chewed by the people or boiled with milk or water so as to take the infusion.† They also made a drink of it by adding honey; it is bitter and stimulating, and prevents sleeping if taken in excess.

In Abyssinia catha was again met with by the French expedition of Lefebvre, Petit et Quartin-Dillon, 1839–1843. The botanic results of that expedition being edited by A. Richard, this botanist devoted a page to *Catha Forskalii*, as he termed the tree, in the "Partie Botanique," tome iv. (Paris, 1847), 134. Among synonyms bestowed upon Forskal's catha, Hochstetter's name of *Trigonotheca* is shown by Richard to be due solely to the author's not having been aware of Forskal's description.

We need borrow only the following lines from Richard:—

". . . . fol. opposit. rarius alternis. . . . Crescit ad pagum Abba-Gerima, prope Adaua, ubi colitur (Quartin-Dillon et Schimper), et in provincia Choa (Ant. Petit et Rocher d'Héricourt).

"Nomina vernacula, Tschut, Tohat, Tohai."

In another French account of Abyssinia, a few years later, kat will be found under the name of *Celastrus Tsaad*, Ferret et Galinier; the tree is in fact closely allied to *Celastrus*, as already noticed by Vahl. The following account in the botanical results of that expedition ‡ is of some interest:—

"Grand arbrisseau qui est appelé Tchaad, cultivé à Abbagarina et dans le Chiré. Les Mahométans, comme à Moka, mangent les feuilles crues ce qui les enivre légèrement. Les feuilles, préparées à la manière du thé, donnent une infusion assez agréable à boire."

* "The Highlands of Æthiopia and Embassy to Shoa." By Major W. Cornwallis Harris, of the Hon. E. I. Comp. Engineers. London, 1844. We have before us only the excellent German translation by K(arl) von K(illinger), 2 vols., Stuttgart, 1845–1846. The short remarks on kat will be found in vol. ii. p. 300, and in the Appendix, pp. 34 and 174.

† In a short notice of the British Vice-Consul at Hodeidah, *Pharm. Journ.*, xvii. (1887), 656, it is expressly stated that the Arabs *do not* make a decoction from kat.

‡ Ferret et Galinier, "Voyage en Abyssinie," iii. (1847), 109.

"Les feuilles du sommet des rameaux sont parfaitement opposées, un très-léger bourrelet transversal passe du pétiole d'un côté du rameau au pétiole de l'autre côté. La base des rameaux offre des feuilles alternes, ordinairement assez rapprochées, deux par deux, pour faire voir que cette disposition n'est qu'un déplacement."

We are also informed recently (June, 1887), by Dr. Anton Stecker, that he saw stately trees of catha near Kórata on the lake of Tâna, Abyssinia. And again, another highly competent authority, Dr. E. Glaser, now (June, 1887) at Pragne, tells us that the plant is termed Kât in Southern Arabia, Tsat or Tschat in the Abyssinian idiom of Amhara. In the countries on the lake of Tâna, they call it also Kût es Salâhin. In a letter to Professor Euting, of Strassburg, Dr. Glaser states that in Abyssinia the area of catha is limited to those districts south of the lake of Tsâna. The most northern region where catha is to be met with in Arabia is apparently a place north of Sanâ; it succeeds best in the valleys of 'Uppas and 'Afis, south of Sanâ, as well as in the mountains of Yemen at elevations ranging from 2,200 to 2,400 feet.

In Abyssinia they chew the young leaves of catha, either fresh or dried, or they use their infusion sweetened by means of honey. According to Dr. Stecker, only the Mahometans chew the drug; he is of the opinion that the plant was taken to Yemen by the Mahometans of South Abyssinia.

In 1859 James Vaughan, Assistant Surgeon, Civil and Port Surgeon at Aden, mentioned kât among other drugs observed at Aden. He speaks, in the *Pharmaceutical Journal*, vol. xii. (1859, Nov. 1), p. 268, of the strong predilection which the Arabs have for kât, the quantity used in Aden alone averages about 280 camel-loads annually. The exclusive privilege of selling it is farmed by the Government for 1,500 rupees per year.

Captain Hunter, in 1877, informed one of us (F.) that in the previous year 1,200 camel-loads of kât found their way to Aden, and that 8,000 rupees were paid for the privilege of collecting duty on the commodity.

Vaughan gives a good representation of two bundles of kât, viz. "Subbare Kât," about 6 inches (14 centimetres) long, and "Muktaree Kât," about half that size, and states that the former is considered of superior quality.

In the interior of the peninsula the use of kât seems not to be known. We are informed, for instance, by Professor Euting, that, in December, 1883, in his journey in Arabia, he was told at Hâjel

by people belonging to the tribe of the Kahtâni, that with them, in the Wâdî ed Dawâsir (about in 19° to 22° N. lat. and 45° E. of Greenwich), kât chewing was not practised at all.

Another of the recent explorers of the interior of Arabia, Dr. Glaser, on the other hand, informed Professor Euting, that in the just-named valley, as well as in the Nedjran (18° N. lat.), kât, *i.e.*, chiefly its young leaves, was chewed when Dr. Glaser paid a visit to those regions; he himself chewed the drug, which, however, he never appreciated very much.

From all the foregoing statements,* it appears that catha is much appreciated in Yemen as well as in the interior of north-eastern Africa. In a description of the island of Perim,† in speaking about the Arabs, the author says: "They also frequently come across the straits in canoes with fresh provisions of all kinds for sale. . . . They also sometimes bring the leaves of a shrub called *kát*, a drug much used by the Arabs and Somalis as a pleasurable excitant, the leaves and tender shoots being said, when chewed, to produce hilarity of spirits and an agreeable state of wakefulness.

Another statement‡ is to the effect that the leaves are shipped at Berbera, on the Somali coast, for Yemen, where they find a good market, the people there chewing them say they are in the same way acting as the opium, but milder.

As the tree or shrub is also largely cultivated in the interior of southern Arabia, mostly in gardens along with coffee, bundles of twigs tied together with strips of bark find their way to Aden. The effects of the leaves being the same as those of strong Chinese green tea, a synod of learned Mussulmans issued a decree acknowledging that it was perfectly lawful to use kât, as it neither injured the health nor hindered the proper observance of religious duties. It produces wakefulness and watchfulness, so that a man may fulfil the duties of a sentry all night without a feeling of drowsiness.§

* We omit a few others of very little interest which are mentioned by Friederich Tiedemann, "Geschichte des Tabaks und anderer ähnlicher Genussmittel," Frankfurt, 1854, 429.

† *Geographical Magazine*, November 1st, 1877, p. 291.

‡ *Preussisches Handelsarchiv*, 1875, ii. 404.

§ *Pharm. Journ.*, xiii. (1883), 840, from *Produce Markets Review*, March 24, 1883. An abstract will also be found in *Just's Botanischer Jahresbericht*, 1883, p. 396, No. 61, as well as in the *Year-Book of Pharmacy*, 1883, p. 219. The same statements also occur in Captain Hunter's "Account of the British Settlement of Aden in Arabia," London, 1877, p. 139. All this second-hand historical information is due to the writings of Silvestre de Sacy and d'Herbelot.

Catha appears to have been introduced some time ago in European temperate houses; in 1867, the plant flowering in the botanical garden at Basel, Dr. Christ availed himself of the opportunity of examining exhaustively the floral organs of catha, which he figured at the same time in the *Archiv der Pharmacie*, vol. cxli. (1870), pp. 67–71. In an additional note, in the same periodical, cciii. (1873), p. 52, Dr. Christ very accurately described the bluntly conical capsule of catha, as ripened in the botanical garden of Lissabon. It is triangular or quadrangular, having three or four dehiscent valves, the whole fruit being 6- or 8-celled. Dr. Christ also pointed out the peculiar form of the arillus in the very small seeds of catha.

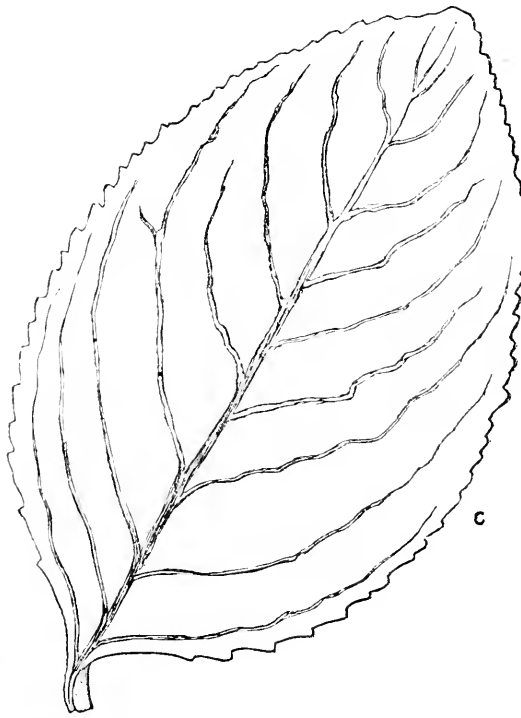
We may state here that one of us has repeatedly observed the living plant in the beautiful garden of Mr. Thomas Hanbury at La Mortola (Palazzo Orengo), near Mentone. The small stipules, as pointed out by Bentham and Hooker, *l.c.*, which Dr. Christ failed to notice in his specimens, are distinctly occurring in the shrub as growing at La Mortola. The largest leaves to be seen there are 11 centimetres ($4\frac{1}{2}$ inches) in length by $7\frac{1}{2}$ centimetres (3 inches) wide; in some shoots they are opposite, in others alternate. We have branches before us showing both kinds of the arrangement of leaves. The petiole does not exceed one centimetre in length, but usually reaches but half a centimetre. The margins of the leaf, on each half, display, in the largest leaves, about forty short blunt teeth, ending with a glandular organ. Perhaps these glands are more developed or more active in the East. In the fresh leaves of La Mortola we failed in perceiving any marked taste or aroma, whereas Botta, as mentioned above, alluded in high terms to the pleasant smell and taste of kat; Forskal, on the other hand, was not at all aware of these virtues of the leaves. In Aden, as Professor Schar, Zürich, was informed by Mr. Escher, a correspondent of his, antiaphrodisiac powers are now attributed to catha.

It would appear that the climate and soil of Mr. Hanbury's estate at La Mortola, on the Mediterranean, are very congenial to catha; it is most luxuriantly growing and flowering there for nearly twenty years, forming a few slender bushes 6 metres (about 18 feet) high; the largest stem is 21 centimetres in circumference (nearly 3 inches in diameter) at a distance of 10 centimetres from the earth. One of us collected there, in April, some flowering branches; Mr. Hanbury says it is in flower for months in the winter and spring, yet has never fruited with him. It was intro-


A
B

duced in that garden by the late Daniel Hanbury in 1868, as we are kindly informed by his brother, Mr. Thomas Hanbury.

The fine plate, No. 30, of Richard's "Botanical Atlas" to Lefebvre, Petit et Quartin-Dillon's "Voyage en Abyssinie," gives an excellent figure of catha, of which we copied a flowering branch (fig. A) and a section of a flower (fig. B). The identity of the plant of Mortola is, therefore, doubtless; still we never met there with so narrow leaves (14 millimetres, little more than half an inch). To

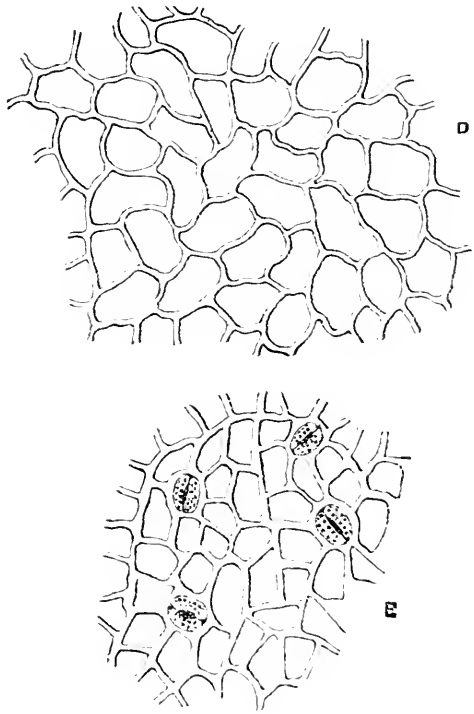


show the difference, we thought it well to give here the sketch of a large leaf from Mortola, natural size (fig. C). Such a striking difference may explain that, for instance, at Harrar, there are no less than four varieties of kat in the market.* The leaves we

* Paulitschke. Petermann's "Geogr. Mitteilungen," xxxi. (1885), 465. Hunter, "Account of the Brit. Settlement of Aden," p. 141, also mentions Sabrai kât and Makhtrai kât, from the districts in which they are produced; the latter fetching the lower price. The two varieties are evidently those figured by Vaughan, *l.c.*

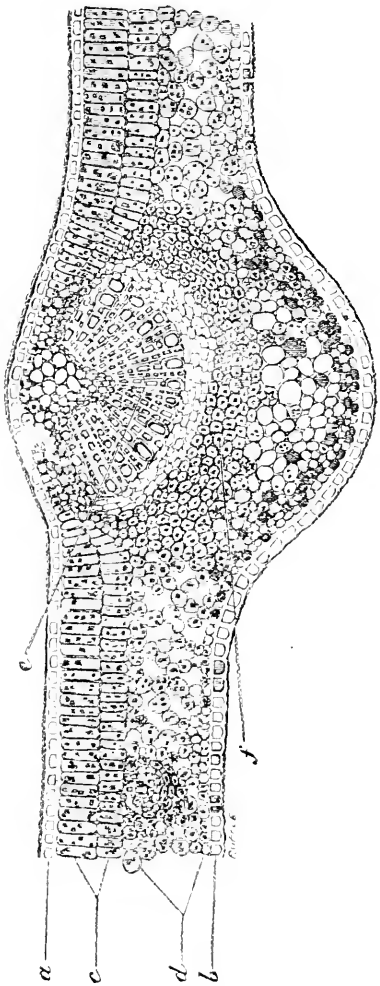
received from Aden may be said to range between our figures A and C as regards their average size, answering to the figure of "Subbare kat" of Vaughan's paper. It is, on the whole, quite natural that a shrub or tree which is so widely distributed and so extensively cultivated should accordingly display considerable variations.

The leaves of catha are leathery, of a dull shining green on the



upper surface, paler beneath, entirely glabrous, and traversed by a reddish midrib giving off a system of veins running towards the edges and the apex without exhibiting any remarkable peculiarity. The same applies to the anatomical structure of the leaf. Fig. D shows the epidermis of the upper surface of the leaf; fig. E that of the under surface, which is provided with stomata; fig. F is a transverse section of that portion of the leaf which is occupied by the midrib. The section shows the usual structural elements as

met with in many other leaves, without any peculiar feature. The leaves belong to that class provided with but one layer of "palissade cells" within the epidermis of the upper surface; in catha



that layer is built up of a double row of those vertical, elongated "palissade cells." *

* See Flückiger und Tschirch, "Grundlagen der Pharmakognosie," Berlin,

There is no evidence of catha having been used in ancient times; no mention of the leaves is met with in the great Cyclopædia of Ibn Baitâr, written about A.D. 1240. We are informed by Professor Nöldeke, that, according to S. de Sacy's "Chrestomathie arabe," 2nd edition, i. 462, Abdalkâdir, an author of the sixteenth century, stated that in Yemen they used "kafta" long before they indulged in coffee. The latter was resorted to in Aden when, in the time of Dhabhânî, in the fifteenth century, kafta had become a rare article, kafta, says Abdalkâdir, being the same as kât, a stimulating, not inebriating drink, which is consequently permitted, like coffee. Kât would appear to mean the leaves, kafta the drink.

Similar statements will be found in D'Herbelot, "Bibliothèque orientale," i. (La Haye, 1777), 461, under the article "Cahnah."*

All the above statements concur in attributing eminent powers to kât, which would seem to be possibly due to caffeine.

Attfield failed in discovering caffeine in the leaves of catha (*Pharm. Journ.*, vi. 1865, p. 400), and one of us† likewise ascertained that they do not contain that substance. The absence of caffeine was again proved, *Pharm. Journ.*, xvii. (1887), 1009, by Dr. Paul.

Professor C. Schorlemmer, F.R.S., also devoted an interesting note‡ to the leaves of caffea, thea, and catha, as grown in the temperate house at Kew Gardens. He ascertained the presence of caffeine in the cultivated leaves of *Caffea arabica*, *Caffea laurina* (none in those of *Caffea liberica*), *Thea viridis*, and *Thea assamica*, but failed in discovering caffeine, both in the fresh leaves, as well as in old ones from the museum, of *Catha edulis*. Professor Schorlemmer only isolated from catha a minute quantity of a kind of sugar, apparently mannite.

Our friend, Professor Schar, Zürich, afforded us the opportunity of examining some bundles of kât twigs of the best quality obtainable at Aden. They were about from 15 to 20 centimetres (4 to 6 inches) in length, each of them provided with about twenty leaves of average size. The leaves alone were powdered, and the powder, 1,300 grams (nearly 3 lbs.), gently warmed with 5 litres ($1\frac{1}{10}$ gallon) of water containing 10 grams of oxalic acid (nearly one-

1885, pages 162 (fig. 96), 183 (fig. 127), 184 (fig. 128), 185 (fig. 129); or English translation, by Power; New York, William Wood & Co., 1887, pages 186, 210, 211, 212, the figures just alluded to.

* Abstracted by the late Daniel Hanbury in his notes to Vaughan's paper, *Pharm. Journ.*, xii. (1852), 270.

† Flückiger, *Archiv der Pharmacie.*, vol. cxli. (1870), 72.

‡ *Chemical News*, vol. xlviii. (Nov. 9, 1883), 225.

third of an ounce). After a few hours the whole was packed into a percolator, and the liquid drawn off the next day. The washings and the percolate were concentrated to the volume of 2 litres, and mixed with half the amount of quicklime which would have been required for saturating the oxalic acid employed. Then the brownish green liquid was allowed to stand for some hours; it then became clear, and was evaporated to half its volume. On saturating it with caustic lye in a good excess, it turned dark brown. We immediately exhausted it by shaking it repeatedly with light petroleum, boiling point from 30° to 65° C. (86° to 149° F.). The petroleum was distilled off for the most part, and the remaining liquid, about 100 c.c., shaken with five consecutive portions of dilute hydrochloric acid. On saturating the clear acid solution with an excess of caustic lye it became milky. By repeatedly shaking the turbid liquid with ether it at last became clear.

The ether, allowed to evaporate in the cold, afforded a trifling quantity, say 0·5 gram, of a thickish, oily, yellowish matter, which readily dissolved in dilute acetic acid, this solution giving, with iodated iodide of potassium or iodohydrargyrate of potassium, precipitates which are characteristic for alkaloids.

No trace of crystallization appeared in the residue from the ethereal solution, even after several days' standing at a low temperature. This alkaloid, the small amount of which did not allow of any further purification, readily dissolved in water, and this solution reddened test-paper impregnated with phenolphthalein. The red colour soon disappeared from the paper, probably due to the evaporation of the alkaloid. When the alkaloid, which might be termed *katine*, was treated with dilute acetic acid, a very trifling residue remained undissolved. The clear filtrate, carefully evaporated over concentrated sulphuric acid, yielded a decidedly *crystalline acetate of katine*. Its aqueous solution was not precipitated by tannic or picric acid, nor by chloride of platinum.

We also expressly ascertained that no caffeine was present in our "katine," which, in all probability, will prove to be a liquid when perfectly pure.

The PRESIDENT, in proposing a vote of thanks to the authors, said that doubtless these catha leaves were used, as coca leaves, for the purpose of preventing exhaustion.

The vote of thanks to the authors was carried unanimously.

The next paper read was on—

A NEW PROCESS FOR THE PREPARATION OF ACONITINE.

By John Williams, F.I.C., F.C.S.

At the meeting of the British Pharmaceutical Conference held last year in Birmingham, I read a short note upon the best mode of preparing crystallized aconitine, and gave the process generally adopted, and by which it can be made without much difficulty.

During the past year I have continued my experiments upon this matter, and have succeeded in preparing the alkaloid by a process which yields, I think, better results than the one I laid before the Conference on the last occasion, and which, as far as I can discover, is new, and has not yet been described. I have now great pleasure in being permitted to bring it before this meeting.

The new process for the preparation of aconitine is very simple in outline, but some practical details must be attended to if a successful result is to be obtained. The process is as follows:—

Aconite root (the root of the *Aconitum Napellus*), dried at a very moderate temperature and coarsely ground, is thoroughly exhausted with amyl alcohol (fusel oil); the amylic solution so obtained is shaken with dilute acid and water, this acid liquid precipitated with carbonate of soda, and the rough alkaloid produced, dissolved either in ether or alcohol, and allowed to crystallize, when the pure alkaloid is obtained.

To carry out this process, however, so as to obtain a satisfactory result, I find several precautions must be taken. The first difficulty is with regard to the aconite root, which should be carefully chosen, and if possible the root verified botanically as that of the *A. Napellus*. We have now every reason to believe that other species of aconite, although yielding alkaloids, some of them probably of great medicinal importance, do not yield alkaloids identical with that obtained from the *A. Napellus*, and as the British Pharmacopœia (very properly I think) gives that plant as the officinal one, great care should of course be taken to avoid the admixture of other varieties. The matter is one of great difficulty, but so important is it considered that, as most of you are doubtless aware, a small sum of money has been granted from the funds of this Conference to enable Mr. Holmes to, if possible, grow some napellus roots, about the species of which there can be no doubt,

and in this way it is hoped we may arrive at more certain conclusions than have hitherto been possible; and I trust we shall be able to establish beyond doubt the real nature of the alkaloid contained in the *A. Napellus*. Of course the experiments I am about to detail have been made upon a sample of root which I believe to be napellus, but it is impossible for me to say so with certainty.

The fusel oil used should be of fairly good quality, and free from ordinary spirit. This oil as sent out by distillers frequently contains a considerable quantity of ordinary spirit; if this is found to be the case it should be carefully got rid of by washing the oil with water several times, and, if the sample is a very bad one, distilling it in a current of steam.

For extracting the root I find maceration for a few days with frequent stirring, and then percolation, the most effective. I do not advise the use of any acid, such as tartaric, and have come to the conclusion that such addition is quite unnecessary. I also think that the maceration and percolation should be done in the cold. I think heating the materials, however gently, very undesirable and, indeed, injurious; in fact, I think heat should be avoided as far as possible throughout the whole process.

The fusel oil after percolation is of a pale straw colour, and is not contaminated with the dark oleoresin, which is extracted from the root by ordinary alcohol; this, I need hardly remark is a very great advantage.

In washing out the alkaloid from the fusel oil by weak acid and water, I prefer sulphuric acid (about one fluid drachm to, say, four pints of water). The oil should be shaken with small but successive portions of the dilute acid, and the aqueous liquid tested with litmus paper, so as to be quite certain that the acid is in excess. I prefer the use of sulphuric acid for this purpose to such acids as hydrochloric or tartaric. The sulphate of aconitine appears to be less soluble in fusel oil than the hydrochlorate or the tartrate, and therefore is more readily extracted. It frequently happens that some hours are necessary for the complete separation of the liquors from the oily liquid, but the time may frequently be much shortened by slight agitation in a rotatory direction. The completion of the washing is known when the aqueous liquid no longer gives any, or only a slight, precipitate with such reagents as double iodide of mercury and potassium, etc.; if this is not attended to, considerable loss may occur.

The weak acid liquid separated from the fusel oil smells strongly of that body, which is to a slight extent soluble in water. To get

rid of this, the liquid must be shaken with ether (common methylated ether, from which the spirit has been washed out, answers the purpose perfectly). Generally, the treatment with the ether should be repeated, as I do not find it easy to separate the whole of the fusel oil at the first operation, unless a very large excess of ether is employed.

The aqueous liquid so obtained smells very strongly of ether, the liquid should therefore be placed in a shallow basin and left in a water-bath, very gently heated, for a few hours. When cold it will be found to be free from both odour and colour, and in a fit state for precipitation.

The precipitation of the crude alkaloid is, I think, best effected by a strong solution of ordinary carbonate of soda. Ammonia can be used, but I decidedly prefer the soda, as I have obtained better crystals from the soda precipitate than from the ammonia one.

The precipitate of crude alkaloid, which is nearly white, should be slightly washed and dried, but some care is necessary in drying it, for we must bear in mind that the alkaloid we are dealing with is a most irritating and poisonous one when dry. If the aconitine is filtered on calico the precipitate can be squeezed and partly dried between porous tiles or other absorbent material, then before it is quite dry it can be distributed on blotting paper and exposed to the air. When dry it can be transferred to a flask or other vessel without difficulty.

The aconitine has now to be dissolved out from this mass by either ether or alcohol, and this must, I think, be done at a boiling temperature, this being the only part of the process in which heat is employed.

If ether is used it should be pure, washed from spirit and rendered anhydrous by some desiccating body. I prefer dried carbonate of potash.

The alkaloid is not very soluble in pure dry ether, and the boiling has to be kept up for some time before the ether is really saturated; it is then filtered into a basin, yielding a perfectly colourless solution, and allowed to evaporate spontaneously, when nearly the whole of the alkaloid is deposited in the crystallized state. The ether may be allowed to evaporate to dryness, and although the crystals deposited are very small, they give when examined by the microscope uniformly shaped crystals to the end. It frequently happens, however, that a ring of gummy extracted matter (almost colourless) forms around the upper rim of the crystals, due, I suppose, to oxidation, which, even under the most favourable con-

ditions, cannot be entirely prevented. I have found it necessary to add to the dry crystals in the basin a few drachms of pure cold ether. The gummy matter I have alluded to is very soluble in ether, but the crystallized aconitine is not, or rather requires a long time before it dissolves. In this way the crystals can be washed from the gummy matter, which would otherwise contaminate them, and while still damp can be easily transferred to blotting paper, on which they can be allowed to dry spontaneously. It is true the crystals suffer a little, the sharpness of the edges being somewhat interfered with, but as the contact with the ether need be only for a minute or so, the amount of injury done is very small, and the loss in weight is found not to be of much importance practically. Before I adopted this plan I found considerable difficulty in transferring the crystallized alkaloid from the basin to a bottle, and when we consider that the $\frac{1}{3000}$ grain has been found sufficient to kill a mouse, and that probably $\frac{1}{10000}$ grain is sufficient to produce very unpleasant symptoms on man, it can easily be seen that the plan of damping the crystals before removing them is a very necessary precaution. Of course a saturated solution of aconitine in ether might be used, but I think the washing the crystals with a little fresh ether is probably the best thing to do.

Crystallizing the aconitine from alcohol has some great advantages, but counterbalanced by some disadvantages.

I have hitherto used pure absolute alcohol. It is very possible that spirit of a lower strength might answer as well or even better, but I have not tried it. The alkaloid is far more soluble in alcohol than in ether, and on cooling a hot saturated solution crystals are deposited very readily. I have obtained some of quite a quarter of an inch in length, and all the crystals produced are much better defined than those deposited from ether; but unfortunately they are not white, colour begins to show itself very soon after solution, and during the after-evaporation of the alcohol the colour becomes deeper and deeper, thus proving that the alkaloid is much more easily altered (or oxidized) when in an alcoholic solution than when it is held in solution in ether or amyl alcohol. This fact is also of importance as helping to explain how it is that discrepant results were frequently obtained by the old process of working, in which alcohol (generally methylated) was used; it may prove, as I have often suspected, that some of the alkaloids which have from time to time been isolated by various chemists who have worked upon the subject, are really changed or altered conditions of the alkaloid, and do not represent any alkaloid really existing in the

living plant. My effort has been to obtain the alkaloid in its unaltered condition,—that is, in the state in which it exists in the plant,—and this I think, by the process I have now described, and especially when ether is used as the solvent, is very nearly if not quite accomplished.

In my paper read before you at your last meeting, I pointed out reasons for dissenting from the proposal made by Mr. Mandelin to convert the crude aconitine into nitrate, and from such nitrate to prepare the alkaloid. I then pointed out that the alkaloid so produced generally acquired a yellow colour, and that the crystals when examined by the microscope differed distinctly from crystals obtained by a direct method, and the result of my present experiments quite confirms this opinion, that is as far as microscopic or chemical reactions can give evidence. I regret to say I am still without direct physiological evidence as to the medicinal activity of aconitine made by the process I have described, as contrasted with samples of the alkaloid made by other processes. I still hope that this subject will form a matter of research by one of our most eminent experimentalists, who has promised to take this matter up when he can spare the necessary time.

I ought to mention that aconitine can be crystallized from very weak spirit, say 1 part of strong alcohol to 2 of water. When such a hot solution, saturated with aconitine, is allowed to cool, long silky needles are deposited; they prove to be a hydrate of the alkaloid. The amorphous aconitine of the Pharmacopœia can also be readily prepared from the pure crystallized alkaloid by dissolving in water by means of dilute sulphuric acid and precipitating by ammonia, washing and drying on blotting paper. This precipitate is really a hydrate, and is soluble in pure anhydrous ether, when it deposits a small quantity of aqueous liquid by standing.

There is some reason to suspect that the medicinal activity of the alkaloid in the amorphous state is liable to vary, and as uniformity is most essential in this as in all potent drugs and chemicals, I think it would be better if in future editions of the Pharmacopœia the alkaloid in its crystallized state should be authorized in place of the amorphous now recognised as officinal.

I have commenced an investigation respecting some of the salts of this alkaloid, but unfortunately my health has been such that I have not been able to continue my experiments, but I hope to be able to do so shortly. The careful analysis of the different products I have obtained has not yet been undertaken, but I hope that this also may be ready for publication shortly. In the meantime

I ought to apologise for the imperfect manner in which I have ventured to bring this matter before you.

Before concluding, I should like to say that I have tried this process upon a sample of what I have every reason to suppose was the root of the *Aconitum ferox*, but of whose identity I cannot be quite certain.

The alkaloid was yielded in good quantity, and very white, and appeared to be very much more soluble both in ether and alcohol than the aconitine yielded by the *A. Napellus*. I also found it most difficult, in fact I may say impossible, to crystallize it. But I may add that our friend Mr. Groves, of Weymouth, to whom I sent some of the sample, has been more fortunate, for he was able to show me a few weeks ago a slide which under the microscope proved to be studded with crystals, and as far as I could observe appeared to be of the right and well-known shape of the true alkaloid, so that there can be no doubt that the alkaloid from the *A. ferox* contains a crystallizable body, but I suspect is mixed with or masked by some other alkaloidal body, probably not so powerful in its toxic action as the true alkaloid. I came to the conclusion that the resulting product from ferox was not of a very active nature, when making it, as judging by the symptoms produced upon myself its power appeared to be far less than that prepared from napellus. This surprised me, as I had been under the impression that the alkaloid of the *A. ferox* was a very powerful one. As, however, some doubt exists as to the true nature of the root employed, it is perhaps hardly necessary to consider this question further at present.

The principle of the process I have described in this paper may, I think, be applicable to the extraction of alkaloids from other plants. I have made some experiments which appear to support this view, but at present I have not been able to do much in carrying out this idea. Should I succeed in my experiments, however, I shall be happy to lay the results I may obtain, if of sufficient importance, before a future meeting of the Conference.

The PRESIDENT, in proposing a vote of thanks to Mr. Williams, said the members of the Conference would all join with him in regretting the cause which had prevented this investigation being completed, but if Mr. Williams had experimented on his own body with aconitine, it was not surprising that he was not in very good form, and he would advise him in future to experiment on some-

body else. He should be delighted when the investigation of aconitine was completed, for the literature upon it seemed to be inexhaustible.

Mr. Holmes said that for a long time the knowledge of aconitine had been very unsatisfactory, but now, at all events, a crystalline aconitine could be placed in the hands of medical men for experiment. He should like to ask Mr. Williams whether the aconite root used by him was German aconite, or whether it had been cultivated in this country, and if the latter was the case, at what time of the year the root had been collected. They knew from the price paid for the German root, that it could only be collected by peasants or children in a very rough way, when there was no other work to do, and it was not possible to get a German root of good quality in commerce. The character of the root itself showed that it was by no means reliable as to species or quality. Unfortunately, in the British Pharmacopœia the root was ordered to be gathered at a time when its collection was almost impossible, *i.e.*, before the leaves appeared, for unless the collector had actually cultivated it, and knew where to find it before the leaves appeared, it was difficult to see how the root was to be obtained. If it were collected when the flowers appeared there would be some chance of knowing what species the plant belonged to. Another question he wished to ask Mr. Williams was whether he had found any traces of picraconitine or pseud-aconitine in the roots he had examined, because if, as he supposed, they were the *A. Napellus* of commerce, those two alkaloids were stated in text-books on materia medica to have been found in that root.

Mr. Conroy said the Conference was highly indebted to Mr. Williams for this paper, one of the most practical he had heard at any of the meetings, and it was so complete and full that it defied criticism. He would ask whether Mr. Williams could state the percentage of alkaloids obtained, as it would be useful to have some information as to the probable yield.

Mr. Beaufort (Leicester) said he understood Mr. Williams to state that this process was applicable to the extraction of alkaloids generally, but if that were the case, how could one be certain that aconitine alone had been isolated, as it was known that the root of *A. ferox* contained also pseud-aconitine and similar bodies?

Mr. Long remarked that these questions were of immense importance, but the question was when these products came to be used in small pharmacies in different parts of the country, how were pharmacists to know whether the material was absolutely

pure, as it was so extremely dangerous to handle? They might be poisoned themselves in preparing the remedy which was to cure the patient.

Mr. WILLIAMS, in reply, said he was not certain about the origin of the root. He was obliged to buy aconite root in the market, and although he obtained the best he could, he could not trace its origin, and that was why he was looking forward with so much interest to what Mr. Holmes was cultivating for the Conference. When Mr. Holmes could spare a few pounds of the root, he should be very glad to work upon it, as he would then have the satisfaction of knowing he was dealing with a really definite thing. With regard to the pseud-aconitine, and other alkaloidal substances which had been found by previous investigators, he had failed in finding them. The process, especially when ether was used, and that was the one he should recommend in practice, appeared to yield one alkaloid to the end, except the little ring, of which he had spoken, of the gummy amorphous alkaloidal body, which was soluble in acids and precipitated by alkalies, and was very small in quantity in comparison with the crystallized alkaloid. He could not state the exact percentage of aconitine yielded, because so much was wasted in experiments that it would be only a guess to state a percentage, but he was quite certain that he had obtained a much larger quantity by this process than he usually did by the old process. The reason was evident: the alkaloid was not destroyed and decomposed by the influence of heat upon an alcohol solution, and it was also kept free from the oleoresinous body which was always dissolved out by alcohol, and from which there was much difficulty in separating the alkaloid. By the present process this substance was not dissolved from the root. Mr. Beaufort had rather misunderstood him. He did not say this process was adaptable for the general extraction of alkaloids, and he should not expect it would answer, for instance, for extracting morphia, but he believed it might answer very well for extracting such alkaloids as quinine. All alkaloids soluble in ether would probably work in amyl alcohol very easily, but bodies insoluble in ether, such as morphia and bodies of that class, he should hardly expect to yield good results. Mr. Long had spoken about testing the purity of aconitine, and he thought the best test would be to have a crystalline article, because the appearance and size of the crystals would be a guide, and microscopic examination of the crystals could easily be made by any one. As for its strength, the effort of the Conference and of all pharmacists was to get alkaloids as pure

as possible, and medical men, when they had the pure alkaloid, could always reduce the dose. If they had an alkaloid of uncertain strength, they did not know whether to increase or reduce it. The standard to be striven for was absolute purity.

THE REPORT OF THE FORMULARY COMMITTEE.

Mr. ROBINSON asked if the report of the Formulary Committee was to be accepted or discussed, as it did not appear on the agenda.

The PRESIDENT said it had been accepted in fact by accepting the report of the Committee.

The Conference then adjourned for luncheon.

On returning, the following paper was read, in the absence of Mr. RANSOM, by Dr. THRESH:—

NOTE ON THE ESTIMATION OF IPECACUANHA.

By FRANCIS RANSOM.

In an article on the "Assay of Ipecacuanha," by Professor Flückiger (*Pharm. Zeit.*, Jan. 13, 1886), the author states that 10 to 20 grams of finely powdered root may be completely exhausted with boiling chloroform to which 1 c.c. of solution of ammonia (specific gravity ·92) has been added. He further states that the residue left from the distillation of the percolate when dried at 100° C. consists of practically pure emetine, and that the process is thus available as a method of estimation. From large experience he concludes that the root contains, on an average, not more than 1 per cent. of emetine, and that the much higher results recorded by other investigators are due to the impurity of the alkaloidal residue, or to faults in titration

I have myself obtained a considerably higher percentage than that mentioned; and while in 1876 Stewart recorded 1·84 per cent. as the average of eight samples (varying from 1·45 to 2·1), Lyons, in his recently published "Manual of Pharmaceutical Assaying," remarks that the proportion of alkaloid is large, generally amounting to more than 2 per cent. As Flückiger's process would seem to be the simplest and most direct of any method hitherto published, I have made some investigations to ascertain whether it is sufficiently reliable to be recommended.

Instead of percolating with chloroform with aqueous solution of ammonia added, it was found better to render the chloroform alkaline by agitation with strong solution of ammonia in a separator, and percolating with the separate chloroform, as any water present would undoubtedly extract other material than alkaloid.

Twenty grams of ipecacuanha in 60 powder were packed closely in the percolator of a Dunstan and Short extraction apparatus, and the alkaline solvent passed slowly through in the cold. By this means the emetine is liberated from its combined acid and the exhaustion can be completed by continuing the percolation with the boiling chloroform, about five columns being necessary for this purpose. The termination of the extraction is indicated by evaporating to dryness a few drops of the chloroform that fall from the percolator, dissolving the residue in diluted sulphuric acid, and adding a drop of Mayer's reagent (solution of iodohydrargyrate of potassium), when any alkaloid present would be made apparent by cloudiness. That no alkaloid remains in the marc after this treatment was further demonstrated in a similar experiment by digesting the residual root with lime and diluted alcohol, filtering, evaporating, and examining the residue by the same method, no precipitate being produced. The chloroformic percolate was then divided into two equal parts, *A* and *B*, and examined as follows :—

A. This was evaporated to dryness at a temperature of 100° C. The residue thus obtained was amorphous, and of a yellowish brown colour, and weighed ·379 gram. As half the original percolate represented 10 grams of root, this would give a percentage of 3·79. It had, however, no appearance of pure alkaloid, and on warming gently with very dilute sulphuric acid, it was found to be only partially soluble, the remainder being of a dark resinoid appearance. The filtered acid solution was rendered alkaline with ammonia, and the alkaloid extracted with chloroform. This, on evaporation, left a residue weighing ·197 gram, indicating 1·97 per cent. in the root, or about half that shown in the first instance. As even this final residue had not the appearance of pure emetine, it was treated with dilute sulphuric acid, in which it was almost entirely soluble, and estimated volumetrically with Mayer's reagent, of which 1 c.c. is regarded as equivalent to ·0189 gram emetine. To complete the precipitation it was found necessary to add a volume of the reagent equivalent to ·16 gram alkaloid, indicating a percentage of 1·6 in the root.

The remaining portion, *B*, of the original percolate was then

agitated with two successive portions of dilute sulphuric acid, and the acid solution estimated with Mayer's reagent, which indicated the presence of ·18 gram emetine, *i.e.*, a per centage of 1·8 in the root, which I think we may safely take as being approximately correct.

From these results it appears that ammoniated chloroform may be advantageously employed for the exhaustion of the root, but that in addition to the alkaloid foreign matter is also extracted, which must be removed before the emetine can be gravimetrically determined. It is also shown that a portion of the emetine was lost in the process before the estimation of the second residue from *A*. This loss is probably due to the continued application of the heat employed to remove the last traces of moisture, as it is well-known that the alkaloid is liable to decomposition at a high temperature. The most ready mode of estimation would therefore appear to consist in simply removing the alkaloid with acid from the chloroformic percolate, and estimating this solution volumetrically with Mayer's reagent. That the volume of liquid affects the results with this precipitant has been shown by several observers, and a convenient table of necessary corrections, based on experiments on a specimen of pure hydrochlorate of emetine, was included in a paper by H. W. Jones, read at the meeting of this Conference at Birmingham last year. The strength of the sulphuric acid used in my experiments has been about 2 per cent., and I have not found that slight variations have caused any difference in the final results.

Having some fear lest the continuous contact with the strongly alkaline chloroform might decompose a portion of the alkaloid, I made two estimations of a sample of ipecacuanha, in one of which the root and alkaline solvent were left in contact for four weeks, while in the other the entire estimation was completed in the course of a few hours. The difference in the quantity of alkaloid found amounted only to ·02 per cent., a variation probably due to experimental error only.

That a thoroughly reliable gravimetric process would be preferable to any volumetric method when great accuracy is required is beyond question; but for ordinary work, where approximately correct results are sufficient, and when the comparative value of various samples is the principal object of investigation, it would appear that exhaustion of the drug, as described, with ammoniated chloroform, removal of the alkaloid with dilute sulphuric acid, and estimation of this solution with Mayer's reagent, may be regarded as a safe and useful method of assay.

Proceeding as described, I have estimated the value of the following samples of root.

		Percentage of Emetine.
1.	contained	1·9
2.	,, ...	2·3
3.	,, ...	1·3
4.	,, ...	1·6
5.	,, ...	1·7
6.	,, ...	1·7
7.	,, ...	1·5
8.	,, ...	1·3
9.	,, ...	1·5
10.	,, ...	1·8

In the above specimens the proportion of emetine present varies from 1·3 to 2·3 per cent., the average strength being 1·66.

It was generally found, as anticipated, that the roots containing the largest amount of cortical portion were richest in alkaloid. This was not, however, invariably the case, one or two specimens of fine appearance being below the average. This may be due to deterioration of the root by keeping, or it may have suffered from damp during transit from Brazil. Mr. Holmes, who kindly provided several of the above specimens, has suggested that in some cases the mouldy roots have been washed and dried on arrival here, and thus made presentable for the market. Some of the specimens yielding the highest percentage of alkaloid are believed to be of the most recent importation.

An exhaustive paper on "Ipecacuanha" has recently been published by Kunz (*Archiv der Pharmacie*, June 15, 1887), in which the author attributes to emetine the formula $C_{30}H_{40}N_2O_5$, which differs from those previously published. The preparation of the alkaloid in a condition of absolute purity has hitherto been attended with great difficulty, and it is probable that some slight modification of Dragendorff's stated equivalent of Mayer's reagent (1 c.c. = ·0189 gram) will be required as soon as the correct formula for the alkaloid is fully determined and admitted. The presence of choline in ipecacuanha has also been detected by this author, a fact which must be taken into consideration in all methods of assay. Choline has also been discovered in Indian hemp and hops, and Professor Dunstan has recently found it in the alcoholic extract of belladonna. Whether this base exists naturally in the living plants or is occasionally a product of decomposition remains to be determined, but being soluble in dilute acid and precipitated by the ordinary

alkaloidal reagents, it is liable to become a source of error if its presence be ignored.

The PRESIDENT moved a vote of thanks to Mr. Ransom for this practical and useful paper.

Mr. NAYLOR said he saw others present who, like himself, had worked on the subject of the determination of emetine in ipecacuanha, but he had never yet been satisfied with any process he had worked, because he had never yet been able to get a uniform result. Various processes had always yielded a very varying product, and he did not see how this was to be got over until the composition of emetine was definitely settled, and its constitution known. For some time it was difficult to obtain emetine in other than an amorphous form, but in more recent years it had been obtained in a crystalline condition, the formula of which had been determined, but beyond that point no one appeared to have gone. He thought there was considerable value in this paper, but was a little surprised to find that the author had obtained such very high results in estimating the alkaloid of ipecacuanha. He had never obtained results approaching those now presented by Mr. Ransom. It would, therefore, appear that this process of Professor Flückiger's was either capable of extracting a much larger amount of emetine from ipecacuanha, or that along with the alkaloid there was some foreign substance. He could corroborate the testimony of Mr. Ransom that it would be very much better to rely on some good gravimetric method rather than on the volumetric method of Mayer, which was described last year in the excellent paper of Mr. Jones. He had had some experience with it, and believed that under certain conditions, it was fairly accurate. Still, from his own experience, he should certainly give the preference to some gravimetric method. He was rather inclined himself to continue the use of lime, which he had no reason to think acted injuriously on the emetine; in fact, it was by such a process that the crystalline emetine had been extracted.

The next paper read was on—

MACKAY BEAN, THE SEED OF *ENTADA SCANDENS*.

By JOHN MOSS, F.I.C., F.C.S.

A year ago (Sept., 1886), during a visit to the Colonial and Indian Exhibition, a prominent Victorian happened to mention a

curious seed known as the Mackay bean, and made the statement that it was strongly poisonous. Curiosity being excited, we shortly found the bean in the Court appropriated to Queensland, of which colony it is a product. I am indebted to Mr. Holmes for the information that it is the seed of *Entada scandens*, N.O. Leguminosæ. Through the kindness and courtesy of Sir James Service, Agent-General to the Colony, a moiety of the beans which a too acquisitive public still left at his disposal was sent to me. A specimen of them lies on the table. The lomentum received was 13 inches long and had one or more cells broken from the style end. The cells are well marked, ligneous, red-brown in colour, and easily separable, being held in position by permanent sutures on each margin; they are from 3 to $3\frac{1}{2}$ inches long and 3 inches wide, including the sutures. From each suture on both sides are obvious transverse striæ, which are lost about three-quarters of an inch from the margin.

The sides of the divisions are also easily separable from each other, and between them is enclosed a single smooth, shining seed of a dark chestnut-brown colour, covered as to the centre by a cinnamon-brown powder which has been rubbed from the inner surface of the cell. The latter is marked by evident radial furrows extending half an inch from the margin. The seeds are lenticular and nearly round, $1\frac{5}{8}$ths by $1\frac{7}{8}$ths of an inch in diameter, and $\frac{15}{16}$ths of an inch thick; the hilum is very small, but well marked, and is on one of the longer sides. The seed can be sawn through, so as to make a clean cut and expose two hard, pale, cream-coloured cotyledons enclosing a lenticular cavity. The integument is sufficiently firm to permit of being converted into very attractive pocket vesta cases. A seed weighs 330 grains, of which 150 grains are integuments and 180 grains contents.

In order to isolate the principle to which the alleged poisonous properties of the Mackay bean are due, the legumin and integuments were treated separately.

Legumin.

Ether Extract.—571 grains in powder, on being exhausted by percolation with ether (·720), yielded 40·14 grains, 7·03 per cent., of a neutral turbid pale yellow viscid oil, which was not rendered clear by heat.

Spirituous Extract.—The same powder, freed from ether by exposure, yielded to spirit of wine (·838) 26·28 grains, 4·6 per cent., of reddish gummy hygroscopic extractive.

Chloroform Extract.—The same powder yielded to chloroform 2·48 grains, ·435 per cent., of pale yellow hygroscopic extract of a greasy consistency.

Proof Spirit Extract.—Proof spirit removed 257·56 grains, 45·1 per cent., of a brown, translucent, semi-horny extract, which could not be obtained quite dry at 212° F.

By macerating the dried residue with rectified spirit (·838) for three days in a warm place, 2 grains, ·35 per cent., more extract was obtained.

The Ether Strong Spirit and *Chloroform* extracts were separately treated with dilute hydrochloric acid and Mayer's reagent applied to the clear filtrate. The proof spirit extract was treated with subacetate of lead, filtered, sulphuretted hydrogen passed through the filtrate, again filtered, slightly acidulated with hydrochloric acid, and Mayer's reagent applied to the clear filtrate. In no instance was any indication of an alkaloid obtained. None of the above extracts reduce the copper in Fehling's solution, either before or after boiling with dilute sulphuric acid.

The legumin of Mackay bean, therefore, does not yield anything in the solvents named, either alkaloidal or glucosidal in its nature.

Integuments.

Ether Extract.—411 grains in powder, on being exhausted by percolation with ether (·720), yielded ·68 grain, ·165 per cent., of a yellow film, which became plum coloured on drying at 212° F.

Spirituous Extract.—The same powder yielded to spirit of wine (·838) 1·02 grain, ·248 per cent., of brown extractive.

Chloroform.—This removed ·28 grain, ·068 per cent., of green extract.

Proof Spirit.—Removed 15·05 grains, 3·66 per cent., of a red-brown brittle extract.

Water.—Removed 24·77 grains, 6 per cent., of deep brown extract.

All the above extracts, after suitable treatment, are indifferent to Mayer's reagent; the integuments, therefore, of Mackay bean are, like the legumin, quite innocent of alkaloid.

The proof spirit extract of integuments reduced Fehling's solution both before and after boiling with dilute sulphuric acid, but more freely after boiling. The water extract was so obviously of the same character as the above that the two were treated as the same. The aqueous solution is precipitated by sulphuric acid. The washed precipitate on being dissolved in hot nitric acid

gives no evidence of a sulphate. It is insoluble in hydrochloric acid, chloroform, ether, benzol, and spirit of wine ·838. It is partly dissolved by soda, giving a yellow-red solution which is not precipitated by an excess of acid. The solution in nitric acid is not precipitated by excess of alkali. When strongly heated, the aqueous extract ignites and leaves a little ash. Its solution in water froths freely when shaken. It is of a bright red colour, which is not imparted to either chloroform, ether, benzol, amylic alcohol, bisulphide of carbon, or turpentine. The colour is discharged by hydrochloric acid, and restored by ammonia.

The above observations point to the conclusion that the aqueous extract contains *saponin*, but no one who has worked on this body will be surprised that up to the present some difficulty has been experienced in separating it so as to establish absolute identity. With more material this can no doubt be readily accomplished. Saponin is only poisonous in a modified degree, not to an extent which justifies the terms in which the bean was originally described. Indeed, I have learned that the bean is to some extent used as an article of food. By very slow spontaneous evaporation of the aqueous solution, extending over some months, I have succeeded in obtaining three or four microscopic crystals, which appear strikingly brilliant amid their turbid surroundings, are tetrahedral in form, and altogether weigh something less than one-twentieth of a grain. When the crop is large enough, I hope to make a particular examination of these.

The PRESIDENT, in proposing a vote of thanks to Mr. Moss, said it had been remarked at the time of the Colonial Exhibition, that no doubt it would furnish a large amount of material for investigation, and this was illustrated by the present paper. He was given to understand that there were many workers at the present time engaged on other colonial products, although their work was not yet in a sufficiently forward state to be presented to the Conference.

Mr. NAYLOR said Mr. Moss in this paper drew the conclusion that the aqueous extract contained saponin, the evidence being its frothiness. He need not remind Mr. Moss that there were other bodies which frothed besides saponin; but they were not difficult to distinguish, because saponin on decomposition by an acid, not only yielded glucose, but another compound which readily crystallized in a very characteristic manner.

Mr. HOLMES said the root of this plant was used in the Philippine

Islands as a substitute for soap, so that saponin, or a substance closely allied to it, might be supposed to occur in the fruit.

Mr. Moss said the effect on the aqueous solution was not the only observation he made on which he based the conclusion that it might contain saponin, but it gave other reactions which were almost all those of saponin; its behaviour towards sulphuric and nitric acids, for instance, and its insolubility in various solvents he had named, although, by the way, with respect to that character there was a good deal of conflict. There were as many saponins almost as there were different varieties of tannic acid, dependent on the source from which they were obtained, but they did generally agree in respect of the reactions he had drawn attention to. The fact of the frothing, after having noticed the other reactions, was confirmatory of the conclusion.

The next paper read was a—

REPORT ON BLAUD'S PILLS.

By T. Maben.

In pursuance of my duties in connection with the preparation of the British Pharmaceutical Conference Formulary, I have had occasion during the year to direct my attention to Blaud's pills, and as the subject is one that has an interest to every practical pharmacist, I have drawn up this somewhat detailed report.

It is not necessary that I should go into the history of Blaud's pills, and I therefore go no further back than the Codex of 1884. We have there the authoritative process for preparing "pilules ferrugineuses de Blaud," a process which has been in use in France for certainly more than twenty years. With the exception of what was evidently a misprint, the process was transferred *verbatim* from the edition of 1866 to that of 1884; the mistake in the earlier edition consisting in directing the pill mass to be divided into one hundred and twenty in place of two hundred pills. The process is as follows:—

"*Pilules Ferrugineuses de Blaud.*

Pure Ferrous Sulphate, dried and powdered.	30 grams.
Pure Potassic Carbonate, dried . . .	30 „
Powdered Gum Arabic	5 „
Distilled Water	30 „
Simple Syrup	15 „

Dissolve the gum in the water in a porcelain capsule by the aid of a water-bath: add the syrup and the sulphate of iron. Stir for several seconds in order to render the mixture homogeneous, add the carbonate of potassium previously powdered, stirring constantly with an iron spatula, and continue the heat until the mass has acquired a pilular consistence, rather hard than soft. Withdraw from the fire and divide the mass into two hundred pills, which are to be dried in a hot-air chamber and silvered. Keep in well-stoppered bottles. Each pill weighs about 40 centigrams."

This process is, no doubt, that by which Blaud's pills are prepared in France, and it is a question seriously deserving of discussion whether we in this country ought not to adopt it as it stands. I am not old enough to say whether the pills which made the reputation of this medicine in Britain were prepared according to the Codex or not, but the probabilities of the case are strongly in favour of the supposition that they were.

The chief point that strikes us in connection with the form is that dried sulphate of iron is used. The Codex gives no directions for drying this salt and no indication of what its composition is, but we may safely assume that it will be correctly represented by the formula $Fe\,S\,O_4 . H_2\,O$. If we reduce the metric weights to the British standard, each pill weighs about 6 grains, and contains 2·3 grs. of dried ferrous sulphate, and a like quantity of dried potassic carbonate, this being equivalent to $1\frac{1}{2}$ grains of ferrous carbonate. It is also evident that there is an excess of alkaline carbonate over that required to effect decomposition, but this does not materially affect the main point, which may be stated thus: Blaud's pills are prepared according to the Codex with dried ferrous sulphate, and each pill contains $1\frac{1}{2}$ gr. ferrous carbonate.

Before we consider the question how far British methods differ from that which I have just given, it may be desirable to ask whether we are justified in departing from the French process and adopting one of our own. Here we have a medicine which is essentially French, in so far as the origin of this particular method by which it is administered is concerned. We even know it by the name of the Frenchman who first brought it into fame, and still further there is a recognised and authoritative form for its preparation in the French Pharmacopœia. If we ask this question with reference to many other less known French galenicals, we would have no difficulty in finding the answer; we should certainly adopt the Codex as our guide, and if in these, why should we not be equally ready to adhere to that standard in so far as this pre-

paration is concerned? To this I reply by asking another question, Is this the best process for attaining the desired result? If it is, we can have no hesitation in adopting it; if not, then we are justified in trying to find more scientific means for attaining the end in view.

This brings us at once face to face with the further difficulty, viz., what is that desired result? in other words, what is the "intention of the prescriber"? Of this we need be in no doubt whatever, the Codex being the judge; those who have prepared Blaud's pills by that process will be able to corroborate what I say, viz., that ferrous carbonate is most undoubtedly formed in the pill mass. The direction that the pills are to be kept in well-stoppered bottles is clearly intended to prevent its oxidation. It is equally certain that the writers on the subject of forty years ago distinctly recognised the fact that carbonate of iron was formed, and specially directed their attention to the best means for preserving it unaltered. What, therefore, we require to decide is, whether the Codex process is the most satisfactory for the production of ferrous carbonate.

This question, however, arises here: How far do Bland's pills, prepared by British methods, represent those prepared according to the process I have quoted? It is safe to say that there exists a very great variety of processes for this popular medicine; each individual pharmacist may probably use his pet variation in preference to that of every other pharmacist. Martindale, who stands *facile princeps* in the region of pure pharmacy, has lent the authority of his name to a method in which crystallized ferrous sulphate, equivalent to 1 gr. of ferrous carbonate, is employed. On the other hand, from those who recommend dried sulphate, we have formulæ giving 1 gr., $1\frac{1}{3}$ gr. and $1\frac{3}{4}$ gr. ferrous carbonate in each pill.

The term "Bland's pills" has become so associated in the minds of medical men with sulphate of iron and carbonate of potassium, that to many prescribers it never occurs to look further and consider whether there may be any possibility of variation in the strength and condition of the dose they are prescribing. In numerous cases they are content to write—

℞ Ferri Sulph.,
Potass. Carb. . . . . āā grs. iiss.
M. ft. Pil.

and leave the compounding of the pill to the judgment of the dispenser. In this they do well, even though in the doing of it

they pay us an unintentional compliment. It is the sphere of the pharmacist to combine drugs in a scientific manner, and when medical men who are not also trained pharmacists invade that sphere, the chances are that successful pharmacy will be at a discount. An illustration of this occurs in a valuable book, recently published, on pharmacy and correlated subjects. It is admitted that the author, in so far as he dealt with these correlated subjects, scored a distinct success; but he is not a practical pharmacist, and when he comes to treat purely pharmaceutical points the usual result happens. This is what he says regarding the subject of this report: "Blaud's pills.—A commonly ordered pill is one containing $2\frac{1}{2}$ grains each of sulphate of iron and carbonate of potassium; a little soft paraffin and cacao butter will form a good mass without encouraging chemical action; or the salts can be rubbed together and allowed to stand for half an hour, when a soft paste results which can be made into a mass with tragacanth powder and a drop of water." These two processes are, to use the mildest possible term, extremely unsatisfactory, and it is difficult to understand how either of them could have been recommended, save by a theorist who had never attempted to put his ideas into practice. To begin with, they contradict each other. The intention of the first, evidently, is that the pills may be made with as little chemical action as possible; the second expressly provides for the maximum amount of chemical action. Again, it is not the case that the first process prevents chemical action, if crystallized sulphate and hydrous carbonate are employed; the reaction proceeds in spite of the soft paraffin. With dried salts the result may of course be different, but no mention is made of dried salts here. Lastly, the alternative process is as bad as could possibly have been suggested, inasmuch as there is nothing to prevent the oxidation of the ferrous carbonate, and it is simply a question of time till the pill consists for the most part of ferric oxide. Having reference to theories such as these, it will be admitted that pharmacists are an essential part of the social fabric, and that our services could ill be dispensed with.

It is perfectly certain, whatever else may be doubtful, that the "intention of the prescriber" in ordering Blaud's pills, is that ferrous carbonate should be administered to the patient. This is admitted on all hands. Some pharmacists, however, and some medical men also, appear to think that the carbonate of iron is formed after the ingestion of the pill, and hence they recommend that dried sulphate of iron be employed in order to delay chemical

action as much as possible. I have already shown that the Codex orders the dried salts, though by no means with the view of preventing chemical action; but however much we may wish to follow this authority, there are, undoubtedly, objections to the use of dried sulphate. In the first place its composition is uncertain; unless great care be taken in the drying, there is the possibility of its partaking of a more or less basic character, which would interfere to a certain extent not only with the strength of the dose, but also with the reaction. There is a popular notion that pills prepared with the dried sulphate are peculiarly uniform and stable, but this is erroneous. It is absolutely certain, in spite of all medical opinions to the contrary, that if an aqueous excipient be employed, no matter how Blaud's pills are prepared, some reaction will take place, and the use of dried sulphate makes no exception to this rule. I have ascertained repeatedly that there is a loss of ferrous salt when pills are so prepared. For example:—

Blaud's pills prepared without heat with ferri sulph. exsiccata, sugar and glycerine—

Each pill contained	(by theory)	1·04 gr.	$FeCO^3$
,, ,,	when made	0·98 gr.	,,
,, ,,	after 2 weeks	0·80 gr.	,,
,, ,,	,, 4 ,,	0·71 gr.	,,
,, ,,	,, 6 ,,	0·60 gr.	,,

This change is explicable on one of two hypotheses. Either the sulphate has been converted into carbonate and then into ferric oxide, or a portion of the sulphate has been split up into ferric sulphate and ferric oxide. In either case a reaction has taken place; in neither case will all the iron reach the stomach in a ferrous condition.*

In preparing these pills from dried sulphate, the details of the Codex have not been adhered to, for the simple reason that these are so clumsy and tedious that I would hesitate to recommend them. If we could ensure a more satisfactory preparation by employing heat, by all means let us put up with what might otherwise be unsatisfactory, but I do not find that the results are

* In a paper on Blaud's pills (*Pharm. Journ.*, [3], xvii., 775), Mr. Duncan gives the results of his estimations of some samples, and three of these, he assumes, judging from the quantity of ferrous salt present, to have been made from the dried sulphate. The large percentages found by no means conflict with what I have stated, and it would be impossible to draw any reliable conclusions from the figures given, unless we knew (1) How much ferrous sulphate was put into the pills, and (2) how long they had been kept previous to estimation.

even as good as those obtained by the use of hydrous sulphate in the cold. The loss in ferrous salt is much greater; even in preparing a small batch, the loss has never in my hands been under 10 per cent.; with large quantities, where the mass is much longer exposed, the loss is no doubt greater still.

Even if we admit, for the sake of argument, that Blaud's pills can be so prepared that the reaction does not take place till the pill is dissolved in the alimentary canal, the theory that ferrous carbonate will then be formed will not in my opinion bear examination. When the pill is dissolved, the potassic carbonate will doubtless be decomposed by the hydrochloric acid in the gastric juice, before the ferrous sulphate can possibly be reacted on. In the event of there being an excess of acid, all the potassium salt will be converted into chloride, and only the carbonic dioxide which would be present in the solution would be available for reaction with the ferrous sulphate. The laws of chemical affinity are such that this would be the certain result if the experiment were tried in a glass beaker, and I am not aware of any reason which would lead us to expect a different reaction in a beaker made of flesh and blood. The theory is absurd in itself, and the fact that it has been propounded by medical men has led some timid pharmacists to talk a good deal of nonsense, which has surely reached its climax when we are seriously asked to believe that capsules containing ferrous sulphate and potassic carbonate done up in the form of a salad will give a sure and certain dose of ferrous carbonate.

From what has been advanced it will be seen that I am not particularly favourable to the use of dried sulphate of iron, and if my arguments are sound, we are thrown back on the only possible alternative, viz. the crystalline sulphate, and the first point to be settled is, how much ought each pill to contain? The Codex, as we have seen, requires $1\frac{1}{2}$ gr. ferrous carbonate, and if we are to follow this precedent, we would require $3\frac{3}{4}$ grains ferrous sulphate and $2\frac{1}{4}$ grs. potassic carbonate. This would make a larger pill than we are accustomed to, but still its bulk would not be much, if anything, over that of an ordinary 5-grain pill. Medical men have, however, become so accustomed to prescribe $2\frac{1}{2}$ grains, and that strength finds a place in so many text-books, that it would be unwise to make any alteration, and I have therefore decided to adhere to this proportion. In the determinations that have been made, each pill contains $2\frac{1}{2}$ grs. ferrous sulphate, which is in theory equivalent to 1·04 grain anhydrous ferrous carbonate.

The sulphate may be used either in a form of large crystals, or in the granular condition. The latter is certainly the more stable salt of the two, and there is less chance of its being contaminated with ferric compounds, but I have not found that the pill possesses any advantages over that made with the large crystals: in point of fact, either variety may be employed.

The essential requisites for Bland's pill mass are:—

1. That it be a good workable mass: not too soft and not too hard. It will be found in practice that a mass can be made without the addition of any moisture, the water of crystallization which is set free being sufficient excipient of itself. The following equation probably explains the reaction which takes place:—

$$Fe\,S\,O_4.\,7\,H_2\,O + K_2\,C\,O_3 = Fe\,C\,O_3 + K_2\,S\,O_4 + 7\,H_2\,O.$$

I find, however, that such a mass, even with the addition of sugar, contains less ferrous carbonate than one prepared with the addition of a small quantity of glycerine and water. Moreover, I have found that the harder the pill mass, the greater the liability to oxidation. A very soft pill, with glycerine as the excipient, oxidizes much less rapidly than a hard pill, and, consequently, I recommend the addition of a little moisture, especially where gelatine coating is not resorted to.

2. That the reaction is complete before the pill mass leaves the mortar. There is no difficulty in this, and it is very desirable, if only in the interest of the pill itself, so far as physical appearance is concerned.

3. That the largest possible amount of ferrous salt be retained in the pill. I have frequently produced pills containing 1 grain of ferrous carbonate, and with ordinary care ·95 grain may always be relied on.

4. That precautions be taken to prevent oxidization. Of the expedients employed for this purpose, sugar and glycerine are the most serviceable. The Codex uses the former, but the latter is even more satisfactory. Experiment has proved that pills made with sugar oxidize more rapidly than those made with glycerine, as for example, with sugar each pill, after six weeks, gave ·7 gr., and those with glycerine ·9 gr. ferrous carbonate.

The objection to glycerine alone is its hygroscopic nature, and this last pill was much too soft. I have, therefore, thought it well to combine the two, in order that both may have their influence, and the pill be at the same time sufficiently hard.

The result is seen in this example:—

Made with sugar and glycerine, each pill, when prepared, gave 1 gr. $FeCO_3$.

At the expiry of two weeks, each gave ·87 gr. $FeCO_3$.

„ „ four „ „ ·81 „

„ „ six „ „ ·89 „

The result of the absence of sugar and glycerine is well seen in this example:—

Each pill contained, two months after preparation, ·30 gr. $FeCO_3$, four months after preparation, ·12 gr. $FeCO_3$; and this is the inevitable result of preparing the mass according to the method which I have already criticised.

There is still another method for protecting the pill from oxidation, viz. coating. This is employed in addition to the means already referred to, the object being to preserve the pill from contact with the atmosphere. It is now admitted that all in all gelatine forms the most satisfactory coating for pills, and I find it is successful in preventing, in a large measure, the oxidation of the ferrous carbonate. For example, pills prepared with sugar and glycerine gave, when made, ·98 gr. $FeCO_3$. They were slightly dried in hot air, and then coated with gelatine. Each pill, after the lapse of two weeks, showed ·92 gr., and after four weeks, ·90 gr. $FeCO_3$. If, therefore, the pills are carefully prepared and rapidly coated with gelatine, we may have every confidence, when we send out Blaud's pills, that they will really contain a large proportion of ferrous carbonate.

The quantity of potassic carbonate in each pill is a point of some importance. It is undesirable to have a large excess of free alkali; indeed, the nearer we approach to theoretically correct proportions the better. Theory requires $1\frac{1}{2}$ grain (nearly) of carbonate of potassium with 16 per cent. of moisture for $2\frac{1}{2}$ grains of ferrous sulphate, consequently it is obvious that $2\frac{1}{2}$ grs. of carbonate, as usually prescribed, is quite a superfluous, if not a mischievous quantity. I have found on experiment that pills prepared with the larger proportion of carbonate oxidize more readily than those prepared with the smaller. For example, pills prepared with $2\frac{1}{2}$ grs. each ferrous sulphate and potassium carbonate gave after two months ·6 gr., whereas those prepared with $1\frac{1}{2}$ gr. carbonate gave ·7 gr. ferrous carbonate. This was the only experiment tried for this particular object, and too much weight need not be put upon it; but I may remark that the same ratio was observed after four months.*

* Mr. Duncan's experiments supply corroborative evidence on this point.

On a review of all these facts, I recommend the following process for Bland's pills:—

Sulphate of Iron		60 grains.
Carbonate of Potassium		36 ,,
Powdered Sugar		12 ,,
Powdered Tragacanth		4 ,,
Glycerine,		
Distilled Water	of each	2½ minims.

Reduce the sulphate of iron to fine powder, add the sugar and tragacanth, and mix intimately. Finely powder the carbonate of potassium in another mortar, and thoroughly incorporate with it the glycerine and water. Transfer this to the mortar containing the sulphate of iron, beat thoroughly till the mass becomes green and assumes a soft pilular consistence, and divide into twenty-four pills. Coat the pills with gelatine, previously drying them in hot air if necessary.

Prepared in this way, Bland's pills contain ferrous carbonate, and will preserve it unoxidized for a very long time.

The PRESIDENT having proposed a vote of thanks to Mr. Maben,

Mr. MARTINDALE said the pill of carbonate of iron of the Pharmacopœia was a much more definite and satisfactory article than Bland's pill. He did not know who Bland was, but he found in the first volume of the *Pharmaceutical Journal*, the first series, a paper by the Editor, Jacob Bell, upon Bland's pill, and he rather disagreed with what Mr. Maben said on the subject. This was a translation of a report of a French pharmacist, M. Bondet, and he recommended the sulphate to be dried very carefully, not above 30° or 40° C., in which case the iron lost about 20 per cent. of water, not nearly 50 per cent., which the dried sulphate of iron of the Pharmacopœia lost by drying it at the high temperature employed. He confessed that so far as his work had gone of late he rather favoured the French Codex process, because pharmacists had not only to make these pills, but to keep them, and to keep them coated in some sort of way so that they should be presentable for some length of time. He thought Mr. Maben's formula would limit their keeping to a short time. The pills would contain at first the largest quantity of ferrous carbonate, but they would not keep as well as they ought to for the ordinary purposes of the pharmacist's business. He got two of his assistants to make

Pills made according to Ince's form oxidized more rapidly than those made by Martindale's.

experimental batches of these pills, which he had brought with him, and the result was that it was a question in his mind whether the word "beat," as Mr. Maben read it, should not have been "heat" together, so as to ensure a complete change. His assistant reported that when merely beaten together, the pills were not so satisfactory as when they were heated together. With that little change the process would work very well. The addition of glycerine and a small quantity of water might be an advantage, especially glycerine, as it enabled the pills to be coated with gelatine. He had also brought some pills prepared by the Codex process on a larger scale; the others were made on a smaller scale, and hardly showed the characteristics of what a pill should be. They sometimes had orders for grosses of them to be supplied at short notice, and therefore these pills had to be kept in stock, and under these circumstances and conditions he did not think Mr. Maben's process so applicable. As he had said, in respect to the quantity of ferrous carbonate, if they were to be used immediately, no doubt Mr. Maben's process was the best; but where the pills had to be kept, the Codex formula would have the preference.

Mr. Cross asked if Mr. Maben had tried to manufacture these pills with granular sulphate of iron.

Dr. Symes said his experience rather bore out Mr. Martindale's remark, viz. that saccharated carbonate of iron pills, when carefully prepared, kept remarkably well, and he could not help thinking that if medical men could be persuaded to order carbonate of iron pills instead of Blaud's pills, they would be more satisfied, and they would get more carbonate of iron than they would get in Blaud's pills which had been prepared for a length of time. Some years ago he happened to find several samples of carbonate of iron which had been put away and lost sight of; one sample was in a paper parcel, and he quite intended throwing it away without troubling to examine it, but he was surprised to find how very little difference there was in the sample, which had been wrapped up in two papers and kept dry for twelve months, and another contained in a bottle about a quarter full, which had been kept perhaps six months, as compared with another sample of more recent date. He quite expected that there would be the widest possible difference, but he found that even that in the paper parcel contained still a good quantity of ferrous carbonate. He should therefore be disposed to support Mr. Martindale's view, that leaving their French friends to prepare pills as they thought fit, they should endeavour to persuade English medical men to

order a recognised pill. He was inclined to favour the use of heat in preparing Blaud's pills. A gentle heat should be used, a little sugar added early in the process, and their manipulation rapidly conducted. There was a great deal in getting Blaud's pills finished off quickly. The object was to bring about decomposition in the quickest possible manner, and get the pill into a mass. He thought the French recommended these pills to be silvered, which was about the worst course to take with iron pills; they should either be coated with sugar or with gelatine.

Mr. NAYLOR said he spoke with some hesitation after the remarks of Mr. Martindale and Dr. Symes, but his experience was that these pills could be made very well by simply beating; and comparing them with the pil. ferri carb. he had found the pil. ferri Blaud made by beating to contain more ferrous carbonate, pill for pill, than the pil. ferri carb. sac. made with saccharated iron.

Dr. SYMES asked whether Mr. Naylor, in testing these preparations comparatively, had in each case taken freshly made pills.

Mr. NAYLOR said he took fresh pills in both cases.

Mr. MABEN, in reply, said he did not wish to dispute the fact that the carbonate of iron pill of the B. P. might be better than the other; but pharmacists had to make Blaud's pills, and the question was how should they make them, though it would perhaps be better if doctors would confine their attention to the Pharmacopœia pill. He had no doubt that heating would cause combination to take place better than beating, but he thought heating gave less ferrous carbonate. His objection to the French process, in addition to the length of time it took, was principally in the fact that there was a considerable quantity of ferrous carbonate lost in the process. He also thought the pills made by this process would keep quite as long as those made by the Codex process. He had used the granular sulphate of iron, but the result did not really differ from that obtained with the crystalline sulphate. Either one or the other might be used.

Mr. MARTINDALE said there was one thing with regard to Blaud's pills; there were $2\frac{1}{2}$ grains of carbonate of potash to $2\frac{1}{2}$ grains of sulphate of iron ordered in each—too great an excess of carbonate of potash, which made the pill decompose rapidly—it produced deliquescence.

Mr. MABEN said it was undesirable to have a large excess of free alkali.

In the absence of Mr. Braithwaite, the following paper was read by Mr. NAYLOR:—

TWO SPECIES OF VESICATING BEETLES FROM SOUTH AFRICA.

By J. Oldham Braithwaite,

Pharmaceutical Chemist.

A small consignment of native "blistering flies" was recently sent from Cape Colony to Messrs. Hale & Son, the well-known drug brokers, by one of their clients there, who states that the beetles are much used by the natives and by local medical practitioners for producing vesication. It was thought possible that they might be usefully introduced here as a substitute for the "Spanish" and "Chinese" flies, or as a profitable source of cantharidin. Having casually seen a few specimens, I applied to Messrs. Hale, who were good enough to request me to examine the beetles, and to furnish me with a sufficient quantity for a preliminary investigation.

The sample was composed of two species of *Mylabris*, neither of which could I find described in such pharmacological or entomological works as were accessible to me. For the identification of the species I am indebted to Mr. Cahan, of the Entomological Department of the Natural History Museum, who courteously informs me that they are two species of *Mylabris*, common in South Africa, *Mylabris bifasciata* and *Mylabris lunata*, and that there appears to be no record of either species, other than technical entomological descriptions. Under these circumstances I have thought that a description would not be without interest from a pharmacological point of view.

It was first necessary to separate the two species, which was easily done; it will be seen from the following figures and description, that they do not very closely resemble each other either in size or markings. It was found that *Mylabris bifasciata* comprised the bulk of the sample, namely, 93 per cent. of the whole; the smaller, *M. lunata*, only being 7 per cent.

Mylabris bifasciata (Fig. 1) varies in length from 20 to 25 millimetres; the antennæ are about 5 millimetres long, moniliform, consisting of eleven joints, the first two basal joints black, the remainder yellow, gradually increasing in size from base to apex; the head is gibbous, about 3 mm. in length, eyes prominent; thorax pentagonal, 4 mm. long by 3 mm. wide. Elytra, 15 mm. long, by 5 broad, crustaceous, convex, black, traversed by two undulating, dark, ochraceous-yellow bands, about 2 mm. in depth; the apical band is bordered by a rufescent margin, and is more

rounded at the costal end than the basal band. The tarsi of the first two pairs of legs are five-jointed, those of the last pair have four joints.

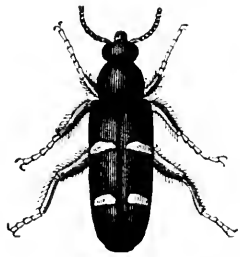


Fig. 1.

Fig. 2.

Mylabris lunata (Fig. 2)* varies in length from 14 to 18 millimetres. The antennæ consist of eleven articulations, moniliform, gradually increasing in size from base to apex, the first four basal joints black, the remainder ochraceous brown. Head gibbous, eyes prominent, thorax, equal in length and breadth. Elytra, 13 millimetres long by 4 broad, crustaceous, black, traversed by two transverse sinuous bands, and having a very conspicuous reniform or semilunar spot at the base of each wing case, also another lenticular spot on the under costal basilar margin, which is not visible unless the beetle is turned over on its back. The colour of all these markings varies in different individuals, from a dull ochraceous yellow to a bright lemon chrome. The tarsi of the first two pairs of legs are five-jointed, those of the last pair have four joints.

The next step was to determine if either species were active vesicants, and if so, the proportions in which the blistering principle existed. As the quantity of *Mylabris bifasciata* available was so much greater than that of *M. lunata*, this species was operated on first.

Experiment I.—Five grams of the powdered beetles were exhausted by percolation with acetic ether, the menstruum, when evaporated, leaving 0·522 gram of residue or 10·44 per cent. It was a yellowish green extract, semi-fluid at 80° F., smelling strongly of the flies. Upon exposure to the air, it slowly turns green, and immediately on the application of nitric acid, it gives a fine green colour. Examined by the microscope, an abundant crop

* The woodcuts of these illustrations were kindly lent by the Editor of the *Pharmaceutical Journal*.

of flattened needle-shaped crystals was observable, as well as the crystals of fatty acids. About three milligrams of this extract applied to the skin of the forearm raised a large blister, which contained from 2 to 3 c.c. of serum, in from three to four hours. (These experiments of actual vesicating power were conducted on myself and on an assistant, so that the error due to personal idiosynerasy might be avoided.)

Experiment 2.—Five grams were similarly exhausted with petroleum ether. This gave 0·595 gram or 11·9 per cent., of an oily residue; although the crystals remarked in the previous experiment were not so numerous in this instance, three milligrams of the extract produced a large blister when applied to the forearm.

Experiment 3.—The extract of experiment 1 was treated with petroleum ether, which removed a yellow fatty matter. The residue was dissolved in chloroform, digested with animal charcoal, and filtered; upon evaporation it deposited a crop of lamellar crystals, exactly similar to cantharidin in microscopic appearance, when viewed by polarized light.

Experiment 4.—Five grams of the powder were treated with acetic ether, exactly in the manner prescribed by the Pharmacopœia for the preparation of "Liquor Epispasticus." Two drops of the resulting fluid, allowed to evaporate on the skin of the forearm, gave rise to a large blister, which filled with serum three successive times in twenty-four hours. A similar quantity of the official "liquor" prepared from cantharides only gave rise to slight, almost imperceptible, vesication.

The presence of abundance of vesicating principle being thus established, it remained to determine the quantity in which it occurs. After trying with cantharides several published methods for the extraction of cantharidin, the following, which is practically that of Mortreux* with but slight modification, was adopted. I have found when working with *Cantharis vesicatoria*, that it gives similar results to the more tedious and lengthy process of Bluhm.†

(*a*) Twenty grams of the powdered beetles were exhausted by digestion with acetic ether, distilling off the solvent. The resulting extract, freed from remaining traces of ether, weighed 2·09 or 10·45 per cent. It was washed with successive portions of carbon bisulphide until nothing more was removable; the insoluble

* *Journ. de Pharm.* [3], vol. xlvi. p. 33.
† *Jahresb.*, 1864, p. 591.

residue was then washed on a filter sparingly, with successive small quantities of rectified spirit, until colourless, the insoluble crystals dissolved in chloroform, crystallized, and cautiously dried until constant in weight. The alcoholic washings were evaporated, but the amount of crystallized cantharidin contained was not found to amount to more than two or three milligrams. By this method no less than 0·204 gram, or 1·02 per cent., of white crystalline residue was obtained.

(*b*) Fifty grams of the powdered beetles were treated in exactly similar manner, omitting, however, the final treatment by chloroform, since the residue left by careful washing with carbon bisulphide and rectified spirit was perfectly white and crystalline. This, when dry, weighed 0·545 gram, equivalent to 1·090 per cent. After weighing, the crystals were dissolved in chloroform, and a "specimen" crop of well-developed flattened prisms obtained by slow evaporation of the solvent.

A check experiment on 20 grams of *Cantharis vesicatoria* gave 0·084 or 0·42 per cent. The accompanying extractive was much higher than in the *Mylabris*, being equivalent to 18 per cent.

The crystals thus obtained from *M. bifasciata* agree in every particular with those of cantharidin. They crystallize in flattened prisms which are identical in microscopic appearance with those of that substance, and they decompose polarized light in a precisely similar manner. When one milligram of this substance is applied to the skin with a little lard, it causes active vesication. It sublimes slowly at from 180° to 184° C. into beautiful iridescent needles, and melts at 209° C. It is soluble without colour in strong sulphuric acid, and is thrown out of solution on adding water; in hydrochloric and nitric acids it dissolves when heated, and crystallizes out on cooling. It is also soluble in caustic potash and soda.

It would appear, therefore, that *Mylabris bifasciata* is extremely rich in cantharidin, yielding more than twice as much as *Cantharis vesicatoria*, and, since it is plentiful at the Cape, would probably be an economic source of the vesicant; it would also be far more easily extracted, since *M. bifasciata* does not contain nearly so much fatty extractive as *Cantharis*. I am unable to find any record of so high a percentage of cantharidin having been previously obtained from any vesicating insect.*

Attention was now directed to *M. lunata*, concerning which a

* The highest record I can find is that of Werner, who obtained 0·815 per cent. from *Lytta aspersa* (*Journ. Chem. Soc.*, 1877, i. p. 723).

brief entomological note appears in Dr. Cooke's paper on "Vesicating Insects."* The quantity available for experiment was extremely small.

Experiment 1.—One gram of the powdered beetles was treated in the manner directed by the Pharmacopœia for the preparation of the official *Liquor Epispasticus*. Two drops of the resulting percolate gave rise to only a slight blister when applied to the skin of the forearm. Exhaustion being completed by a further percolation with acetic ether, and the menstruum evaporated, a residue of 0·112, or 11·2 per cent., was obtained. Upon examining *subente*, a few crystals were visible which were insoluble in carbon bisulphide. A few milligrams of this extract produced a fairly marked vesicant action, but which, however, was not to be compared with that obtained from the other species.

Experiment 2.—All that remained, viz. 5·061 grams, was treated for the determination of the cantharidin, as in the case of *M. bifasciata*; only 0·015, or 0·296 per cent., of crystalline residue was obtained, which agreed with cantharidin in physical characters and melting point. Although from the small quantity operated on the above figures are not of very great value, they suffice to show conclusively that this *Mylabris* is very much poorer in cantharidin than its congener.

My thanks are due to my principals, Messrs. Wright, Layman & Umney, in whose laboratory these experiments have been conducted, and to my friend, Mr. R. W. Merrett, for having executed the drawings.

The PRESIDENT, in proposing a vote of thanks to Mr. Braithwaite, said he understood that this particular vesicating fly was brought to the notice of the Conference some twenty years ago, but then received but brief attention, and, so far as he knew, from that day to this it had not been examined, so that Mr. Braithwaite had the credit of being the first to give scientific attention to the qualities of this beetle.

Mr. WILLIAMS asked if the beetle could be produced as a mercantile article, because the quantity of cantharidin named was very interesting to the manufacturer, being larger than that found in the true *Cantharis* beetle. There was often a quantity of cholesterin found in connection with cantharidin in many species of flies, but he supposed the author had been careful to separate the two bodies, because he spoke of a fatty acid, and cholesterin was

* *Pharm. Journ.* [3], vol. ii. p. 261.

not a fatty acid, it was perfectly neutral. The quantity of cantharidin named was about twice that ordinarily found.

Mr. Moss said this was a very practical paper, and was likely to be very useful, provided the observations contained in it were correct, as might be assumed, considering the author. The flies he spoke of belonged to the same genus as that which yielded the greater part of the cantharidin of commerce—the *Mylabris*. It was well known that cantharidin was obtained from that genus in preference to the *Cantharis*. The price of Spanish cantharides was now very high, three times that of the Chinese flies or *Mylabris*. Again, in addition to the direct economic advantage, *Mylabris* seemed designed by nature to yield cantharidin to the solvents used, because it gave up to those solvents a very small proportion of fatty matter, which tended to prevent crystallization and the easy purification of the cantharidin. He understood from the paper that these two flies occurred in considerable quantities at the Cape, and that they might be collected economically, and as they contained about twice as much cantharidin as the Chinese *Mylabris*, no doubt there would soon be a market for them, besides which they would use flies coming from a British colony rather than those coming from China.

Mr. Balkwill said he had been much interested by this very practical paper. If it pointed to any promise of having a more satisfactory preparation for liquid blister than the *Liquor epispasticus* of the British Pharmacopœia it would be very gratifying to the ordinary pharmacist. If from these flies a pure cantharidin could be prepared in sufficient abundance to enable them to have a solution of it for blistering purposes, instead of the present preparation, which was about as uncertain as anything in the Pharmacopœia, it would be exceedingly satisfactory.

Mr. Lascelles-Scott said he had had several varieties of *Mylabris* sent to him with the intimation that they were likely to contain cantharidin, but had not been successful in obtaining a blister either on himself or on any other subject, nor, except in one instance, had he found the smallest trace of cantharidin. He was bound to say, however, that those insects he had examined were not of the same species as had been referred to in the paper.

Mr. Holmes said he had heard from those who made cantharidin that the Chinese flies were very unsatisfactory, because although they yielded in some cases a large amount of cantharidin, in others they yielded only a small quantity. This might be due to the fact that the Chinese *Mylabris* consisted of two species, the

Mylabris phalerata and the *Mylabris Cichorii*, the two species being mixed in varying proportions. There might be the same difficulty with these two species from the Cape, unless the *M. bifasciata* described by Mr. Braithwaite could be kept free from the *M. lunata* in the imported article; otherwise there would be always a certain amount of uncertainty in the yield of cantharidin.

Mr. NAYLOR said it was especially mentioned in Mr. Braithwaite's paper that the *Mylabris bifasciata* was very plentiful at the Cape, and with reference to the purity of the article, and the cantharidin extracted, he gave the characters, which seemed very definite; the cantharidin crystallized in flattened prism, identical in microscopical appearance with the cantharidin from the cantharides.

The next paper was a short—

NOTE ON THE CULTIVATION OF ENGLISH RHUBARB.

By W. ELBORNE, F.L.S.,

Assistant Lecturer in Materia Medica in the Owens College, Manchester.

In a report on English rhubarb read before the British Pharmaceutical Conference in 1884,* I stated that the cultivated product of *Rheum officinale* occurred in two forms, known as "highly cultivated" and "ordinary cultivated," and that by the results of my analysis the latter product was superior to the former as regards active constituents. Founded upon those results, the high cultivation of *R. officinale* has since that date been abandoned, and the whole of the English-grown rhubarb yielded by that species is a product of natural and "ordinary cultivation," constituting a drug of more compact structure and activity. In reference to the authenticity of this drug, I may remind you that the plant from which it is derived was obtained by French missionaries in Thibet in 1867, and transmitted to Dr. Soubeiran and grown in the garden of the School of Pharmacy at Paris, and subsequently described by Professor Baillon.† From this source offsets of the root came into the possession of Hanbury and Flückiger, and through them into the hands of the late Rufus Usher of Bodicote, who succeeded

* *Year-Book of Pharmacy*, 1884, p. 435; *Pharm. Journ.* [3], xv. 136.
† *Pharm. Journ.* [3], iii. 301.

in propagating it, and whose successors are now the sole producers of the same in this country.

I would again draw attention to the great similarity in appearance and general characters which exists between this English-grown *R. officinale* and the dark-veined variety of the East Indian imported drug, suggesting probably that the latter is of similar origin. Specimens of these varieties are exhibited, which upon inspection will be found to possess a large number of characters in common.

Members interested in the subject were invited to examine the specimens after the meeting.

A vote of thanks was passed to Mr. Elborne for his paper.

The next paper read was on—

OIL OF EVODIA: A NEW DEODORANT FOR IODOFORM.

By H. Helbing,

Apotheker of the German Hospital, London.

The deodoration of iodoform has, it must be confessed, not yet, been successfully achieved, in spite of numerous experiments with various correctives. Cumarin, ol. menth. pip., ol. eucalypt., roast coffee, and other things, have been tried with more or less success, but generally the latter.

Under these circumstances I think I may be permitted to call your attention to the value of the essential oil of *Evodia fraxinifolia* as a deodorant. I had an opportunity of examining the fruit of this plant, and found that it yields an oil having a most agreeable and powerful odour, which is even able to overcome the smell of iodoform, either in its crystalline shape or in solution. For practical purposes it is only necessary to add a little (2 drops to the oz.) of the essential oil to the disinfectant, in order to obtain a complete deodoration of the latter; the chief objection which has been raised against the use of this valuable remedy thus being obviated. I would be very pleased to find my observations confirmed by experiments of others. As to the botany of *Evodia fraxinifolia*, I may refer to Christy's "New Commercial Plants," No. X. He says:—

"It seems probable that a description of *Evodia fraxinifolia* was first published, under the name of *Rhus fraxinifolium*, in Don's 'Prodomas Floræ Nepalensis,' 1825. The plant is described as a large tree, a native of Nepal, with pinnate leaves, the pinnæ lanceolate, acuminate, serrate, glabrous and shining, the panicle much branched and villous. Sir William J. Hooker, however, subsequently pointed out that the floral characters did not agree with those of the genus *Rhus*. In the 'Icones Plantarum,' 1848, plate 710, it is referred to Blume's genus, *Philagonia*, and a good figure accompanies the letterpress. The plant is placed under the natural order, *Terebinthaceæ*, and a reference is given to *Tetradium* (?) *fraxinifolium*, of Wallich, in Herb. Hook., 1821. In the recent work, Hooker and Bentham's 'Genera Plantarum,' the species is included in the genus *Evodia*, under the natural order, *Rutaceæ*, and it is identified with the *Tetradium trichotomum*, described in Loureiro's 'Flora Cochinchinensis,' p. 91, which is there mentioned as having trichotomous racemes of whitish flowers, the tree, of medium size, inhabiting the hills of Cochin-china. Sir W. J. Hooker's description of the species may be thus summarized:—Dioecious leaves impari-pinnate, glabrous; leaflets elliptical-oblong, acuminate, sub-serrate; the base oblique; the lateral leaflets nearly sessile; the terminal leaflet with a rather longer petiole; the cymes paniculate, pubescent, axillary and terminal; the flowers generally tetramerous (sometimes pentamerous), the inner surface of the petals silky; the four stamens are slightly longer than the petals; the ovary 4-celled; an inhabitant of Nepal."

The fruit as supplied to me by Mr. Christy consists of three or four carpels placed together in the shape of a star; these are brown on the exterior, and dotted with small warty points; each carpel contains one seed of a roundish heart-shape and resplendent black colour, having a diameter of 4–5 millimetres. Besides the fruit the sample contained a good many remains of stems, consisting of hard wood, black on the outside and striated longitudinally, being slightly flattened on the transverse section.

The fruit has a very strong odour, and yielded on distillation about 4 per cent. of a thin, fluid, essential oil of a very pale yellow colour; I could obtain no particular reactions with it. It has, as I have already remarked, an exceedingly agreeable and intense odour, similar to bergamot; its specific gravity is very low, not exceeding 0·840; it is soluble in alcohol and ether, and has a pungent, smarting taste.

The PRESIDENT, in proposing a vote of thanks to Mr. Helbing, said if he had discovered a true disguise for this intensely pungent chemical, he had offered pharmacists a distinct advantage.

Mr. MARTIN asked what was the source of the oil of evodia.

Mr. CHRISTY said he had some doubts whether it would be possible to get this oil in any quantity until the plant was grown in our own colonies. He was fortunate enough to obtain a few seeds which had germinated, and he was distributing them in the colonies, and hoped thus to obtain fruits. It was very difficult to obtain, because the trees were cut down by the natives. The seeds which came into the market came from a very small shrub. He had tried to dissuade Mr. Helbing from bringing the matter forward now, because there was not yet sufficient information to enable them to form a conclusion upon it.

Mr. LASCELLES-SCOTT said it would be his unpleasant duty to throw cold water on this suggestion. He had been making experiments on some oil of evodia in his possession, although not with the same view as the author of the paper. But on seeing the title of the paper in the published list, remembering his old experiments with reference to iodoform some years ago, and knowing something about the active properties of this oil, he had great doubts as to whether there was much in it. He was bound to say that the sample produced did not seem to bear out the statements in the paper. There were several essential oils which would to a certain extent mask the odour of iodoform. A well-known Indian oil, the oil of spikenard, would do so far more perfectly than that of *Evodia fraxinifolia*.

Mr. HOLMES asked what oil Mr. Scott referred to. He believed the Indian oil of spikenard was not known as an oil of commerce.

Mr. LASCELLES-SCOTT said the sample he had was one obtained officially from the India Office some years ago.

Dr. SYMES said this oil did not appear to accomplish the object intended to any very marked degree, and therefore it was scarcely necessary to trouble themselves at present, as to the difficulty in obtaining it. A great many substances had been suggested for this purpose; in his experience tonquin covered the odour of iodoform as well as anything he had met with. It was just a question which was the most persistent, and whether sufficient were used to cover the odour, or whether it evaporated before the iodoform was dissipated. Of course, the most persistent remained in all these cases.

Mr. HAMPSON asked what was the action of these various agents

for disguising the offensive odour. They might get nearer the truth if they had some means of ascertaining why these essential oils acted in the manner they did.

Mr. HELBING said he found that the oil of evodia was superior to any other oil for this purpose. He found that when iodoform was mixed with a little peppermint oil or coumarin, of course the mixture did not smell like iodoform, but there was a very strong smell like peppermint or coumarin. Now, on the other hand, he found that the iodoform mixed with evodia gave no smell at all, and he believed the sample produced showed this. He had mixed different samples, all of the same strength, two drops to one ounce, with several very strong smelling ingredients, but, so far as he could detect, that mixed with evodia oil had hardly any smell at all.

In the absence of Dr. KAUDER, the following paper was then read by Dr. THRESH :—

CRYPTOPINE AND ITS SALTS.

By Dr. E. KAUDER.

Since the discovery and description of cryptopine by T. and H. Smith,* and its more recent investigation by O. Hesse,† nothing has been published with reference to the chemical characteristics of this alkaloid and its salts.

Having been lately engaged in preparing some of the rarer opium-alkaloids, I think a short notice of the method by which I prepared and purified cryptopine, together with an account of its different reactions, may be of some interest, more especially so as the description given by the discoverers differs in some degree from that of O. Hesse and from my own experience.

Preparation and Purification.—The mother-liquor, from which codeine, narceine, thebaine, and papaverine have been separated in the usual manner, contains the cryptopine as a salt, together with extractive and resinous matters. That liquor was treated with excess of caustic soda, the resulting precipitate washed with hot water, and redissolved by hydrochloric acid. The solution, upon cooling, soon forms a gelatinous mass, which upon standing for two or three days changes into very soft crystals, that appear to float in the dark coloured liquor. Excess of hydrochloric acid

* *Pharm. Journ.* [2], viii. 595, 717.

† *Annalen der Chemie und Pharmacie*, viii., Supplementband 299.

sometimes accelerates the crystallization. The crude salt is collected on a filter, pressed, purified by recrystallizing from hot water, and passing the hot solution through charcoal. The liquor upon cooling gelatinizes and crystallizes in the manner recently described by T. and H. Smith.* These crystals upon being dried shrink together, forming a hornlike substance. To obtain a more satisfactory product the salt is dissolved in hot spirit, from which it crystallized in beautiful soft masses *without* any gelatinous character. Even by this method I found it impossible to obtain crystals of any considerable size, and in drying the salt shrinks together, but without forming a horny mass. When mixed with water the crystalline form is clearly recognisable. The salt is then quite white and chemically pure, as ascertained by the following tests :—

Strong pure sulphuric acid † dissolves the salt with a violet colour, which, in a short time, changes into a deep blue. In about one hour, or immediately, if heated to 150° C., the blue fades away and the acid then has a greenish appearance. Sulphuric acid containing traces of oxide of iron dissolves the salt with a deep rose, having a violet tinge, which soon becomes distinctly violet, and, finally, deep blue within about five minutes. Standing for an hour, or upon being heated to 150° C., the reaction is the same as with pure sulphuric acid.

According to Smith's statements, cryptopine which dissolves in sulphuric acid with violet colour contains *thebaine*, but as I prepared cryptopine from the mother liquor from which the thebaine had been separated, I felt confident that no considerable quantity of this alkaloid could be present. On the supposition, however, that cryptopine salt might contain traces of thebaine, I treated it in the following manner.

Thebaine is stated ‡ to be decomposed easily by warming with

* *Pharm. Journ.* [3], xvii. 545.

† I may here state that there is no better reagent to identify opium alkaloids than strong sulphuric acid. The variety of colours produced by pure sulphuric acid, and by acid containing traces of oxide of iron, is very great, and has proved to be of the utmost service. The reactions of cryptopine have been carefully repeated by me, and though the chief features are *nearly* the same as those already published, there are still some differences which I think advisable to point out. It has been shown that pure sulphuric acid kept in glass bottles sometimes takes up traces of iron from the glass. The best way of ascertaining whether the acid is perfectly free from iron is to try its reaction on codeine. Pure codeine does not give any colour with pure sulphuric acid, even after being heated, whilst sulphuric acid containing traces of iron produces a blue colour.

‡ *Annalen der Chemie und Pharmacie*, cliii. 47.

excess of hydrochloric acid, whilst cryptopine suffers no decomposition. This is in fact a method which has been recommended to remove the thebaine. I therefore studied the reaction of hydrochloric acid on thebaine, and can fully corroborate the previous statement. By heating muriate of thebaine (10 parts) with hydrochloric acid (200 parts) of 1·04 specific gravity to the boiling point, and cooling immediately, a salt settles, sometimes directly in the crystalline state, sometimes as a sticky mass, which in a short time partly solidifies and recrystallizes from hot water in plates similar to meconic acid.

This salt, called muriate of thebenine, differs widely from muriate of thebaine, both in crystalline form and in its reactions with sulphuric acid. Pure sulphuric acid dissolves it with a dark blue-violet colour, changing in a short time to a magnificent rose, which upon heating to 150° C. turns to a dirty green. Sulphuric acid containing traces of iron dissolves it with the same dark violet-blue colour, which soon becomes brownish red, and on heating to 150° C. changes to brown with a greenish tinge.

This salt is very easily changed. Upon placing a drop of the colourless watery solution on a piece of filter-paper, the latter is soon coloured red, through oxidation. Even in the dry state the salt gradually acquires colour by the action of light and air.

By boiling the solution of muriate of thebenine with excess of strong hydrochloric acid for a quarter of an hour, thebaicine and further decomposition-products, which do not yield crystallizable salts, are formed.

On the basis of these facts, I boiled the cryptopine salt with hydrochloric acid for one hour, thinking that even traces of thebaine would be thereby decomposed. The salt which crystallized out upon cooling gave the same *violet* colour reaction with sulphuric acid. I therefore was sure that the violet colour could not be due to the presence of thebaine.

A second way of positively proving the purity of the salt was by preparing acid oxalate of cryptopine and allowing it to crystallize for two or three days in a cool place. This method not only proves the absence of thebaine, but also that of protopine, since both alkaloids give salts which are more soluble in water than acid oxalate of cryptopine. The mother-liquor from the crystals was divided into two parts, and both made slightly alkaline by a few drops of ammonia, which did not at once cause a precipitate. The first portion was extracted *immediately* by ether, the ether on standing deposited regular crystals of pure cryptopine,

and on being shaken with hydrochloric acid, and excess of hydrochloric acid added to the dilute watery solution, soft crystals of muriate of cryptopine were formed in about one hour or two, perfectly free from hard crystals, which would have indicated the presence of *protopine;* the other portion of the ammoniacal liquor on being set aside for a day or two gave some crystals, which by their reaction with sulphuric acid, and after being converted into acid tartrate, proved to consist of cryptopine without a trace of thebaine.

A dilute solution of the chemically pure muriate of cryptopine in warm water was treated with ammonia in slight excess. The alkaloid thrown down was collected in a filter, washed, and dried. It was in a fine state of division, like magnesium, but its crystalline appearance was plainly recognisable with a powerful microscope.

Cryptopine is but sparingly soluble in boiling spirit, although sufficiently to allow of fair crystals being formed having an opaque appearance. I may here state that although cryptopine is but slightly soluble in benzole (50·90) or solvent naphtha, these solvents can be used for preparing *transparent* crystals of the alkaloid. Cryptopine in powder, as well as the crystals from spirit and from benzole, was found to melt at 213° C. (=415·4° F.).* T. and H. Smith give the melting point as about 204·5° C. (=400° F.); Hesse, 217° C. (=422·6° F.).

Cryptopine when treated with hydrochloric acid suffers little or no decomposition, thus differing remarkably from some of the principal alkaloids of opium. One grain muriate of cryptopine was heated with 20 grains H Cl of 1·04° specific gravity for one hour, care being taken to prevent evaporation of the acid. The hot liquor was made alkaline by ammonia; the precipitate, washed with warm water and dried, weighed 0·695 gr., equal to 69·5 per cent. Theoretically, muriate of cryptopine should contain 71·8 per cent. of alkaloid. It is more than doubtful whether this loss is due to the alkaloid being partly decomposed, for it has been proved that some portion is retained by the ammoniacal solution, every drop of which produces a faint violet colour with sulphuric acid.

The reaction of both powder and crystals of cryptopine with sulphuric acid is the same, but *differs* essentially from that of the

* This melting point was estimated in the usual manner with an ordinary thermometer, without taking into account atmospheric pressure, etc., which might probably account for the difference between the melting point found by Hesse, to which it is very near.

muriate. Strong sulphuric acid containing traces of iron dissolves it first with yellow colour, which turns to rose and violet, then becoming blue in about three minutes; on being allowed to stand for half an hour the blue changes to green.

Pure sulphuric acid dissolves it with a yellow colour, changing gradually to violet, dirty violet, and greenish. The colours, however, are not so brilliant as those produced by acid containing iron.

Froehde's reagent dissolves cryptopine with a dark dirty violet colour, which becomes deep indigo-blue in half a minute, and at the end of half an hour changes to green, advancing from the edges until the whole liquor is uniformly coloured.

Most of the salts of cryptopine become very easily *electric*: on reducing them to powder in a porcelain mortar the crackling of small sparks is distinctly perceptible.

A good many of the salts crystallize either from water or spirit; most of them when dissolved in hot water form upon cooling first a jelly, which after some time begins to crystallize. So do, for instance, the muriate, the acid tartrate, the acid oxalate, etc. If a saturated solution of the latter is prepared by dissolving a sufficient quantity in boiling water, it crystallizes as a rule directly without forming a jelly. A much stronger solution, however, prepared by making a strong solution of the neutral salt (which is much easier soluble in water than the acid salt) and adding a second equivalent of oxalic acid, soon gelatinizes, but the next day the jelly is found to be changed into small prisms. So far as I experienced the acid oxalate is the cryptopine salt which can be obtained in largest crystals.

The non-crystallizability of the neutral sulphate of cryptopine is particularly remarkable, as has been pointed out by Hesse. As acid salts of dibasic acids seem to crystallize easier, I prepared the acid sulphate of cryptopine, which on cooling gelatinized. After standing for two months it showed some signs of crystallization, which after another two months had advanced but little through the jelly. This is particularly noticeable, as most sulphates of the alkaloids are not inferior in their crystallizing power to other salts.

The acid chromate, which is pretty soluble in boiling water, separates on cooling partly in heavy prisms, partly in light needles, which being dried are changed into the same heavy crystals, but of course of much smaller size, a reason why a sample of the salt does not look quite uniform. The same behaviour is shown by the

double chloride of cryptopine and platinum; some of the cryptopine salts therefore are excellent representatives of physical isomerism.

Picrate of cryptopine crystallizes from spirit in fine yellow needles.

The neutral meconate of cryptopine is remarkable, and as far as I know has not yet been described, though it can claim interest, as most likely it is the form in which cryptopine exists in opium. Its properties differ somewhat from those of meconate of morphine, being, for instance, very insoluble in cold water. One hundred c.c. of a saturated solution at 14·5° C. were found to contain only 0·075 gram, which would correspond to a solubility of 1 part in about 1300 parts of 14·5° C. Boiling water dissolves a sensible quantity, and on cooling the solution the salt is deposited in fine silky needles. If the solution was saturated, the whole liquor solidifies to a crystalline mass; if not very strong and cooled down quickly a jelly is formed first, which soon begins to crystallize.

Analysis.—0·642 gram substance dried in the open air lost 0·104 gram on being heated in an air-bath at 105° C. to constant weight.

0·4 gram substance precipitated with ammonia gave 0·2616 gram cryptopine.

The formula for meconate of cryptopine therefore is,

$$(C_{21}H_{23}NO_5)_2C_7H_4O_7 + 10\,Aq.$$

This salt should contain theoretically—

	Found.
H_2O = 16·10 per cent. . .	16·21 per cent.
$C_{21}H_{23}NO_5$ = 66·01 „ . .	65·4 „

A portion of the cryptopine is of course carried away in the filtrate and washings.

Upon being dried the salt colours a little yellow, and though not entirely soluble in water afterwards, it recrystallizes from hot water in the same manner and with the same properties as the original salt. The dried salt easily attracts water in the open air.

Referring to a paper lately published,* it seems to be of interest whether cryptopine as a strong base like morphine can yield an acid meconate; my experiments on this point, however, are not yet finished.

Tannate of cryptopine is amorphous and very sparingly soluble in boiling water.

* *Pharm. Journ.* [3], xvii. 690.

I am not aware that any experiments with cryptopine have been made on animal life; I think it would be interesting to learn its action on the system, but leave this to physiologists to undertake.

So far as I can judge, cryptopine is contained in all kinds of opium in varying amounts; the quantity, however, is much larger than was supposed by T. and H. Smith. In one lot of 5,000 lbs. of opium I found 3 lbs. of crude muriate of cryptopine.

My thanks are due to Messrs. John A. Wink & Co. for their courtesy in kindly permitting me to place this paper before the Conference, all the experiments having been made in their manufactory and with their material.

The PRESIDENT having proposed a vote of thanks to Dr. Kander.

Mr. DOTT said the first thing to be observed was that the distinguishing of an alkaloid by colour reactions was a process always open to error, especially as what one man called violet another man called blue. The process of getting rid of the thebain by treating with hydrochloric acid would not answer, because the decomposition-product of thebain and cryptopine yielded the same colour reaction. Further, he thought the author of this paper relied on the original statement of Mr. Smith with regard to the quantity of cryptopine that existed in opium, but it was well known to be a much larger quantity than was then believed.

Mr. H. B. BRADY said it was worth mentioning that the discovery of this alkaloid, cryptopine, was announced at the meeting of the Conference at Bath, when Messrs. T. and H. Smith sent a small specimen.

The Conference then adjourned.

Wednesday, August 31, 1887.

The PRESIDENT took the chair at 10 o'clock. The first paper read was—

THE FUTURE OF PHARMACY.

By PROFESSOR LEECH, M.D., F.R.C.P.

When it was suggested by one of your Local Secretaries that I, as Professor of Materia Medica at the Owens College, should read a paper at this Conference, I at first felt some hesitation as to whether any communication I could make would not be some-

what without the scope of the objects of the Conference. For, though I follow with the greatest interest the progress of pharmacy, my own work relates almost entirely to the action of drugs.

A little consideration, however, led me to accept with pleasure the invitation of your Secretary to take part in this Conference, for it seemed to me that it might not be entirely without advantage if I discussed the influence which present and impending changes in medical views and medical practice is likely to have on the future of pharmacy, immediate and remote.

No one can watch the advances and alterations which are taking place in the theory and practice of medicine without being convinced that the work of the pharmacist, so far as it is influenced by its relation to medicine, will in time differ not a little from that which now devolves upon him.

Of the two causes which, it seems to me, will lead to this difference, one is already in operation, and to it I will first allude.

Until a few years ago the forms in which medicines were ordered differed but little from those in vogue in Sydenham's time.

Great changes had indeed been made in methods of production, and preparations more convenient for dispensing had gradually been introduced, but the authors of our Pharmacopœias never considered it as part of their duty to search after methods by which the discomforts connected with the administration of medicines could be lessened. Practitioners generally did not take much heed of this subject, and pharmacists were content for the most part to do the best they could with the prescriptions of the doctors. But in recent times enterprising men have seen a want and hastened to fill it. Scientific pharmacists have invented better or at least more convenient preparations than those in the Pharmacopœia; they have invented, too, pleasanter forms of administration, and, since the production of these new compounds on a large, is easier and cheaper than on a small, scale, new commercial industries have arisen which have absorbed some of the work formerly done by individual pharmacists. Not only are the materials, ready for combination, produced on a wholesale scale, but also medicines ready for exhibition in their most convenient form.

Now there are, I think, good grounds for believing that the call on the part of the medical profession for these preparations and medicines is increasing, and will increase, and that this call will

distinctly affect pharmacy. The new compounds are welcomed partly because of their convenience, partly because their uniformity of composition is, to a certain extent, guaranteed by the wholesale producer. The present system of education, moreover, leads medical men to prefer ordering medicines which they know are made up in a palatable form, to devising combinations which may not be so pleasant for their patients as they would wish. A large proportion of those on whom powers to practise are conferred have little idea of the best methods of ordering medicines, or of the physical results they may obtain by the association of the drugs they wish to give.

All the examining boards, indeed, require a certificate that the candidates who come before them have attended practical pharmacy, and these certificates are for the most part obtained from hospital dispensaries or private practitioners.

At dispensaries students, with few exceptions, learn little or nothing, and even the opportunities for acquiring a knowledge of compounding drugs under practitioners who dispense their own medicines have somewhat diminished; for ready-made medicines are usurping the place of the official preparations which used to constitute the surgery stock. Instead of extracts, powders, and gums, I find, not unfrequently, pearl-coated pills, gelatine capsules and tablets, actual compounding being reduced to a minimum The increasing variety and pleasantness of these ready-made medicines, the excellence of the combinations presented for use, and the fact that the labour of the practitioner is much lessened by their employment, will doubtless tend to reduce still further the actual compounding of drugs by medical men, and this, by lessening the opportunities which students have of learning pharmacy, will lead in the future to a still more extensive use of compounds ready prepared for administration.

It is not likely that a return will be made to the old system under which medical students acquired a knowledge of pharmacy. There is, indeed, at the present time much controversy amongst those who have charge of medical education as to the extent to which pharmacy and materia medica should be taught. Already less knowledge of these subjects is required than formerly, and there are some who would banish them altogether from the curriculum. I do not believe that such exclusion will be decided upon. I look forward to the time when students will be taught in well-equipped pharmaceutical laboratories as much concerning the dispensing of drugs as will enable them to prescribe properly for

their patients, and when the compounding of medicines by medical men shall cease entirely. Even should this come to pass, the transference of work from the ordinary pharmacist to the wholesale producer will still go on; but should matters remain as they are, or pharmacy be excluded from the curriculum, such transference will go on rapidly.

If, then, the sole office of the pharmacist were to compound drugs, the future of pharmacy could not be regarded as satisfactory. In the end, however, the very increase of the wholesale production of compounded medicines as simple articles of commerce will not take from, but add to, the work of the future pharmacist, if he fulfils all the duties which seem to belong to his occupation. Before I show how this may come to pass, let me draw attention to another influence which is destined, it seems to me, to powerfully affect the future of pharmacy. I allude to the progress of our knowledge as to the chemistry and the action of drugs.

It was in the early days of medicine, when plants themselves or their juices were looked upon as active medical principles, and before any clear idea had been formed of the manner in which disease is influenced by drugs, that the great majority of the forms our medicines now assume—infusions, tinctures, extracts, and the like—were devised.

The brilliant advances in chemistry at the end of the last and at the beginning of this century, led to the discovery that drug-yielding plants contain substances of definite composition, chiefly alkaloids or neutral principles, with which their medicinal properties are intimately connected. But since the effects of these new substances were not quite the same as the drugs from which they were derived, since, too, they were, for the most part, costly and many of them required to be used with the greatest care, they did not replace the older forms of administering medicine.

Following quickly on the progress in chemical science came an advance in pharmacology.—that department of science which concerns investigation into the action of drugs on organs and tissues. It might also be said that from the advances in chemistry pharmacology originated, for scientific accuracy was impossible until principles of definite composition were obtained for experimental purposes.

During the past half century investigations as to the physiological action of drugs have been carried on in almost every country, and never more actively than at present.

So far we have not obtained nearly sufficient knowledge to found thereon a science of therapeutics. The facts discovered by the pharmacologist are at present only aids to the therapeutist; and suggest to him the direction in which he should proceed. But he cannot feel assured of success when he follows the indications given, and it will be long before all the complicated problems which relate to the action of drugs on every tissue are so far worked out as to enable him to feel such assurance.

But pharmacological investigations have made clear many points which are materially influencing the practice of therapeutists; and there are two or three which have an important bearing on the future of pharmacy.

It has been shown that we can never rely on a substance affecting the organs and tissues in a definite manner unless we in the first place make sure that the substance employed is of definite composition; that since extremely minute quantities of many substances will affect tissues in a marked manner, the presence of a second substance even in very small proportion will often greatly modify the action of the first, and sometimes annul it.

The importance of a second point has also been clearly shown. The influence of the amount of the substance used—of dosage—is all important. We cannot influence organs and tissues in a definite and uniform manner if we employ varying quantities of the substance, for different amounts produce not only different effects, but sometimes opposite effects.

Since medicines cure disease by the influence they exert on tissues and organs, it is manifest that what is true in pharmacology must be true also in therapeutics. We cannot in a definite and uniform manner influence a disease process by a substance unless we can be sure that the substance is free from contamination, and unless we have the means of giving it in definite and determined quantities.

Now it is quite certain that we are not able, by the use of the large majority of ordinary officinal preparations, to administer to our patients definite substances in definite quantities, for these preparations as ordinarily made do not contain definite quantities of active principles. One reason for this is that comparatively slight differences of the menstrua employed lead to great differences in the preparation produced.

Messrs. Dunstan and Ransom recently showed in a paper read before the Pharmaceutical Society, that one and the same species

of belladonna root can be made to yield extract containing an amount of alkaloid varying from $1\frac{1}{4}$ to 3 per cent., by merely diluting the alcohol which is used for the percolation of the drug.

But if the utmost possible care were invariably taken to always use menstrua of exactly the same dilution, the strength of the resulting compounds would still differ, since the amount of alkaloids present in the same species of plant, grown under different conditions, undoubtedly differs considerably. Cultivation makes much difference in the percentage of active principle contained in a plant.

Mr. Gerrard, for example, has shown that the wild belladonna contains more alkaloid than the cultivated. Then, too, the amount of alkaloid present even in wild plants is not always the same. Stenhouse found that broom grown in the shade contained only one-fourth of the amount of spartein contained in plants grown in sunny parts, and the aconite of northern districts is said to be a much more powerful drug than that of the south.

Manifestly the ordinary official preparations used and ordered by medical men are likely to differ most widely in their composition; such difference has in several cases been proved. In twelve commercial specimens, for example, of extract of nux vomica examined by Messrs. Dunstan and Short, the amount of strychnia contained varied from 4 to 8 per cent.

It has been proposed of late, as you know, to remove this difficulty by what has been called standardizing our galenical preparations—that is, by making an extract which shall contain a definite amount of the chief alkaloid of a drug, and using this extract as the basis of all other preparations of the drug. Undoubtedly by methods such as those suggested in the admirable papers of Messrs. Dunstan, Short, and Ransom, we could in the case of nux vomica and belladonna get much nearer than at present to preparations which would give us the power to administer definite amounts of certain principles at will, but in the case of many of of our drugs it would be very difficult by any standardizing process to fulfil a second indication which the teachings of pharmacology indicate, not to give definite single or combined substances of definite composition.

A closer chemical investigation of the chemistry of our drugs has revealed the fact that almost all of them contain more than one active principle, and pharmacologists find that these principles have not always similar actions. They at times differ widely, and sometimes are absolutely antagonistic The difference in the

effects of the hyoscyamine and atropine found in the belladonna plant on the animal economy is but slight, but strychnine and brucine of nux vomica have by no means a similar action, whilst the methyl conia and conia of *Conium maculatum* differ still more widely, one paralysing the spinal cord and the other the ends of nerves. But the alkaloids of the Calabar bean, physostigmine and calabarine, are, it is said, in many respects absolutely antagonistic, the former paralysing, the latter stimulating, the spinal cord. Digitalis contains a substance, digitonin, acting on the heart in an exactly opposite manner to three others, digitoxin, digitalein, and digitalin, which it likewise contains, and the jaborandi leaf contains an alkaloid, jaborine, which is directly opposed in most of its physiological effects to two other constituents of the plant, pilocarpin, and pilocarpidine. It usually happens that one alkaloid preponderates and gives the plant or drug its special physiological feature; it seems probable, indeed, that some of the subsidiary alkaloids are produced from the chief alkaloids by some chemical change taking place within the plant. But whether secreted separately or derived there secondarily, these alkaloids vary in their proportion to the preponderating one, and are probably at times entirely absent. As yet but little notice has been taken by therapeutists of the possible effects produced by a variation in the relative amounts of two or more alkaloids possessing opposite physiological effects yet present in the same plant, but pharmacologists have found that unless they take care to separate the alkaloids which are yielded by a plant, and use a pure substance, they do not get uniform results. Now if we cannot rely on the effects produced by an *uncertain mixture* of alkaloids on organs and tissues, neither can such an admixture be relied on to cause uniform results when employed to influence organs and tissues in the cure of disease. In therapeutics, therefore, as in pharmacology, we shall require, in order to be sure of our results, to use alkaloids or definite mixtures of alkaloids in order to get uniform results.

When our therapeutic system is firmly based on pharmacological knowledge, one at least of the leading duties of a pharmacist will be to see that the alkaloids or other active principles ordered by the physician are pure, and, if combined, that they are mixed in most exact proportions. But this is a distant future for pharmacists as well as doctors. Empiricism, guided increasingly, however, by pharmacological knowledge, will long continue to govern our therapeutic procedures, and the time-honoured infu-

sions and decoctions will not yet awhile be replaced by active principles, for the combinations formed by nature in plants are often better than any single substance which we at present know, or any artificial mixture of these substances. A time will come when we shall have determined the best combinations and admixtures of the alkaloids for therapeutic use, and then our combinations and admixtures will be more definite than those now provided us by nature in drugs. Meanwhile there will be an increasing call for preparations rendered uniform in composition by minute care in preparation, and guaranteed by the vendor.

It is felt by the members of our profession with increasing force that many of the conflicting results recorded by therapeutists, many of the failures met with when successes are expected, are connected with difference in strength in the drug employed. The want of reliance on the uniformity of our present official preparations is leading medical men to employ the preparations of those large houses in America and Germany, as well as in England, who guarantee that their compounds are of a definite strength, and as the profession gets more and more imbued with the teachings of pharmacology, the search after preparations of fixed and definite composition will become more general. *If pharmacy is to hold its own, each pharmacist must be in the future the guarantor of the purities of the medicines he dispenses, not the mere distributor.* The gain to pharmacists which will result from the acceptance of this position will, I believe, more than counterbalance the loss resulting from the transference to other hands of a certain portion of the work formerly devolving on them. Should the position be declined, it will be taken up by some other class, and with it may be transferred all other work which requires scientific training. The increased knowledge required will undoubtedly lead to an increase of educational requirements in science, and narrow the portal through which pharmacists must pass before entering on the work of their life. Especially in organic chemistry will a thorough training be necessary.

One of the leading features of the therapeutics of the present day is the introduction of organic compounds of definite composition as medicines. These compounds are the outcome of conjoint chemical and pharmacological investigations. By putting an atom of amidogen into this compound, or an atom of ethyl into that, it is possible, as Schmiedeberg and others have shown, to build up substances whose physiological and therapeutic action can be foreseen. Already we have dimethyloxychinizin (antipyrin), tetra-

hydroparachinanisol (thallin), oxychinolinemethylhydride (kairin), dimethylæthylcarbinol (hydrate of amylene), and many others. Doubtless, too, we shall have many more. At present probably the majority are supplied fairly pure, but as the use of these compounds extends they, like the alkaloids and galenical preparations, will require the supervision of the pharmacist—a supervision which he cannot exercise unless well versed in chemical science.

Let me say, in drawing this paper to a conclusion, that I have purposely looked at the future of pharmacy from a medical point of view only. I know full well that grave difficulties stand in the way of the pharmacists as a body accepting the *rôle* which I have set forth as desirable for them. It may be, indeed, that the obstacles are insuperable. I hope this is not the case, however, for of this I am quite convinced, the rise of pharmacy to a higher estate, or its fall to a lower, depends on whether what I may call its more scientific functions are accepted or declined.

[To illustrate the influence of extremely small amounts of active principles on tissues, Professor Leech caused contraction of the gastronemius of a frog by the induced current before and after the application of a solution containing 1 in 30,000 of veratrine. The curve taken by means of a lever writing on a revolving drum showed the immense change in the form of contraction which so small a quantity of this alkaloid produces in a most striking manner. Other curves, showing the antagonising effects of drugs and the influence of varying amounts of the same drug were also shown.]

The PRESIDENT, in proposing a vote of thanks to Professor Leech for his extremely admirable and suggestive paper, said the members of the Conference were much indebted to him for coming forward, notwithstanding the pressure of his professional duties, to give them this paper. He thought he could promise him that the members would ponder it very carefully and deliberately when they saw it in print. He did not know when he had been so deeply impressed with the importance of pharmacists endeavouring to provide for the medical profession drugs and chemicals—and especially alkaloidal principles—of purity and definiteness. He had been deeply impressed by witnessing the experiments that morning, for if those infinitesimal doses of active principles produced such results as had been shown beyond contradiction—it was no theory, but absolute demonstration—it surely behoved

them in the performance of their special duties, namely, the obtaining and preparing of medicines for the use of the medical profession, to do their very best to secure purity and definiteness. He felt that no paper could have been more germane to the work of the Conference than one of this type, since it was their *raison d'être* to represent the higher cultured side of pharmacy, and to that point Professor Leech had called marked attention. Their future must largely depend on their capacity to fulfil the special function which devolved upon them in the administration of medicine and cure of disease.

Mr. Balkwill asked if he were right in assuming that the extremely small quantities of medicine which had been used in the experiments, which carried the mind at first to the idea of infinitesimal doses, would represent the amount of that medicine which would be circulated in the blood, and so reach the muscles through the capillaries.

Mr. Moss thought the President had so well expressed the general feeling with regard to this paper, that there was very little need be said by others. What occurred to him on seeing the experiment performed was that, provided he and other pharmacists did succeed in getting preparations of an absolutely uniform character, and they were always doing their best so to do with some measure of success, it would be necessary for medical men to weigh their patients.

Mr. Gerrard, as a practical pharmacist, was able from a considerable amount of work to corroborate a great deal of what Professor Leech had said, not from his experience as a physiological experimenter, but from witnessing the experiments of others. He had been largely engaged in making solutions for physiological experiments, and from time to time they had been returned to him, although the substances were weighed in the same balance, taken from the same bottle, and every possible care taken to select material from the same sources, and yet the same preparation made in that way would give different results, and the most fractional quantity in excess of an acid or alkali had been found to make considerable differences in the result of the experiment. It was found that check experiments had to be made to neutralize such results as were produced by the slight excess of acids which occasionally had to be employed to get alkaloids into anything like a presentable solution, and even the exposure of distilled water to the air for a few hours would make a difference in the tracing resulting from a physiological experiment. No

doubt their aim should be as far as possible to obtain preparations of a standardized character, from which measured results could be obtained, but, as had been mentioned, the effect of these on the strength of the muscle must be taken into consideration; they had to deal with weak muscles and strong muscles, and he should like to ask if there were any means of determining with accuracy the relative strength of muscles.

Mr. LASCELLES-SCOTT said the eloquent discourse to which they had listened that morning was unusually appropriate to the meeting, and peculiarly appropriate to the particular phase through which medical pharmacy was now passing. They stood on the threshold almost of a new departure from the old system of medicine, which dealt with drugs by the pound, and draughts by the gallon, and were now seeking to take the essence as it were, the spirit of these preparations, and to give them in a simple and pure form in the place of a complex and indefinite form. He was much pleased to find that Professor Leech had impressed upon them the necessity of looking out for very small differences in the quality of alkaloids, and, he would venture to add, also of glucosides, because he conceived that the action upon muscles in the simple and beautiful way just demonstrated would enable them to get over some of the difficulties which had been forced upon English scientists by the operation of the Viviseetion Act. Abroad there was no difficulty at all. If they came across a new substance which seemed to produce a marked effect on the animal economy, there was no hesitation in trying it upon an animal, alive or dead. He was not going to argue for or against that freedom, but hoped all members of the Conference would take to heart Professor Leech's observations, because he had shown how by acting on a dead muscle it was possible to obtain many of the effects which their *confrères* abroad obtained by acting on the living, suffering body. But that was not all. He was pleased to note that the general tone of the discourse seemed to indicate, as its text, that there should be a little more real fraternity between medical men and pharmacists, and he ventured to think the paper might be regarded in some sense as an indication that they might join hands together for the advantage of science on the one hand, and the benefit of suffering humanity on the other. It came to him as a very appropriate sequel to a lecture by Professor Fenwick, he had heard the other day, when he struck out an entirely new departure in his address at St. Peter's Hospital; leaving the usual cut-and-dried hospital lecture on one side, he showed his students how

much they were indebted to pharmacists in providing them with new, purer, and far better preparations. He thought that not only the Conference, but pharmacists all over the country, would feel that Professor Leech's paper would have great and good results.

Mr. WILLIAMS said he had listened to the paper with great interest, and it seemed to indicate the direction which he believed modern pharmacy was striving to follow. Their efforts were to bring everything to as certain and absolute a condition, not only of purity, but standard strength, as could possibly be, so that medical men might know what they were really using, and not be obliged to rely even upon the reputation of great houses. He might illustrate that by reminding the members that photography, an art which had gone side by side with chemical research and medical practice, had shown how important this question was, and photographers had really been in advance of medical men in discriminating the purity of the chemicals they used. No doubt it had been within the observation of many present that photographers had been able to condemn an impure chemical long before medical men had been able to do so. This encouraged him to think that they might progress in improving processes, and in getting more like standard conditions, and he trusted the time would come when medicine would be as certain, and the operation of drugs and chemicals upon the human system as well understood, as they were in the more mechanical art of photography or in the allied branches of knowledge.

Professor LEECH, in reply, said the experiment shown was perhaps striking as the result was so visible. The influence of doses of one-thirtieth of a grain of arsenic on the human body was quite as marked an example of the effect of minute doses. He had heard the word "infinitesimal" applied to the amount of veratrine used. This term is usually applied when millionths and billionths are alluded to; from these infinitely small amounts no visible results follow. It was easy to understand, however, that one part of a powerful alkaloid in many thousands of the fluids of the body might act very definitely. One part in 100,000 of veratrine in the blood, for example, could produce a very distinct effect, for a grain given to a man would perhaps kill him, yet if this be distributed throughout the blood of the body, the proportion of alkaloid to blood will be smaller than 1 to 100,000. It was quite true, as one of the speakers suggested, that body weight had an important influence on the action of drugs, and pharmacologists are accus-

tomed to weigh the dogs and even the frogs subjected to experiment. A time might come when the weight of the patient would have to be taken into consideration by the therapeutist; at present he was more concerned in weighing the patient's peculiarities. In both men and animals drugs act differently in health and disease; the pharmacologist had to study their effects under both conditions. Frogs react differently to agents according to the condition they are in, and therapeutists as well as pharmacologists had to take into account the influence of disease on the tissues of their patients, yet the purity of drugs was the matter of chief importance. What he had wished to do was to strengthen the hands of those in the Pharmaceutical Society and Conference who were endeavouring to improve the character of drugs. He knew, as Mr. Williams had said, that much had been done already, and his paper would have fulfilled its purpose if it in any way strengthened the hands of those who were pressing forward in the direction of a definite standard of purity. It had been said very truly that photographers had been before medical men in demanding and obtaining pure reagents. His feeling was that the demand would lead to supply, and his observation showed that there was an increasing demand for the supply of pure drugs which must be met. He had mentioned on the previous day that Owens College had established a large materia medica museum and a pharmaceutical laboratory, where they taught pharmacy to both medical students and pharmacists, and it would give great pleasure to himself and the Curator, Mr. Elborne, if any gentlemen would like to inspect them.

A paper was then read entitled—

THE ESTIMATION OF SMALL QUANTITIES OF SALICYLIC ACID IN WINES, ETC.

By Walter H. Ince, A.I.C.

Literature.—Chem. Centr., 1886, p. 412; *Journ. de Pharm. et de Chim.*, July, 1881; *Arch. Pharm.* [3], xxi. p. 296; *Bied. Centr.*, 1883, p. 495; *Compt. Rend.*, 1881, p. 406; *Year-Book of Pharmacy*, 1881, p. 650; *Chem. Zeit.*, 1882, p. 619.

The difficulty in the detection and estimation of salicylic acid is to extract it in a sufficiently pure form to apply the reagents.

Most of the tests lose their delicacy in the presence of the

slightest trace of either acid or alkali; the extraction, therefore, of salicylic acid in a perfectly free and practically neutral state is the first desideratum.

H. Pellet and J. de Groberts (*Compt. Rend.*, 1881), extract the suspected body with ether, and apply the reagents to the ethereal residue.

Siebold and Bradbury (*Year-Book of Pharmacy*, 1881), precipitate colouring matter with a lead salt.

Both these methods, though useful qualitatively, were found to be practically useless quantitatively; in the first case, the ether extracts varying quantities of salicylic acid, and in the second place, the nitrate of lead left in solution interferes more or less with the colorimetric reactions, otherwise reliable; elimination by sulphuric acid or hydrogen sulphide is objectionable for the same reason.

After many trials I found that distillation in a current of steam was a satisfactory method of extracting a definite quantity of the acid from a definite volume of wine or similar body.

The next consideration was a reliable reagent which would give a definite colour, suitable for colorimetric assay, or some substance which would give reliable volumetric results.

The tests tried were as follows:—

I. *Ferric Chloride*, either applied as a dilute neutral solution (sp. gr. 1·001) or by my method of ferrous chloride and bromine vapour. This forms a good test for general purposes, but, for reasons which I cannot explain, the colour varies slightly from violet-brown to rich violet. Moreover ferric chloride, however dilute, possesses a certain colour, which is apt to mask the violet coloration when salicylic acid is present in the proportion of 1 to 600,000 or more of water. Ferric chloride is besides very unstable, and rapidly decomposes into free hydrochloric acid and colloidal ferric hydrate.

Its delicacy is 1 in 800,000 to 1,000,000.

II. *Millon's Test* (acid nitrate of mercury, $N_4O_7(HO)_2(HgO)_2$ consists of the addition of a solution of mercuric nitrate in dilute nitric acid to a hot solution of salicylic acid.

Red colour: delicacy the same as ferric chloride.

III. *Hypochlorite of Sodium* added to ammoniacal solution with gentle heat. Blue colour; only useful in strong solutions, 1 in 700.

IV. *Bromine Water*, with formation of a white crystalline precipitate: a good rough quantitative reaction in dilute solutions; the turbidity gives an indication of quantity, 1 in 20,000.

V. *Ferrocyanide of Potassium* added to boiling solution, followed by potassium hydrate, ferrous sulphate, ferric chloride, and excess of hydrochloric acid, produces a blue coloration due to hydrocyanic acid.

Very delicate, but useless in quantitative work.

VI. *Cupric Sulphate*: green colour, 1 in 600.

VII. *Potassium Permanganate* to acid solution; with decolorization on warming. This I hoped to make a very delicate reaction, either by simply determining the point where the decolorization ceased, or by adding excess of a standard permanganate solution, boiling, and then adding potassic iodide and determining the quantity of liberated iodine by thiosulphate of sodium, and so indirectly the quantity of permanganate used.

Unfortunately, however, extracted bodies other than salicylic acid are also obtained, which act in the same way, and so render the test useless.

Finally, I decided on adopting the first two, namely, the ferric chloride and mercuric nitrate, as indicators, in conjunction with distillation.

The process works well within certain limits, giving reliable proximate results; the working is as follows:—

210 c.c. of the liquid to be analysed with 10 c.c. of diluted sulphuric acid are placed in a retort fitted with a suitable condenser, and distilled.

The first 50 c.c. are rejected, and the next two 50 c.c. separately collected; the liquid in the retort is kept boiling rapidly the whole time.

The sulphuric acid is added in order to free the salicylic acid from combination, as in claret containing a large quantity of tannin little or no salicylic acid distils over. The first 50 c.c. are rejected, as they consist mainly of dilute alcohol, and until the whole of the alcohol has passed over no salicylic acid is obtained.

The last two 50 c.c. may be dealt with in either of the following ways:—

I. They are placed in two flasks on a water-bath, and 10 c.c. of a 10 per cent. solution of mercuric nitrate in dilute nitric acid are added to each. If there is much salicylic acid present, a red coloration will immediately appear; should only very little be present, there is no coloration for five or even ten minutes.

The flasks are kept on the bath for twenty-five minutes, when they are taken off and cooled.

Three or four flasks are then taken, and in them 50 c.c. of dis-

tilled water, a few drops of ethylic alcohol, and varying measured quantities of standard salicylic acid solution are placed, and treated with mercuric nitrate in the same way.

After twenty-five minutes have elapsed the contents of the trial flasks are cooled and compared colorimetrically in Nessler glasses with the first two; the result in c.c. multiplied by 7·69 (Log. ·88593) gives the number of grains per pint of salicylic acid.

II. The alternative method of estimating is to collect the second and third 50 c.c. in Nessler glasses, and add a definite quantity of ferric chloride solution to each; the colours must be compared with varying quantities of standard salicylic acid.

In both processes care must be taken to place *exactly* the same quantity of indicator in each, so that the liquids under examination be subjected to exactly the same conditions.

The second 50 c.c. is kept apart, so as not to unnecessarily dilute the third 50 c.c., which generally contains the greater proportion of salicylic acid.

Standard Salicylic Acid Solution.—The standard solution consists of 2·4 grams of pure salicylic acid in 1 litre of distilled water; of this 1 c.c. in 210 c.c. = ·1 grain per pint. It is always advisable to make a check qualitative experiment with ferric chloride when using the mercuric nitrate for an indicator, so as to prevent the possibility of a red or yellow tinge being due to some oxidized matter mechanically carried over by the steam.

If distilled rapidly, the quantity of salicylic acid that comes over in the second and third 50 c.c. is, for all practical purposes, the same. When the percentage of alcohol is high the salicylic acid is correspondingly low; but as salicylic acid is only introduced in wines of low alcoholic strength, this does not affect the value of the process.

With very little practice the number of c.c. required of the standard acid may be readily predicted.

The growers in the South of France add salicylic acid to poor wines in the proportion of ·4 to ·7 of a grain to a pint; ·8 to 1 grain per pint is sufficient to preserve beer from turning sour.

I have to tender my best thanks to Dr. Attfield, M. Arnoud (S. France), M. Emery (S. France), and M. Ebertin (Lyons), for samples of wine for experimental purposes.

The following figures are examples of some of the experiments with pure wines :—

210 c.c. taken.	No. of c.c. of Standard Acid added to the Wine.	Equal to Grains per Pint.	No. of c.c. the 2nd and 3rd 50 c.c. required.	No. of c.c. × 7·69.
Claret A	5	·5	·64	4·9216
,, B	10	1·0	1·3	9·997
,, C	10	1·0	1·4	10·766
Vin Blanc A	5	·5	·66	5·0754
,, B	10	1·0	1·3	9·997
,, C	15	1·5	2·0	15·38
Sherry A	5	·5	·63	4·8447
,, A	10	1·0	1·2	9·228
,, B	5	·5	·64	4·9216
,, B	10	1·0	1·1	8·459
,, C	10	1·0	1·3	9·997
,, C	15	1·5	1·9	14·611
Port A	10	1·0	1·2	9·228
,, B	10	1·0	1·1	8·459
Spiritus tenuior . . .	10	1·0	·2	1·538
S. V. R.	10	1·0	·0	·0

The above experiments were conducted in Dr. Attfield's private laboratory at 17, Bloomsbury Square, London, W.C.

The PRESIDENT, in proposing a vote of thanks to Mr. Ince, said they would all join in wishing him success in the continuation of his scientific studies on the Continent, and would hope to be furnished at some future meeting with some of the results which would no doubt follow his scientific investigations.

Mr. REYNOLDS said it was usually understood that the French Government, in extending its paternal care over its citizens, forbade the use of salicylic acid; it might be that some small proportion was permitted, and perhaps Mr. Ince would be able to say what that amount was in the case of wines.

Mr. LASCELLES-SCOTT asked whether Mr. Ince, in distillation, used the wine as supplied *per se*, or whether he added some alkali or alkaline earth first, in order to fix the salicylic acid. He had had some little experience in the examination of wines and beers suspected to contain this acid, and his best results were obtained by adding to the liquor some hydrate of barium in the first instance, to allow him to get rid of the alcohol, then disengaging the salicylic acid by sulphuric acid, and applying a current of steam.

Mr. GERRARD asked if Mr. Ince observed any decomposition of

salicylic acid during the distillation, because it was generally understood that at a high temperature it underwent partial decomposition.

Mr. Ince, in reply, said he believed it was determined by the Health Committee, which met in Belgium at the beginning of this year, that salicylic acid was detrimental to health, and therefore none at all was allowed, but many adulterations took place, and in the case of weak wines the peasants themselves added it to their own wine to preserve it. No alkali was added to the wine originally, because if absolute alcohol were placed with salicylic acid, the whole of the alcohol distilled over, and not a trace of salicylic acid was found in the distillate until the alcohol was removed. A slight decomposition might go on during the distillation, but if even half the salicylic acid were destroyed, and half came over, being originally checked by pure wine, the results would be the same as if none were destroyed.

The next paper read was a—

NOTE ON THE TESTING AND PURIFICATION OF HYDROCHLORATE OF COCAINE.

By John Williams, F.I.C., F.C.S.

So much has been written and such various statements made respecting cocaine and its salts, that I am almost afraid to offer any remarks upon such a subject; but I think many present will agree with me that samples of the hydrochlorate especially are found to frequently vary in quality, so much so that it is a very desirable thing, if possible, to have a ready mode of testing, and if necessary, purifying the article; therefore I venture to bring before the attention of the Conference the following note, which I trust will be found of use for the desired end.

The process I recommend for the purpose is very simple, and depends upon the almost absolute insolubility of the hydrochlorate of cocaine in ether (although cocaine itself is so freely soluble) and the fact that most if not all the secondary salts (or impurities) appear to be soluble, even when converted into hydrochlorate.

The plan I adopt is to dissolve the cocaine hydrochlorate to be examined in the smallest quantity of absolute alcohol of sp. gr. ·795; to this solution it is simply necessary to add about six times the volume of pure ether, and allow the mixture, after shaking

several times, to stand for ten minutes or more, when the crystalline precipitate of the pure salt can be thrown on a small filter, squeezed, spread on blotting paper, and allowed to dry. In the course of a few hours the smell of ether will have quite gone, and the weight of the salt can be ascertained. Of course, if the weight of the original sample had been taken, its quality can be at once ascertained.

In performing this operation, the only essential point to remember is that both the alcohol and the ether must be quite free from water; in other words, absolute.

If it is desired to ascertain the purity of the alkaloid cocaine itself, this is done by dissolving the sample in absolute alcohol, and adding very cautiously, and drop by drop, strong hydrochloric acid, testing after each drop with previously damped (but not wet) litmus or turmeric paper, when neutrality or very slight acidity is produced, the ether can be added and the process carried on as with the solid salt.

Cocaine in a crude state is now sent into this country from abroad, I believe especially from South America. Some of this crude cocaine is very impure, and it is very necessary to test it carefully. The process I have given effects this object very easily.

If the cocaine operated upon is very impure, the addition of the ether to the alcoholic solution of the hydrochlorate will produce a milky liquid, which, even after some time, will be found very difficult to filter, as the very fine precipitate runs through the filter and the liquid cannot be got to filter bright. I have found, however, that by adding a somewhat larger proportion of ether, and allowing the mixture to stand, with occasional shaking, for some time, the milky precipitate at last becomes crystalline, and can then be filtered readily. A very pure sample of hydrochlorate hardly becomes milky at all, but deposits the crystalline salt in a very few minutes.

If it is desired to examine the ecognine or amorphous cocaine, or any of the other products or bodies described by various authors, of course the ether and alcohol must be evaporated off, and in the residue left these products will be found. I have given but a small amount of attention to them, but have come to the conclusion (perhaps hastily) that they are not of the value (medicinally speaking) which cocaine certainly possesses, and that they will hardly repay any very elaborate investigation; or perhaps it would be fairer to say that with our present knowledge we are not in a position to pronounce an opinion.

The cocaine hydrochlorate, purified in the way I have described, I think it will be generally admitted is very much improved. The complaints frequently made about its "mousey" smell, and also reports from medical men of considerable pain sometimes produced by the use of the drug, will I think no longer occur if this process of purification is adopted. In fact, this process of purification is simply bringing cocaine back to the state of purity which it possessed when first made and offered to the medical practitioner, and when its fame was established. I fear it must be admitted that since that time many samples have got into the market which have not been of the highest standard of purity, and that some of the doubts which have been from time to time thrown upon the medicinal value of cocaine are really due to this cause.

The PRESIDENT, in moving a vote of thanks to Mr. Williams, said a more valuable moral or application to the paper they had that morning heard from Professor Leech could hardly have been given. A great deal more had yet to be said on the question of cocaine, and they were much indebted to Mr. Williams for this contribution, brief as it was, but to the extent to which it went absolutely reliable.

Mr. SHEPPARD asked the best method of preserving cocaine in solution for application. He had had occasion to dispense a great deal within the last few years, and found that when kept in a water ten per cent. solution, it became muddy after a few days. He had lately dispensed it in a camphor mixture, and found it keep better than with pure water, but even then, after keeping it for a week or so, it became turbid.

Mr. CHRISTY said the great merit of this paper was that if pharmaceutical students would only gather from it how to treat the enormous quantity of cocaine regularly coming from Peru and Bolivia it would save merchants having to send it all to Germany; it did not stop in this country, whereas if Mr. Williams's method could be followed, English pharmacists would be able to treat it here.

Dr. SYMES said his experience of cocaine was that when first introduced the results obtained with it were highly satisfactory, but the article usually met with then was of a somewhat more basic character than it was now. Whenever a medicinal substance was obtained and found to be of value naturally, they endeavoured to refine it, and so get it more elegant, and occasionally possibly they

overstepped the mark in some direction; for instance, as a commercial article cocaine hydrochlorate could now be obtained in a more crystalline condition, much nicer in appearance, than it could originally, and he believed that was due to the fact that the salt was neutral, or slightly acid, but to the extent to which it was acid it was less effective, weight for weight. For some time it was thought useless to apply cocaine hydrochlorate to any other than a mucous surface, or as a hypodermic injection, and as applied to the skin it was thought of little or no value, but it had been ascertained that if the skin, instead of being acid as it naturally was, were washed with carbonate of soda, the cocaine hydrochlorate was effective. That supported the view that its efficiency was as a basic salt rather than otherwise. He would ask Mr. Williams whether, taking basic hydrochlorate, and treating it as he suggested, the cocaine, which was itself soluble in ether, would not be lost, and whether even its medicinal activity would not be impaired to the extent to which he took out any cocaine traceable in the sample. His impression was that a very fairly pure article was obtainable in the market. He was not referring to what was acknowledged to be crude cocaine, but he thought the hydrochlorate obtained in the ordinary way was fairly pure. Where it failed frequently was in the application of it; the dentist complained of it more frequently than the medical man, because he had more difficulty in bringing it into contact with the nerve; unless deeply injected it had little effect on the nerve which he wished to deal with. The pharmacist should not immediately condemn his hydrochlorate as impure, because he heard complaints about it simply that it had been used for some purpose, and was not effectual. On one occasion he had received a serious complaint about cocaine hydrochlorate which had been sent to South America, and in fact the dentist refused to use it further until asured it was pure, when the very same article was being sent out to medical men in England, and produced satisfactory results.

Professor TICHBORNE said he had listened with considerable pleasure to this paper, as he had some knowledge of the subject, and quite agreed with Mr. Williams that the qualities in the market were very varied. It was his fate to have occasionally to neutralize the cocaine alkaloid as found in commerce with salicylic acid, and having a note of what was originally the saturating power of a sample of pure cocaine made by Merck, he found that he very rarely got the same figures; and further than that, two samples from the same manufacturer rarely coincided. He would

ask Mr. Williams, if he had come to any conclusion, what was the origin of that peculiar mousey smell which everybody who had had to do with cocaine would have noticed. It was evident that there was a substance present having an odour which was remarkably like that of conine. As regarded keeping in solution, he would recommend a method of his own. Some years ago he put before the Conference the application of a salicylate for keeping solutions of the alkaloids, chiefly in connection with atropine. Some serious effects had been produced by the use of muddy solutions of cocaine hydrochlorate, the muddiness being due to some fungoid growth which appeared in warm weather in two or three days. He found that camphor water would not keep cocaine except for a short time, and when the fungoid growth was once produced it was not a matter simply of loss of strength, but of danger, as such a solution sometimes produced a very peculiar ophthalmic disease. If a faintly acid solution of salicylate of cocaine were carefully prepared, it would keep at least twelve months, if not longer.

Mr. Maben corroborated what Dr. Symes had said. Some samples were much more amorphous than others. He had asked medical practitioners to take special notice whether any difference was found in the operation of these different samples, but they had not found any appreciable difference.

Mr. Williams, in reply, said he did not think he could add much in answer to Mr. Sheppard, as it was not in his department of pharmacy; the same with regard to Professor Tichborne's remarks. He should not like to speak about the keeping properties of hydrochlorate of cocaine when in solution, as he had not investigated it. It was quite true that a considerable quantity of cocaine at present did go to Germany and came back again to England in a more or less finished state. His efforts were rather to show that they could do without that process, and that the English manufacturer or even pharmacist could perform this operation so readily that he could purify his own cocaine. Dr. Symes had remarked that probably some of the cocaine was lost, and also remarked on the acidity: he found that if a hydrochlorate containing free acid were used, the acidity was retained in solution in the alcohol and ether. He could only say that with a pure sample of hydrochlorate of cocaine—he had tried the experiment over and over again—if 100 grains were taken, dissolved in absolute alcohol and precipitated by absolute ether, there was not a loss of one grain. There was a loss when a commercial or comparatively impure hydrochlorate of cocaine was precipitated, but it only lost what ought to be

lost—impurity. He also thought that if some of the cocaine were tested in the way he had described, with litmus paper, it would be found perfectly neutral, and could be used for hypodermic and other purposes without the slightest hesitation. He also agreed with Dr. Symes that the ordinary commercial hydrochlorate in the market was a very good article; he was not saying a word against it; but still he thought, as Professor Tichborne had mentioned, as it was known to vary, there was no reason why it should not be brought to perfection. The real increase in cost was very trifling, for there was no reason why methylated ether should not be used. The whole of the odour of methyl went off, and he did not think it made the slightest difference to the result. The saturating power he had not gone into; he had been satisfied with getting an apparently definite result.

The next paper read was entitled—

PHARMACEUTICAL NOTES ON SOME SYNTHETICAL COMPOUNDS RECENTLY INTRODUCED INTO MEDICINE.

By H. Helbing,

Apotheker of the German Hospital, London.

The remarkable increase in the number of organic compounds contained in the materia medica, which recently has been even much more rapid than formerly, may be taken as a reliable indication of the progress made by the chemistry of medicine in later years.

When we remember that before the commencement of this century the separation of active principles like morphine or quinine from the raw drug was unknown, we cannot restrain from admiration of the vast number of synthetically prepared remedies which have since been introduced, and of which the greater part is of quite recent origin.

In attempting to place before you an account of a number of these modern improvements, I have paid special regard to the pharmaceutical side of the question, and have avoided lengthy formulæ, or the minute details of preparation, as also chemical reactions. I have confined myself to giving in alphabetical order a description of certain antipyretics, antiseptics and soporifics, samples of which you here see, together with suitable combinations

and preparations of them. Details are also given of the nature, solubility, and therapeutic value of these remedies, besides a few hints which may be found to be of use in dispensing. I also note the melting and boiling point of each, as these are of great importance in determining the purity of the preparation; indeed they supply the chemist with ready means of testing the article for himself at once.

Acetphenetidin, paraecetphenetidin,

$$NH(CO CH_3)C_6H_4.OC_2H_5.$$

This antipyretic has only been in use for a short time, but the results hitherto obtained with it are described as excellent. Hinsberg and Kast have shown that a dose of three to eight grains is able to reduce the temperature of the human body by 3·6° F., and the experiments carried out in the clinic of Professor von Bamberger, of Vienna, have only tended to confirm the favourable accounts of the discoverers. It appears to be perfectly devoid of secondary effects, and fully able to bear comparison with all other febrifuges.

It is a greyish white crystalline powder without smell, producing a slightly pungent after-taste; it is practically insoluble in water, but dissolves readily in alcohol. The melting point is at 275° F. It is advantageously prescribed in the form of powders containing the above-mentioned dose, since from its tastelessness it is readily taken by patients.

Amylene hydrate.—Tertiary amylic alcohol, dimethyl ethyl-carbinol.

$$\begin{matrix} CH_3 \\ CH_3 \\ C_2H_5 \end{matrix} \!\!>\!\! C.OH.$$

Only a few weeks ago this compound was recommended by Professor Jolly and von Mering as a soporific, in which class of remedies it appears to have taken a prominent place. Before applying it to patients numerous experiments on animals had been carefully carried out. A dose of ʒj. is sufficient to produce sleep for six or eight hours. No unpleasant secondary effects are recorded.

The remedy is given in water (in which it is soluble in the proportion of 1 : 12) with a little juice of liquorice.

Amylene Hydrate,	
Liq. Glycyrrhizæ	āā ʒj.
Aq.	ad ʒj.

S. to be shaken before use.

It is also administered in capsules of gelatine.

It is a clear fluid with an odour reminding one slightly of camphor; it is soluble also in alcohol. Specific gravity, 0·812 at 5·36° F. Boiling point, 216° F.

Antifebrin, acetanilide, phenylacetamide,

$$C_6H_5NH.CH_3CO.$$

Since the first experiments with this valuable remedy, performed by Drs. Cahn and Hepp, in Strasburg, antifebrin has been carefully studied by others, and with the same satisfactory results. It possesses the advantages over other remedies of this class of being low in price, and moreover the dose is small; 2 to 10 grains once, twice, or at most three times a day sufficing to produce a considerable reduction of temperature in cases of typhoid fever, pneumonia, also in erysipelas and acute rheumatic gout. It is given in powders as well as in solution; for the latter mode of administration it will be found most advisable to dissolve it in brandy, subsequently adding a little water and syrup. The following formula is given as an example :—

Antifebrin	ʒj.
Brandy	ʒivss.

Dissolve and add—

Distilled Water, Simple Syrup	āā ʒvj.

One tablespoonful to be taken as directed.

The remedy is thus rendered very pleasant to take, and the patients express no aversion to it.

A good preparation should be of pure white colour, and form moderately large crystals, which are but very sparingly soluble in cold water, rather more readily in hot, and easily in alcohol: antifebrin melts at 233·6°, and boils at 563°.

Antipyrin, oxydimethylchinizine, $C_{10}H_9CH_3.N_2O$.—Antipyrin may fairly be considered the most popular of modern antipyretics. The dose varies from 15 to 30 grains, two, three or more times a day. For children 3 to 12 grains will be found to be sufficient. It is of great value in all febrile diseases, reducing temperature very promptly. Of late it has also been applied in subcutaneous injection as a local anæsthetic. In some cases a bright pink rash, like nettlerash, will suddenly appear during treatment; this is considered to be of no importance, as it causes no inconvenience and soon disappears.

Antipyrin is readily soluble in water and alcohol; it possesses but little flavour, and that not unpleasant; and is, therefore, adapted for administration in solution. It thus possesses great advantages over quinine, especially in treating children, who take it very readily if mixed with a little syrup, thus:—

Antipyrin	80 gr.
Simple Syrup	ʒj.
Water add to	ʒiv.

Two teaspoonfuls for a dose.

This mixture is almost free from bitterness, and children do not at all object to it.

It crystallizes in colourless laminæ, which melt at a temperature between 230° and 235·4° F.

Antithermin, phenylhydrazinlevulinic acid,

$$C H_3 C (C_6 H_5 N - N H) C H_2 - C H_2 C O O H$$

has been recommended as a febrifuge, but although it is now obtainable in the market, details are still wanting as to dose and effect. It forms large colourless crystals of a slightly bitter taste, which cause an unpleasant grating when ground between the teeth. It is insoluble in water, and but sparingly soluble in alcohol. The most suitable form for administering antithermin is the pilular.

Aseptol, acidum sozolicum, orthophenolsulphonic acid,

$$C_6 H_4 O H S O_2 O H.$$

By aseptol we understand a $33\frac{1}{2}$ per cent. solution of orthophenolsulphonic acid. It is almost odourless, but faintly suggests carbolic acid, and is reported to possess the antiseptic properties of this latter antiseptic and of salicylic acid, standing, as regards strength, midway between them. Its superiority lies in the possession of antiseptic without poisonous or irritating properties, so that it is especially adapted for abdominal surgery and for ophthalmological operations. Sozolic acid is readily soluble in water, alcohol, and glycerine. It is applied in a solution of 3, 5 or 10 per cent., to which strength the stronger solution can be reduced by dilution with water.

Betol, salicylate of β naphthol ether,

$$C_6 H_4 O H . C O O . C_{10} H_7.$$

This remedy is one of the very newest, and analogous to salol. It is applicable therefore in all those cases in which this latter is found

to be of use, viz., rheumatism, cystitis, etc. The dose is given as 5 to 8 grains in some cases of intestinal catarrh. As it is not a phenol compound, betol possesses the advantage of being freer from detrimental properties than salol.

It forms small, white, resplendent crystals, is almost devoid of taste, and being insoluble in water is best dispensed as a powder or in compressed tablets, or in pills made up with liquorice juice and powder, each containing $2\frac{1}{2}$ grains of betol. It is soluble in alcohol, as also in fatty oils, and is therefore well adapted for being worked up with butter of cacao into pencils for the treatment of gonorrhœa. These may be prepared by melting four parts of ol. theobromæ, and adding to the warm liquid one part of betol. This readily dissolves in the fat, and the mixture is allowed to partially cool, when it is poured into moulds. The finished product contains of course 20 per cent. of betol.

The melting point of betol is 203°.

Hypnon, acetophenon, $C_6 H_5 C O C H_3$.—By means of 3 to 8-grain doses of this very powerful soporific a profounder sleep is produced than that caused by chloral hydrate. Hypnon possesses an agreeable aroma somewhat resembling a mixture of oil of bitter almonds and neroli, but its action on the mucous membrane of the mouth is almost caustic. It is dispensed therefore in capsules of gelatine, each of which contains 1 grain of the remedy combined with 10 of almond oil, to prevent any risk of unpleasant effects.

It is a colourless fluid, sparingly soluble in water, more readily so in alcohol, of the specific gravity 1·032 at 59° F., the boiling point being 410° F.

Methylal, dimethylether of methylene, $C H_2 (O. C H_3)_2$.—Methylal is a soporific of a very recent date. It is administered in doses of 20 to 25 grains in water, with a little syrup.

Thus :—

Methylal.	℥j.
Syr. Orange Flower	℥ss.
Water	℥j.

One tablespoonful for a dose.

It has also been applied externally as a local anæsthetic dissolved in oil, or as an ointment, with lard as a base. Both forms are made to contain 15 per cent. of methylal.

It is a colourless ethereal fluid, which smells like a mixture of chloroform and acetic ether, and tastes pungent and aromatic; it is readily soluble in water as well as in alcohol; the specific gravity at 59° F. is 0·855; it boils at 107·6°.

Naphtalin, $C_{10}H_8$.—To most fungi naphtalin has been found to be a powerful poison, and has proved very valuable as an antiseptic, being applied in the same manner as iodoform. Professor Rossbach, of Jena, first administered it internally in cases of acute and chronic enteric catarrh, in typhoid fever and acute gastro-intestinal catarrh. It has since been extensively applied, but not with absolutely uniform results. It is given as a powder in wafer in doses of 2 to 8 grains, to which a drop of oil of bergamot is added to obliterate the peculiar smell of tar belonging to it, which makes it otherwise impossible for some patients to take it. For example, the following formula may be adopted :—

Naphtalin	30 gr.
Sacch. Alb.	30 gr.
Ol. Bergam	1 gr.

Make a powder and divide into ten doses, one to be taken three times a day.

Naphtalin is a crystalline body forming colourless, resplendent scales; it tastes pungent, is insoluble in water, but sparingly soluble in cold alcohol and fatty oil, but readily if these agents are heated. The solution in oil and the ointments should be made to contain 10 per cent. of naphtalin, which must be added to the warm fatty matter. Melting point, 176° F.; boiling point, 424·4°.

Naphtol β = naphthol, isonaphtol, $C_{10}H_7OH$.—As a substitute for tar preparations, naphtol has been applied to the skin with very good results, especially in psoriasis and other chronic affections. A 2 to 5 per cent. solution in alcohol is the usual form of application, but it can also be made up into ointment containing 3 to 25 per cent. Internal administration of this compound was attended with toxic effects, and has, therefore, been discontinued.

It crystallizes in resplendent scales, has an aromatic odour, is slightly soluble in hot water, readily so in alcohol and fatty oil. A very good ointment may be made by adding 1 part of naphtol to 10 of melted lard, and well stirring. The substance dissolves without much difficulty, and forms a white, smooth product.

Naphtol melts at 253°, and boils at 546·8°.

It should not be confounded with naphtalin.

Salol, phenylether of salicylic acid, $C_6H_4OH.COO.C_6H_5$.—This remedy appears to give the greatest promise of future importance, for in the short time that it has been known, it has done very good service as a febrifuge and an anti-rheumatic, being

administered in doses of 15 to 30 grains two or three times a day, as also as a gargle, ʒij., thus—

Salol	ʒij.
Spirit. Vin.	ʒiv.

A teaspoonful to a glass of warm water for stomatitis and ulcerations of the mouth and pharynx.

A salol mouth-wash is also very much recommended, and may be prepared as follows:—

Take salol, gr. 40, dissolve in ʒiv. of a suitable spirituous dentifrice liquid. Half a teaspoonful to be used in a glass of water, with which it forms a milky emulsion.

For chronic forms of diphtheria, it is reported to have more powerful effect than solution of chlorate of potassium or salicylic acid. It is also applied, worked up with butter of cacao into pencils, as an antiseptic. These are prepared in a similar manner to those of betol before mentioned.

Salol is a white crystalline powder of a mild aromatic odour; it is insoluble in water, but soluble in alcohol. The melting point is 108° F.

Thallin, $C_9 H_{10} N (O C H_3)$.—Thallin is employed either as sulphate or tartrate. It is rapidly obtaining a recognised position in the materia medica, for it is a reliable and powerful antipyretic, applicable in all kinds of febrile conditions. 3 to 8 grains in pill are considered a suitable dose. It is also applied externally, especially lately, with great success, for injections in cases of acute and chronic gonorrhœa, for which it is prescribed in aqueous solutions containing 1 drachm of the thallin salt in ʒvj.

Salts of thallin are crystalline powders, not quite pure white in colour, of a bitter and intensely aromatic taste, and of a peculiarly persistent odour, which is similar to that of coumarin; they are readily soluble in water, but far less so in alcohol.

Urethan, ethyl of urethan, $C O (N H_2). O C_2 H_5$.—As a mild hypnotic, urethan is very useful, being administered in doses of 15 to 40 grains, either as a powder or in solution, with a little syrup as a corrective. Thus—

Urethan.	ʒij.
Syr. Simpl.	ʒj.
Aqua	ʒiij.

Two tablespoonfuls for a dose.

It does not produce a comatose condition, like chloralhydrate,

but tends to induce a healthy natural sleep in cases where this is impeded by other causes.

It is a crystalline body of a mild ethereal odour, tastes somewhat like saltpetre, is soluble in water and alcohol, and melts at about 120° F.

The list comprises a considerable number of remedies which German chemists are obliged to have always in readiness, as they are continually, and indeed almost daily, required in making up prescriptions. The greater part of these compounds are now hardly considered new in Germany, having obtained a recognised position in the materia medica, and having, as such, become in a great number of cases favourite drugs of many physicians. But as far as my experience goes, such is by no means the case in England.

This subject is a very important one, and it would be interesting to know why English physicians and English chemists do not pay these remedies that attention which they have been considered by other scientists to merit and repay. That this neglect really exists in this country is almost indisputable; at any rate these articles are sold but in very small quantities compared, for instance, with the consumption of them in Germany. Salol, as I have been informed by competent authorities, has scarcely been used at all here. The statistics of the manufacturing firm show, that of antipyrin, one of the most extensively applied antipyretics, five hundred times as much is used on the Continent as in England. Nevertheless antipyrin has been so thoroughly studied by numberless authorities, that doubts certainly cannot be entertained as to its being a most valuable remedy.

No one can fail to be struck with the active endeavours made by men of the profession in England to obtain standard preparations, and their preference for remedies containing a definite quantity of active principles. Consequently it might be presumed that these synthetical compounds, which really represent the *beau ideal* of concentrated, pure, and uniform preparations, would quickly command that attention which has already been accorded to them elsewhere. I conclude my remarks with an expression of the hope that these medicines will soon find a place in British pharmacy, which in other respects calls for cordial admiration on account of its high scientific standing and the care expended in a thorough investigation of all valuable remedies.

I shall be pleased to offer some of the best preparations men-

tioned in the above list to the Museum of the Pharmaceutical Society.

The PRESIDENT, in proposing a vote of thanks to Mr. Helbing, drew special attention to the very fine specimen of betol shown. If he remembered rightly, Dr. Paul had recently called attention to this article in the Journal. The paper was specially interesting as giving point to the address they had heard from Professor Leech that morning. With regard to the moral of his story as to the different course pursued by medical men in Germany and in England, of course that was a question on which they could offer no opinion; but any rate it was a matter of great interest to see such fine specimens of some of these new remedies.

Mr. COLLIER said he could not agree with the remark that few of these things were used in this country. Several of them had been employed in the hospital to which he was attached, but they did not seem to possess all those properties which were attributed to them. He got a certain quantity of one of them, and it was at first used rather largely, and he had to obtain an increased quantity. Then the whole thing seemed to drop out, and he had at the present time some of them in his cupboard which would never come out until they were cleared away. One of the latest tried was kairin, which had proved rather dangerous, and the effects were not found to be satisfactory.

Dr. SYMES did not think the reproach that these things were not used in this country should go forth unchallenged, for on this point he could support the remarks of the last speaker. He did not wish to at all discount the importance of their being brought forward, but they were very largely used in this country, although all the effects they were said to possess in the first instance were not endorsed. It was due to English physicians to say that quite recently they had shown that antipyrin possessed other properties than those which were originally attributed to it. It was now being used as an anæsthetic. He thought that medical men in this country were quite willing to use, and pharmacists were quite ready to supply, these new remedies as soon as they had any authoritative information of their usefulness.

The next paper read was a—

NOTE ON CAMPHOR OIL.

By Peter MacEwan, F.C.S.

Some years ago the volatile oil, which is obtained in Japan as a bye-product during the manufacture of camphor, was introduced into this country as a therapeutic agent, and I had the opportunity of examining a specimen which had been presented to the Pharmaceutical Society, and found that it did not contain camphor. Afterwards Mr. John Moss communicated a paper to this Conference, in which he gave analytical results of a number of samples of the oil, showing that it is of a very variable nature. A wish expressed at that time for a complete analysis of the oil was very shortly satisfied in the paper communicated to the Chemical Society by Mr. Yoshida, a Japanese chemist (*Journ. Chem. Soc.*, October, 1885, p. 779), who showed that the oil consists of two hydrocarbons boiling at 150° C. and 172° to 173° C., camphor (about 23 per cent.) and an oxygenated oil, *camphorogenol*, which through the influence of heat and oxidation changes into camphor, thus accounting for the deposition of camphor in the oil through age. The oil is still used to a considerable extent in this country, and large quantities are imported into the United States, where, it is stated, its principal use is as an adulterant of essential oils, especially peppermint oil.

I have examined numerous samples of the oil during the past two years, and have been struck with the great range of quality which they exhibit. Some are almost colourless, others very dark, and their other physical characters show great variation, as may be judged from the figures which are given below. In the discussion on Mr. Moss's paper there was some doubt as to the cause of the dark coloration of some samples, but that point was cleared up by Mr. Yoshida. The colour is not due to the tins in which the oil is imported, but to the heat which it is subjected to; in other words, the dark oils are residues, as may be judged by the following results:—

Sample A. A dark brown oil with a perceptible green shade; specific gravity, 0·960. A measured volume fractionated gave no distillate below 180° C. The fractions were:—

	Per cent.	Specific gravity.
180–190° C.	21·5	0·915
190–202° C.	*nil*	—
202–210° C.	22·0	0·945
210–225° C.	28·0	0·977

The residue has a specific gravity of 0·998, and was quite free from camphor, so were all the fractions. As camphor begins to distil about 200° C., it is evident that the oil contains none. Sample B was of a curious character. It was similar to A in appearance, but was heavier (specific gravity, 0·995). It was heated for some hours far above the boiling point of camphor, but not a drop of distillate was obtained. I have examined other samples of a similar character with the same results, the inference being that high specific gravity and dark colour are indicative of absence of camphor.

The following results were obtained with samples which were of a pale colour:—C was a water-white oil, D and E of a pale straw colour, and F was amber coloured. Their specific gravities were:—C, 0·926; D, 0·933; E, 0·922; F, 0·974.

They gave on distillation the following results:—

C.	Per cent.	D.	Per cent.
140–150° C.	4	—	—
150–170° C.	32	—	—
170–190° C.	30	175–192° C.	38·5
190–202° C.	6	192–202° C.	31·5

E.	Per cent.	F.	Per cent.
150–178° C.	18·5	—	—
178–190° C.	40·5	180–195° C.	7·5
190–202° C.	10·0	195–205° C.	20·0

In each case camphor began to distil at the highest temperature noted, and the residues on cooling contained crystals of camphor, and were of a brown colour. None of the fractions yielded crystals of camphor on cooling to 0° C. The specific gravity of the distillates between 150° and 178° varied from 0·886 to 0·892, and between 170° and 195° from 0·901 to 0·921, this variation being due to the distillate being more abundant at the beginning or end of the fraction. I did not find it possible to estimate the amount of camphor in each oil, obviously that is not possible by heating, as the camphorogenol would be changed in the process; but I may say that sample D gave the most abundant distillate of camphor. Sample F should be compared with A and B, both as regards its fractions and specific gravity. It is evidently a mixture of such an oil as D and a residue oil, probably with some camphor added to it; some insight is added to the latter suggestion by the fact that a higher temperature than in other cases was required to distil off the camphor. C is an excellent oil, better in appearance than any other, and evidently more carefully prepared.

It is desirable that camphor oil should be brought to some state of uniformity before it gets into the hands of the retailer, and to do this the dark and heavy oils should be excluded, as suggested by Mr. Moss, the rest bulked and submitted to distillation, so as to get rid of all that will distil below 170° or 175° C. The distillate would be very suitable for varnish making.

I observe that a paper on "Camphor Oil" was recently contributed to the Massachusetts Pharmaceutical Association, by Mr. E. C. Marshall, who comes to the conclusion that the oil supplied by wholesale druggists in the United States contains no camphor, having arrived at this opinion by simply cooling the oils to the freezing point of water. This is not a conclusive test; the oil must be distilled in order to get a true idea of its worth, and the results should be judged in connection with the specific gravity. If it contain the lighter hydrocarbons, it is evident that it has not been subjected to prolonged heating in order to get all the camphor out of it, and these light hydrocarbons, are the better solvents of camphor, so that they prevent its separation on freezing, unless it is present in large quantity.

Samples A, B, D and E were taken from the tins in which they were imported. I am indebted to Mr. John Moss for them. C and F are oils as supplied to retailers.

The President having moved a vote of thanks to Mr. Mac Ewan,—

Mr. John Moss said they were all much obliged to Mr. MacEwan for this paper, but he did not quite follow his reasoning when he said he thought one sample of oil had had camphor added to it; he could hardly imagine that such was the case, seeing that camphor was four times as valuable as the oil. It might be interesting to the meeting to know that immense quantities of this oil were imported into Europe for distillation, and found their way into various industries. The endeavour made some short time ago to use camphor oil generally in pharmacy had only been partially successful, it only being used to a very limited extent. A great deal of the oil which came from Japan, and thousands of cases came every year, went to German oil refiners and distillers, and were by them subjected to cold to extract the camphor, of which large quantities were obtained in this way. It was then distilled, the lighter oils being used chiefly for making varnishes, drying paints, and things of that kind, and an enormous quantity came to this country for these purposes. The next heavier oil was almost

identical with the natural oil of sassafras, and to it the name of safrol was given. Some of it, he believed, found its way into pharmacy under the name of oil of sassafras, going round by way of America. It was not much used in pharmacy, however, its chief use being for soap-making. He was informed recently by a large distiller that he had succeeded in isolating from the heavier oils, after safrol had been separated, a considerable portion of eugenol, the heavier portion of the oil of cloves, and so large a quantity did he deal with, that although the proportion of eugenol was very minute, the total quantity produced was very large. This gentleman did not believe very much in Yoshida's camphorogenol, which he thought was simply the lighter oil which gradually underwent a process of chemical change, and produced camphor. Of course the name was a perfectly true descriptive name to apply to the light oil, provided his friend was correct as to the fact, but Yoshida applied it to a distinct body which he said he isolated.

Mr. MacEwan explained that his reasons for thinking that camphor had been added were given fully in the paper. He could not account for the abnormal figures produced in any other way.

A paper was then read entitled—

SOME FUNDAMENTAL ERRORS IN THE BRITISH PHARMACOPŒIA.

By Charles R. C. Tichborne, LL.D., L.A.H.I., F.I.C., Etc.

At the time that the British Pharmacopœia of 1885 appeared, there were multifarious criticisms upon that book. Perhaps no work ever published in our generation got such a critical analysis. Some were carping, a large proportion of the criticisms erroneous, and I must confess a very small minority correct. Even to the present day, however, some stand uncorrected, such as that on p. 27, where the manufacturer of sulphurous acid is directed to put 30 oz. of distilled water into a 20 oz. bottle. I am inclined to think that as a whole, very few books (containing so much condensed work) are so free from errors. In making my remarks on Pharmacopœial errors, of course I am not going to discuss or consider what might be suggestions for possibly improved formulæ; I am dealing with actual mistakes. There are errors in calculations in connection with the weights, however, which permeate

the whole of the Pharmacopœia and which I think should be carefully put to rights in the new edition. Thus in the temperature used in graduating measures used by the Pharmacopœia and those graduated by law, there is a discrepancy which throws everything into confusion. The errors produced are not large, but unfortunately they pervade every calculation in the book, and produce that uneasy feeling which must prevail where we are knowingly working upon wrong data. How can we accept such paragraphs as the following, which we quote from the B. P., under such a state of thing? Preface (1885) says, "among the objects contemplated in revising the process for various preparations has been that of promoting increased uniformity of strength." Again, in Preface (1887), "By the Medical Act, it is enacted that the General Council should cause to be published," etc., "together with the true weights and measures by which they are to be prepared." Again, "it is to afford to the members of the medical profession and those engaged in the preparation of medicines throughout the British possessions one uniform standard and guide, whereby the nature and composition of substances to be used in medicines may be ascertained, with the object of establishing uniformity of strength and composition." We are informed in the same preface that the legalized imperial weights and measures are to be used, but that specific gravities are to be taken at 60° F. In the appendix we are informed that the volumetric solutions are to be made with vessels graduated at 60° F., and all measurements are to be made at 60° F. One of the worst examples of confusion is, however, the statement that we are to make the measurement with true metric apparatus at 60° F. Thus it will be seen that the Pharmacopœia works and makes all measurements at 60°, whilst the imperial measures used are graduated at 62° F., and the metric measures should be graduated at 39·2° F. I should mention that I brought this matter before the General Medical Council, but, unfortunately, too late for anything to be done. The whole of the B. P. was then in type. Nothing, however, could be more courteous than the action of Drs. Quain, Collins, and other members of the Pharmacopœia Committee, who might very legitimately have looked upon me as a bit of a nuisance. I had previously set the Standards Department in motion, who also communicated with the Pharmacopœia Committee, urging them to adopt a standard of temperature which should coincide with the standard of temperature adopted in the construction of weights and measures.

In a communication received by the Medical Council upon the subject, the matter of the gallon is concisely put as follows :—"It is desirable to maintain the legal standard of temperature of 62° F. This temperature was proposed in 1820 by the Standard Commission, and has been adopted in all successive Acts relating to weights and measures. It is at this temperature only that the standard gallon, the yard, and the pound have their true values. The temperature of 60° has been followed in error by many of our high modern chemical authorities, and it would appear to have been originally used for hydrometric purposes, and hence has improperly found its way into modern practice." Now, it is self-evident that a common standard of temperature should be agreed upon by the common consent of the Legislature of the country and scientific men. On looking into the matter, I see at once that so many important Acts of Parliament are connected with the question, that it would not be expedient, in my opinion, to change the temperature standard (62°). Nor can I see any reason for retaining the standard of 60° F., except it be for the convenience of holders of stock of volumetric apparatus. They would, I am sure, be recouped by the large demand for new instruments. Some years ago, in communicating with the Standards Department of the Board of Trade, in connection with the standard cubic foot of gas, my attention was called to the fact that all the standards of weights and measures as defined and used in numerous Acts of Parliament were based upon these data, or measurements taken at a temperature of 62° F., and all referable to a fixed natural standard, viz., a pendulum vibrating under certain arbitrary conditions. The standard gallon, when divided into 70,000 parts, constitutes the unit, or the standard grain. As a worker in science I am aware that it is a very general practice to make all measurements, etc., at a temperature of 60° F., and I have had under consideration for some time past how far this discrepancy would affect many of the methods adopted in practical sciences, and naturally examined the Pharmacopœia from this point of view. I find the weights and measures throughout the body of that work are divisions of the above specified gallon containing 70,000 standard grains, whilst the volumetric solutions are constructed upon the gallon at 60° F., which contains about 70,011 grains, as determined by myself theoretically.* Mr. Chaney, of the Standards Department, kindly gives the results of actual experimental determination. I will quote his words: "If we weigh a gallon of distilled water

* Calculated from the tables of expansion of water by heat.

in a brass vessel when the temperature of the water, brass, and air is each at 62° F., we find, as pointed out in your letter of yesterday, that the gallon of water weighs 70,000 grains. If, however, we weigh the same gallon when the temperature of the water, brass, and air is each at 60° F., we find the gallon of water weighs 8·5 grains more, or 70,008·5 grains. If we weigh a gallon of pure water in a glass vessel under the different conditions above stated, then at 62° the gallon of water weighs 70,000, but at 60° it weighs 70,010·45,"—very near my theoretical 11 grains. "The above results are for pressure of thirty inches, but as we know, variation of barometric pressure makes but little difference, about 2·5 grains on the gallon for every inch of the barometer above or below thirty inches. The vessel in which the water is contained becomes of the same temperature as the water itself, and hence it is impracticable to assume as some do that the water is held in an imaginary vessel whose temperature changeth not." Let us see how these variations affect the calculations of the B.P. In estimating dilute sulphuric acid (p. 26) we are directed to take 6 drachms (the division of the 70,000 grained gallon) and estimate it by a volumetric solution made according to my calculations theoretically per 70,011 grains per gallon. We are therefore working under such conditions that we could only obtain correct results by taking and measuring the substance to be estimated at 62° F., and by using and maintaining the temperature of the volumetric solution at 60° F.—a condition of things not indicated in the directions of the Pharmacopœia (*vide* p. 489), nor is it the principle upon which a reliable volumetric analysis is made. We are supposed to be working not so much at a fixed temperature as at an equal temperature, and also assuming that all instruments used in one experiment have been graduated at the same temperature. The temperature of the room where you are working is a matter of secondary importance, because it will affect the temperature of all the fluids you are estimating equally. But in making a standard solution the temperature becomes important, and your solution must lie either at 60° or 62°, according to the construction of your measures.

Again, at page 487, such statements as "the grain measure" at 60°, "being the volume of a grain of distilled water," is superfluously untrue; and again, a very equivocal position arises from multiplying the standard grains throughout the work by specific gravities taken at 60° F.

I have already said that the most striking point of all is that we

have in the Pharmacopœia still further complicated matters by the adoption and use of the true metric standard, but with an intimation at the same time that we must measure and work with it at 60° F. The litre and cubic-centimetre vessels are supposed by the Committee to be true measures agreeing with the metric system, and that there should be no mistake upon the point a special note is added to show that the c.c. is one fluid gram of water at 4° C. (39·2° F.). The results follow that in making the volumetric solution of oxalic acid, if we use grams and cubic centimetres in making this solution at 60°, we shall dissolve 63 grams of oxalic acid, not in 1000 grams of water, or a litre, but in about 999 grams of water only. It follows that the whole of the calculations in connection with the metric system are also erroneous. I refer to such statements as that 100 cubic centimetres of solution of oxalic acid are equal to 5·23 grams weight of carbonate of ammonia, or 19·1 of borax. We are told that 100 cubic centimetres of volumetric solution of nitrate of silver equal 27 grams of hydrocyanic acid. So it would if we had not been unfortunately directed to use metric measure, and then directed to work at 60° F. In such a case your 100 c.c. of volumetric silver made one-tenth of an equivalent per 1000 parts will in English instruments give the hydrocyanic ·12 per cent. higher than it really is.

The volumetric instruments in this country seem to be generally graduated at a temperature of 60° F., as evidenced by the following experimental determinations :—

Experiment 1.—25 c.c. flask at 60° F. contained by weight 24·986 grams = 999·44 per litre.

Experiment 2.—25 c.c. pipette at 60° F. contained by weight 24·987 grams = 999·48 per litre.

Experiment 3.—20 c.c. flask (foreign) at 60° F. contained by weight 19·867 grams = 993·35 per litre.

Experiment 4.—10 c.c. pipette at 60° F. contained by weight 9·983 grams = 998·30 per litre.

Throwing out experiment 3 and taking the highest and lowest, these experiments give us an error of 1·11 per thousand parts (998·89 grams per litre). Mr. Sutton, in noticing this error, puts it down as $\frac{1}{1000}$. This error of 1·11 would amount to 7·77 grains when calculated upon an imperial gallon.

If we take the graduation upon the same instrument at 62° F., the following will be the result :—

Experiment 5.—25 c.c. flask at 62° F. contained by weight 24·982 grams H_2O = 999·28 per litre.

Experiment 6.—25 c.c. pipette at 62° F. contained by weight 24·985 grams H_2O=999·40 per litre.

Experiment 7.—20 c.c. flask (foreign) at 62° F. contained by weight 19·84 grams H_2O=992·02 per litre.

Experiment 8.—10 c.c. pipette at 62° F. contained by weight 9·98 grams H_2O=998·0 per litre.

At this temperature the experiments would give an average of 998·70, or an error of 1·30 per thousand, which would equal 91 grains on the gallon.

From the above we see that in making the volumetric solution of silver we should dissolve 17 parts (one-tenth of an equivalent), not in 1000 parts of water, but in less than 999 parts of water, and so on as regards all the volumetric solutions. A volumetric solution made in a true litre measure must not be used from a vessel graduated at 60°, and should not be used in connection with gram weights.

Then to return to the estimation of hydrocyanic acid. The Pharmacopœia says that "100 c.c. of the volumetric solution of nitrate of silver will equal 27 grams of hydrocyanic acid (2 per cent.)." This statement would be correct if it were not for the graduation at 60°; but here, although we imagine we have used 100 c.c., we have really only used 99·889 of nitrate of silver solution, and therefore—

$$\frac{99{\cdot}889 \times 27}{100} = 26{\cdot}97,$$

a difference of one-half a grain upon this small experiment, or an error of 0·12 per cent. in the estimation of such an important substance as hydrocyanic acid. We are, of course, assuming that we are using a volumetric solution either made in true French measures or with English measures.

I am aware that it will be said that the error of 11 grains per gallon, or even 77 grains per gallon will never poison any one. That may possibly be true, but such errors are not absolutely necessary, and could easily be avoided, and therefore they should not disfigure a standard work which is to serve for general calculations and as a legal authority under the Adulteration Acts. By this arrangement we have arrived at the invention of a new so-called metric scale based upon no system.

If we are going to graduate our vessels at 60°, why call them cubic centimetres and litres—which they are not?

The PRESIDENT, in expressing the thanks of the Conference, said Professor Tichborne had conferred a great favour on the Conference in bringing forward this paper. Exactness in weights, measures, and temperatures, as far as practicable, were to be desired.

Mr. ABRAHAM was much pleased that this question had been brought forward by a gentleman of Professor Tichborne's position. He had ventured on more than one occasion to point out the anomaly between the measures and the metric weights. He trusted now that Professor Tichborne had pointed out this inaccuracy more forcibly some remedy might be devised.

Mr. LASCELLES-SCOTT remarked that when the Pharmacopœia first appeared there was what some one called a perfect howl of complaint from all quarters; in some instances perhaps the criticisms were not called for, but in too many cases they were found to be based on truth. Various corrections had been officially made, and the editors had to admit a number of errors. The result of that criticism and of such papers as they had heard that morning would be, he hoped, to induce the Medical Council to make good use of pharmacists' knowledge for the next edition, and he felt sure that, having the assistance of Professor Attfield, he would keep them right in the future, or nearly so. One point upon which Professor Attfield had anticipated criticism was with regard to these errors in weights and measures, but it must be remembered that if there were an error to begin with, in a volumetric solution, of only 11 grains to the gallon, it might very well be counterbalanced by the ordinary inevitable errors of analysis; but supposing the latter were in the same direction as those Professor Tichborne spoke of, the aggregate might be very large, and the analyst would be held responsible for errors which were really due to defective measures.

Professor TICHBORNE, in reply, said he had two objects in bringing forward this paper,—one was that the subject should be thoroughly ventilated and investigated before the next edition of the Pharmacopœia came out, and he was quite sure that now attention had been attracted to it, it would not remain as it was. No doubt the matter would be well looked after by Professor Attfield. Secondly, every one liked to get credit for his own observations, and he had thought it desirable to put it on record that he had brought this matter before the Pharmacopœia Committee, who no doubt would consider it. The Conference had heard that morning, in connection with Professor Leech's admir-

able paper, what small doses would act upon the human body, and it had been suggested that it was desirable to weigh the patient in order to regulate the doses. He, however, could not see that there would be any use in weighing patients if they could not estimate hydrocyanic acid and similar medicines to ·13 per cent.

The Conference then adjourned for luncheon.

On resuming a paper was read on—

A SPURIOUS CUBEB.

By William Kirkby, F.R.M.S.,

Pharmaceutical Chemist.

The large extent to which cubebs have been adulterated during the last few years is so well known to every pharmacist that it will hardly be a matter of surprise that I should bring another instance of cubeb substitution under your notice.

In 1885 (*Pharm. Journ.* [3], xv. 653) I described a false cubeb which a little prior to that time had been spoken of as being probably the fruit of *Piper crassipes*. My paper appears to have had the unexpected result of confirming the opinion that such was the source of this drug, although I distinctly pointed out how it differed from the description given in "Pharmacographia" of a reputed specimen of *P. crassipes:* namely, in *P. crassipes* having a pedicel from one and a half times to twice as long as the berry, and having a very bitter taste, while the berry described has a pedicel usually about the same length as the fruit, and a taste which cannot be described as very bitter. Instead of referring to this variety, therefore, as *Piper crassipes*, I shall call it the "short-stalked" variety, leaving the identity of it to be determined by an examination of authentic fruits, which I hope to be able to undertake when the necessary material comes to hand.

At the beginning of this year I received from Mr. E. M. Holmes a supply of false berries more nearly resembling cubebs in certain respects than any previous substitute.

Like cubebs they consist of a berry supported on a non-articulated stalk. The globose head is generally flattened on the top, with sometimes a slight elevation at the apex; the base is suddenly contracted into the pedicel, which not infrequently arises from a depression, and is stouter than in the true drug, as well as being laterally compressed. In colour they vary but little, being of a

dark brown tint; they are more or less wrinkled according to the stage of their development. When freshly bruised an abundance of essential oil exudes, having an agreeable camphoraceous odour reminding one strongly of cajuput; the taste is aromatic, somewhat pungent and bitter. The diameter of the head ranges from 4 to 7 mm., and the length of the stalk from 7 to 11 mm., being from one and a half times to twice as long as the berry (fig. 1).*

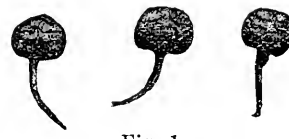


Fig. 1.

In the more fully developed fruits, known by their comparatively smooth skin, the perisperm is seen to be white and starchy.

The pericarp consists of the same number of layers as in cubebs (fig. 2). In my previous paper the example of other writers† was followed in applying the term testa to the inner shell of the pericarp. This I now think to be incorrect, for though there are four distinct layers in the pericarp, the testa and the tegmen are found attached to the seed, which is only united to the hard inner shell of the pericarp at its base. It will therefore be seen that the terms used in this paper have not reference to the same parts as in the former one.

The epidermis is composed of small flattened cells, covering an interrupted ring of cubical sclerotic cells. Within this is the broad layer of loose parenchyma interspersed with larger cells containing oil. These latter resist the action of strong sulphuric acid to a greater extent than the surrounding tissue, and the oil is not coloured by being left in contact with it. Small groups of stone elements are present in it; also a quantity of starch. The succeeding portion comprises about eight or ten rows of regularly arranged thin-walled cells, extended tangentially; it is free from starch, but the inner rows contain small crystals of calcium oxalate. I find that crystals are likewise present in the "short-stalked" drug and in cubebs, but are much smaller; indeed, in cubebs they are almost indistinguishable, hence my failure to discern them before. In both these instances calcium carbonate was found, while but little is present in this specimen. From this it may be inferred that

* The woodcuts of this and subsequent illustrations were kindly lent by the Editor of the *Pharmaceutical Journal*.

† "Pharmacographia," 1874, p.522.

there is some connection between the two salts. The inner part of the pericarp, found as a hard shell, and described before as the testa, consists of two, or occasionally three, courses of angular, isodiametrical, sclerotic cells. Between the epicarp and mesocarp are from sixteen to eighteen woody bundles; the xylem is composed of a few spiral vessels, and the phloem of soft bast with one or two fibres. The seed is in structure identical with that of cubebs, the

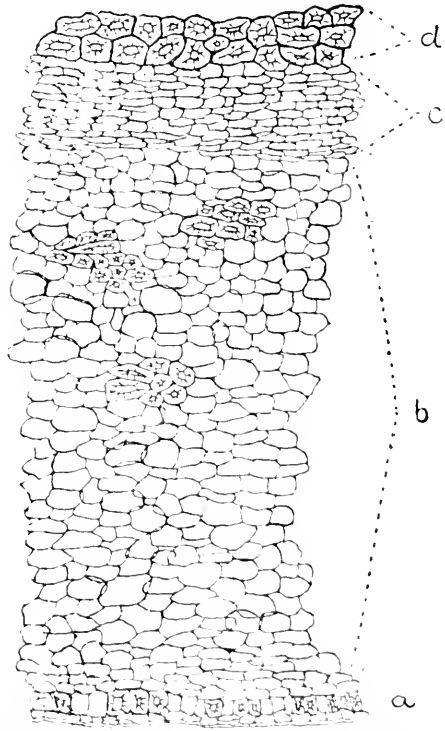


Fig. 2.—Section of pericarp of spurious cubebs×62. *a*, epidermal layers; *b*, epicarp; *c*, mesocarp; *d*, endocarp.

integuments consisting of two membranes, and the perisperm of hexagonal cells, radially elongated, containing an abundance of starch. The starch granules are small, angular, and have a very distinct central hilum. The greater portion of the cells contain a globular starch body, consisting of an agglomeration of starch granules; these are a very characteristic feature (fig. 3). Strong sulphuric acid reveals no specialized cells by any colour reaction.

In structure this drug differs from cubebs in having stone elements in the epicarp, in having more than four rows of cells in the mesocarp, in the endocarp having isodiametrical stone cells in more than one row and not radially extended, in the larger crystals of calcium oxalate in the mesocarp, in having the round starch bodies in the perisperm, and in the oil giving no colour reaction with sulphuric acid. It differs from the "short-stalked" drug in the same particulars, with the exception that they both have about the same number of cells in the mesocarp.

In the unground state it may be distinguished from cubebs by its larger size, less wrinkled surface, flattened pedicel, its cajeput odour when bruised, and by giving no carmine colour when crushed

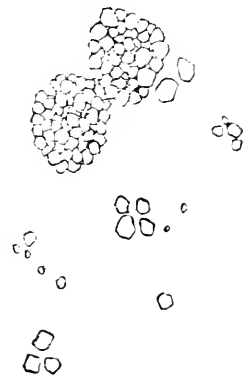


Fig. 3.—Starch of spurious cubebs ×620.

on a white surface and treated with strong sulphuric acid. From the "short-stalked" variety it may be known by its longer pedicel, darker colour, and different odour. In the powder it may be at once recognised by its characteristic starch bodies.

The PRESIDENT, in proposing a vote of thanks to Mr. Kirkby, said this paper strikingly illustrated the value of microscopic work in pharmacy. Mr. Kirkby's reputation as a botanist and microscopist was not confined to the north of England, but was well recognised in Bloomsbury Square. Though the note was but a brief one, no one could have listened to it without being struck by the careful and prolonged examination with the microscope which this specimen had received.

Mr. Holmes said the members were much indebted to Mr. Kirkby for placing in their hands the means of detecting this possible adulteration of powdered cubebs, and those who had to deal with that drug must know that, having become very scarce, cubebs were not only adulterated, but several other peppers, etc., were offered as substitutes for it. One of these consisted of the fruits doubtfully attributed to *Piper crassipes*, which possessed different medicinal properties, and produced noxious effects when taken; a second substitute was not known to possess injurious properties, and as to the third one, which Mr. Kirkby had now brought forward, they knew nothing about its medicinal properties, or whether it was superior or inferior to the genuine, or dangerous. Should it prove to be injurious, pharmacists were now in a position to detect its presence. Within the last week he had examined the best sample he could procure of the cubebs at present in commerce, and found it contained not only *Piper crassipes*, but also several other adulterants which were met with previously, mixed together with genuine cubebs, and also some of the very immature fruits which had been recently imported. He had lately received a specimen from Professor Flückiger of what he described under the name of *Piper crassipes*, and the fruit differed in several particulars, notably in greater bitterness and shorter stalks than that hitherto known by that name in commerce. Special prominence might be given to the fact that the fruit in the whole state did not give a crimson reaction with sulphuric acid. He had placed on the table a sample of original cubebs, and also of *Piper crassipes* from the Pharmaceutical Society's Museum, so that members could judge by comparison of the odour of the true cubeb and its adulterants.

Dr. Symes said this paper had considerable interest from a pharmaceutical point of view. They had all felt, until recently, that if they obtained cubebs which appeared to be genuine, and had them freshly ground, that was the best possible way of supplying a good powdered cubeb. Owing to the scarcity of the drug, and its higher price, many persons who formerly ground cubebs themselves had taken to buying it in smaller quantities ready ground. Mr. Kirkby had shown how one adulterant might be detected in the powder, but there was a very rough pharmaceutical process for detecting a very common adulterant, that was by triturating it with a little water in a mortar, when a considerable quantity of sand or gritty matter would be found in very many specimens. He had failed to find a specimen lately in which

there was not too large a portion of siliceous matter. A specimen from quite a respectable house recently contained 12 per cent of ash, and he had been able to wash out sandy matter by merely triturating the powder, and pouring it off two or three times from a mortar. It was far better that they should look for this foreign matter themselves than leave it to the public analyst to do so.

In the absence of Dr. Atkinson the following paper was read by Dr. Thresh.

A CONTRIBUTION TO THE CHEMISTRY OF THE NITRITES AND OF NITROGLYCERINE.

By G. Armstrong Atkinson, M.D.

Late Demonstrator of Materia Medica in the University of Edinburgh.

In the *Pharmaceutical Journal* for July 3, 1886, I published a paper on the "Pharmacognosy of the Nitrites," in which several interesting questions were discussed.

It is desired in the present paper to offer the results of further work at this important subject. Historically, the discovery of the earliest known nitrite, nitrite of ethyl, is usually accredited to Raymond Lully (1235–1315). He seems, however, merely to have recognised the violent action of strong nitric acid upon alcohol, and to have allowed the bulk of the ether, the ethereal nitrous gas of the older chemists, to escape. To Kunkel belongs the credit of indicating in 1681 the importance of the distillate. The further history of this nitrite and of its impure alcoholic solution, the spirit of nitrous ether of our Pharmacopœia, requires no comment. The other nitrites introduced as of scientific or medicinal interest by various chemists and pharmacologists, as nitrite of amyl by Balard, Guthrie, and Richardson; nitrite of potassium by Reichert and Weir Mitchell; nitrite of sodium by Barth and Binz; the double nitrite of potassium and cobalt by Leech, and nitroglycerine—a body closely allied in many of its pharmacological manifestations to a simple nitrite—by Sobrero and Pelikan, have formed a well recognised group. The essential pharmacological basis in this group is nitrous acid. Nitroglycerine is a nitrate of glyceryl, but as Hay showed, this nitrate in the alkaline fluids of the body becomes largely reduced to a nitrite, and so a nitrite

action is produced. All the pharmacological action of nitroglycerine is not, however, to be thus explained.

Nitrous acid cannot well be used medicinally owing to its great instability, especially in the presence of water, however dilute the solution may be. For example, it was found that a watery solution of nitrous acid (prepared in any of the ordinary ways) of the strength of 1 in 1000, kept in a stoppered bottle, half filled, in a room at 60° F., in a few hours was only about 1 in 3000, and although it more slowly deteriorated after this, yet in 12 to 14 days the nitrous element was either absent or but the faintest trace was left. The decomposition is into nitric acid, nitric oxide, and water. Two of the dilute acids of the Pharmacopœia, dilute nitric and dilute nitro-hydrochloric acid, contain nitrous acid, but in so minute a quantity as to be of no therapeutical importance. Further, a substance sold as "Acidum Nitrosum," and sometimes used in medicine, is merely a solution of nitrous in nitric acid, the amount of nitrous acid varying greatly. This preparation, when diluted, rapidly acquires the characters of a solution of nitric acid, over which it probably possesses no advantage. The only possible form in which moderately pure nitrous acid could be conveniently exhibited in medicine is as a watery solution of not more than 1 in 3000, the decomposition of which is retarded by admixture with glycerine. The acid, however, has no advantage over its salts, and could obviously only circulate in the blood as a nitrite. Now nitrites are readily decomposed by very dilute hydrochloric acid, the acid of the gastric juice, to the extent of ·2 per cent., and in the stomach a certain amount of decomposition of a nitrite, as nitrite of sodium, will usually occur. The liberated nitrous acid will be partially destroyed, but, as a prolonged series of experiments on the stomachs of rabbits showed, some is absorbed, under normal conditions at least. It is therefore important to know whether after absorption nitrous would replace carbonic acid in the bicarbonate of sodium existing in the blood serum. Dittmar ("Chem. Analysis," 225) states: "Nitrogen trioxide does not seem to be capable of decomposing the carbonates of the alkalies." To investigate the point, in the first place a stream of carbonic acid gas was passed for hours through solutions of varying strength of nitrite of sodium at temperatures ranging from 60° to 212° F. No decomposition of the nitrite occurred. By mixing solutions of nitrous acid of varying strength with solutions of carbonate and bicarbonate of potassium and of sodium, it was found that at all temperatures between 60° and 212° F.

nitrous replaced carbonic acid. In these experiments one must be certain no nitrite is contained in the solution of the carbonate employed, a not infrequent impurity, as I pointed out in the *Pharmaceutical Journal* of April 17, 1886. Furthermore, as it is probable a certain amount of phosphate of sodium exists in the blood serum, some physiologists indeed regarding it as largely present, it is of interest to know that although phosphoric replaces nitrous acid, yet judging from experiments allied to those with bicarbonate and carbonate of sodium, nitrous acid converts part of the phosphate of sodium in a solution of that salt into acid phosphate of sodium, and forms at the same time some nitrite of sodium.

A brief statement may be made as to some of the other nitrites. Nitrites of sodium and potassium are readily soluble in water; their watery solutions are perfectly stable, provided no fungi be allowed to grow. The solutions can be boiled for hours without undergoing any decomposition, and on exposure to the air they undergo no conversion into nitrate unless nitrifying germs be present. The sodium is more suitable for therapeutical use than the potassium salt, and is readily obtained in a comparatively pure state. It can be further purified by recrystallization from alcoholic or even watery solution. The purified salt can be heated for days over the water-bath without any loss of nitrite. The same naturally holds with nitrite of potassium. It is clear, therefore, that nitrites of sodium and potassium in their solid form, or in solution in the absence of acids chemically stronger than nitrous and of ferments, are perfectly stable.

The nitrite of potassium and cobalt is not of sufficient therapeutical interest to require consideration.

Nitrite of ethyl is chiefly to be considered in regard to its presence in the spirit of nitrous ether. The only point I shall take up in connection with this spirit is as to whether nitric acid, free or combined, exists in it. In a large number of specimens, ascertained to be free from nitro-substitution bodies, the free and combined nitrous acid was estimated by Allen's or Eykman's process, and then the amount of nitric oxide yielded by Schloesing's method of nitric and nitrous acid determination. The nitrous acid present was converted into its equivalent in nitric oxide, deducted from the total nitric oxide, and the remainder read as nitric acid. The general result of these experiments showed nitric acid free or combined to be constantly present in the spirit, varying in recent specimens from a mere trace to as much as

1·5 per cent., calculated as hydric nitrate, in old specimens. Moreover, very old specimens of spirit of nitrous ether, from which all nitrite had disappeared, gave nitrate reactions.

The loss of nitrite in spirit of nitrous ether is retarded by the addition of glycerine. This loss is very rapid in watery solutions of the spirit, and is in such solutions also retarded by the addition of glycerine or of spirit, or spirit and glycerine. It is also retarded by the addition of acetate or citrate of ammonium, double decomposition occurring with the formation of some nitrite of ammonium.

Nitrite of amyl usually, when recently prepared, contains 75–80 per cent. of actual nitrite of amyl. This nitrite is stated as being insoluble in water. Recently prepared nitrite of amyl was washed with distilled water until the washings were neutral. The purified nitrite was then for a few seconds shaken up with distilled water, filtered, and the neutral filtrate at once examined quantitatively for nitrite. It contained nitrous acid equal to about 1 of nitrite of amyl in 100,000. If the nitrite in excess were left in contact with water for some hours, the filtrate then contained nitrous acid equal to 1 in 1000, but the solution was markedly acid from decomposition of the nitrite of amyl. Following the same process as with spirit of nitrous ether, recently prepared nitrite of amyl was found to contain traces of nitric acid free and combined; old specimens considerable amounts.

The qualitative analysis of nitrites is conveniently carried out either by the starch iodide or by Griess's metaphenylenediamine reaction. With the former 1 of nitrite of sodium can be detected at once in 1,000,000 of water, or in 10,000,000 in two or three minutes. The reaction is more delicate if the temperature is comparatively low; and if some time be required owing to the extreme degree of dilution the solution must not be exposed to much light, as light is apparently able to decompose hydriodic acid. With Griess's test 1 of nitrite of sodium is not distinctly indicated in more than 200,000 parts of water. Most of the other numerous tests for nitrites were examined, but they gave less satisfactory results than the above.

The quantitative analysis for inorganic nitrites is best conducted, in simple watery solutions, by a modification of the permanganate process described before the Royal Society of Edinburgh ("Proceedings," March, 1886, and *Pharm. Journ.*, March 20, 1886). If the solution be not simple, one or other of the colorimetric processes may be employed. For organic nitrites Allen's or Eykman's

process is in every-day use, and these processes may also be used for inorganic nitrites, but with less accuracy than the permanganate.

To test for or to estimate approximately nitrites in the blood, it is advisable to use dialysis. In the urine the tests are directly applied, but a certain small loss of nitrite occurs in the urine from destruction of nitrite by the colouring matter, and if the secretion be strongly acid also from liberation of nitrous acid and mutual decomposition occurring between it and the urea.

Finally some points in connection with nitroglycerine may be discussed.

Pure nitroglycerine, prepared by myself, was a colourless, sweet body with a slightly pungent taste, producing its characteristic headache. It volatilized very slightly at ordinary temperatures; 20 grams, thoroughly dried, exposed to the air but protected from dust, after ten weeks had lost only 4 milligrams. When heated over the water-bath the loss is naturally greater. As mentioned in my previous paper (*Pharm. Journ., op. cit.*), it is soluble 1 in 760 water, but requires some time to dissolve to this extent. It has been mentioned that it decomposes in the presence of alkaline substances with the production of nitrite, and in this connection it is of interest to note that when a saturated watery solution of nitroglycerine is mixed either with a saturated watery solution of bicarbonate or of phosphate of sodium, the principal factors in the production of the alkalinity of the blood, all the solutions being kept at 100° F., the bicarbonate solution contains nitrite in about one hour, the phosphate in twenty to twenty-two minutes. In the system, however, the decomposition has commenced at most in two to three minutes, probably the living tissues rapidly dissociating the ether.

The qualitative and quantitative analysis of nitroglycerine deserves some attention, for the usual qualitative tests applied for its detection both in the arts generally, and in toxicology especially, have been merely the physical characters of the compound and its explosive force on percussion. The quantitative analysis has also been of a very crude nature, the amount found in the stomach, for example, being merely judged of by the eye, while neither qualitative nor quantitative analysis appears to have been applied to the detection of the ether in the various fluids and tissues of the body. Naturally gravimetric estimation still holds for large or approximately large quantities, but the method by which we can detect the presence of nitroglycerine in extremely minute quantities, as

1 in 500,000, or even 1 in 1,000,000 of water, or accurately estimate the amount in watery or alcoholic solutions, is essentially based on the decomposition it undergoes, as already mentioned, in the presence of various alkaline reagents. In this decomposition two-thirds of its nitric are reduced to nitrous acid, the nitrous acid forming a nitrite of the base employed to decompose the ethereal salt. Hay has formulated an equation for the estimation of the amount of nitroglycerine. He calculates the amount of nitrous acid produced on decomposition of the nitroglycerine in a given volume of liquid, this amount may be termed x. Then since 100 parts of nitroglycerine must yield 33·48 parts of nitrous acid, the amount of nitroglycerine present will be $x \times 100 \div 33{\cdot}48$. The watery or alcoholic solution is most conveniently decomposed by rendering the fluid strongly alkaline by the addition of caustic potash free from nitrite, and boiling for three or four minutes, when the fluid will have acquired a yellow tinge. The depth of colour varies according to the strength of the nitroglycerine solution, and is due to the formation of a reddish brown aldehydic resin. The amount of nitrous acid present as nitrite is calculated by a colorimetric process, using a standardized solution of nitrite of sodium of the strength of 1 in 500,000 or 1 in 1,000,000 for starch iodide, and 1 in 100,000 for Griess's metaphenylenediamine reaction. The yellow tinge from the resin formation is so faint when the solution is sufficiently diluted as to be of no consequence practically. This direct method of decomposition does not give satisfactory results with the urine, and still less with the blood, unless in the urine large quantities, comparatively speaking, of the ether be present. In the blood constant decomposition of the nitroglycerine goes on, and little is found in it unless the drug be intravenously injected. After large medicinal doses I have usually obtained it in the urine, the urine in these cases frequently also containing traces of nitrites. To estimate the nitroglycerine in the *urine*, if much be present, the urine may be directly alkalinized and boiled, but a loss always occurs, and with less quantities some separation process must be followed. Of these the following gave the most satisfactory results, allowing one of nitroglycerine added to 300,000 parts of my own urine to be detected. 50 c.c. of the urine are treated with ether, the ethereal layer separated, a solution of caustic potash added to it, the ether driven off, and the remaining fluid boiled. If any nitrite be extracted by the ether as well, it may be allowed for, or more conveniently destroyed by acidifying and heating the urine before adding the ether.

For the *blood*, dialysis may be employed, but with unsatisfactory results. The best method I have used is similar to that for the urine. The blood is collected in ether, and thoroughly exhausted by it. The separated ethereal liquid is decomposed, as in the case of the urine. If any nitrite be extracted from the blood by the ether, which is not usually the case, it may be calculated in a portion before adding the alkali, or may be removed by adding some acidified alcohol and water, and warming: it is preferable as a rule to allow for it however, the opposite course being preferably followed with the urine. Rabbits usually, when bled to death, yield 30 to 50 c.c. of blood; if this amount be collected from the carotid of a rabbit, and a small quantity of a watery solution of nitroglycerine at once shaken up with it, and then the ether process followed out, it is possible to detect 1 of nitroglycerine in 100,000 parts of blood. Animals poisoned with nitroglycerine given *per orem* have but little of the ether in their blood, partly because it is not rapidly absorbed, partly because it is excreted by the kidneys, but principally on account of its decomposition by the fluids and tissues of the body.

From the gastrointestinal contents in poisoning cases, nitroglycerine can be usually obtained, by extraction with ether, in considerable amount, especially from the stomach. The ether may be in this case merely allowed to evaporate, and the minute globules of nitroglycerine obtained. These globules can also usually be observed in the stomach without further treatment when much nitroglycerine has been swallowed.

The nitroglycerine in the Tabellæ Nitroglycerini of the Pharmacopœia and in allied preparations is not easily extracted. The largest yield was thus obtained:—The tablet or pill was rubbed with a little water, so as to form a thin paste; this was thoroughly exhausted with ether, and the ethereal solution treated with a solution of caustic potash, as previously described. From one tablet the faintest nitrite reaction only was obtained, and I have generally found it necessary in estimating the strength of tablets and pills to fall back on their comparative pharmacological activity, experimenting usually on myself.

The PRESIDENT moved a vote of thanks to Dr. Atkinson for his contribution, which he was sure would repay careful perusal.

Mr. MARTINDALE said he had not tried to estimate the amount of nitroglycerine in preparations made for pharmaceutical purposes,

because the quantity required to produce physiological action was so minute that it was almost beyond analysis. One mode of preserving the nitroglycerine for explosive purposes was this; it was very soluble in oils and fats, and from that solution it could easily be obtained again by shaking up in methylated spirit, and then throwing the alcoholic solution into water; the nitroglycerine separated almost in a pure condition. But this process was useless for detecting the minute quantities in ordinary pharmaceutical preparations. One of the earliest workers on the subject was Dr. de Vrij, who read a paper upon it at the meeting of the British Association in 1851, and with regard to its poisonous properties, he said that when he first prepared nitroglycerine in 1851, he administered 10 minims to a rabbit without producing the least toxic effect. He thought it might be interesting to the meeting to know that though a very small quantity of nitroglycerine produced physiological action, it could hardly be made to kill, and he thought the records of death from it were rather doubtful.

The next paper, which was read by Mr. Dott, was on—

THE CHEMISTRY AND PHARMACOLOGY OF SOME OF THE MORPHINE DERIVATIVES.

By D. B. Dott, F.R.S.E., and Ralph Stockman, M.D.

(From the Materia Medica Department, Edinburgh University.)

Before describing the methods employed for the preparation of the substances used in our experiments, and the precautions taken to insure their purity, it is desirable to remark briefly on the chemistry of these compounds.

How * appears to have been the first to investigate the action of alkyl iodides on alkaloids, and in his second paper, at least, he clearly recognises that the resulting products are analogous to methylammonium iodide, and are formed by direct union of the alkyl haloid with the nitrogen of the base. It is curious, in the light of our present knowledge, that How seems to have been surprised that morphine methochloride is merely isomeric with codeine hydrochloride and not identical therewith. In their

* *Chem. Soc. Journ.*, vi. (1854); *Trans. R. S. E.*, xxi. (1857).

research,* "On the Connection between Chemical Constitution and Physiological Action," Crum Brown and Fraser discuss the chemistry of these bodies, and it is carefully pointed out that they are additive compounds, and the nomenclature adopted is intended to avoid misunderstanding. For instance, the additive compound of strychnine and methyl iodide is called *methylstrychnium iodide*, and we have similarly *methylmorphium iodide* and *ethylcodeium chloride*. It is also shown that by double decomposition with silver sulphate, and treatment of the sulphate with baryta, the hydroxide of the ammonium base is formed. Notwithstanding these facts, a host of writers and compilers, and some experimenters, have fallen into the error of describing these additive compounds as methylstrychnine, ethylcodeine, etc., and, what is of more importance, they have reasoned from their false premises to fallacious conclusions. To expect, because the addition of methyl chloride to a base produces a certain modification in its physiological action, that the substitution of an atom of methyl for one of hydrogen should cause a similar modification, is evidently unwarranted. It may here be noticed that there is a difficulty regarding the names "methylmorphium chloride," and the like, which is probably sufficient to prevent their systematic use. In methylammonium iodide an atom of hydrogen may be replaced by methyl, and the resulting compound appropriately called "dimethylammonium iodide," because both atoms of methyl are in combination with the same nitrogen atom, and have, in short, the same value. On the other hand, in the case of a complex alkaloid, the methyl may be combined with nitrogen, with oxygen, and probably also with carbon. Whence it is evident that to describe as "diethylmorphium iodide" the compound obtained by addition of ethyl iodide to ethylmorphine would be quite misleading. It seems advisable to adopt the nomenclature now generally used, and say "ethylmorphine ethiodide"; just as we say "morphine hydrochloride," and not "morphium chloride." At the same time it must be borne in mind that these additive compounds differ essentially from ordinary alkaloidal salts. The original alkaloid is not separable from its addition compound, and while the salt of an alkaloid has the same physiological action (speaking generally) as the alkaloid itself, the methiodide of an alkaloid has an altogether different action from that of the alkaloid. We can scarcely escape the conviction that the union of hydrogen chloride (H Cl) with an alkaloid is not of the same

* *Trans. R. S. E.*, xxv.

nature as the union of methyl chloride ($C H_3 Cl$) with the base. Indeed, it rather appears that "morphine methochloride" is not a morphine compound at all, but the salt of a new base.

That the compounds of alkaloids and alkyl haloids frequently give the same colour reactions as the alkaloids themselves proves nothing more than that both contain some common nucleus. There is certainly much to be said in favour of the names "methylmorphium chloride," "ethylstrychnium sulphate," etc.

Methylmorphine (*Codeine*). $C_{17} H_{18} (C H_3) N O_3$.—The natural codeine used in the experiments afterwards described was prepared from Turkey opium in the usual way. The artificial codeine was prepared by the action of morphinate of soda on methyl chloride, extraction by chloroform, and subsequent purification. The last-mentioned process is simply a modification of that of Grimaux, who was the first to produce codeine artificially.* Hesse† has, indeed, claimed priority of discovery, but his claim cannot for a moment be admitted. Even were it proved that Hesse had actually prepared codeine before Grimaux had done so, no priority would be established, as Hesse was not aware that his product was really codeine until long after Grimaux had published his results. Grimaux found that his alkaloid had the same composition, crystalline form, colour reactions, and melting-point as codeine from opium; and although he found a slight difference in specific rotatory power, he rightly concluded that that was due to impurity, and that the bases were truly identical. We have determined the rotatory power of the alkaloids prepared as above described, using an alcoholic solution containing 1 gram of base in 11 c.c. at 21°.

Codeine from Opium . . .	$[\alpha]_D = -137{\cdot}34$
Artificial Codeine . . .	„ $= -137{\cdot}38$

If there remained any shadow of doubt as to the absolute identity of the bases, it is completely removed by the pharmacological results noted below.

The numerous exact descriptions of the physiological action of codeine, given by previous observers, made it unnecessary for us to carry out experiments on animals with the natural alkaloid, and also made it an easy matter to determine that there is an exact similarity of action between it and methylmorphine prepared artificially as above described.

* *Comptes Rendus*, xcii. 1140, 1228 (1881).
† Liebig's *Annalen*, ccxxii. 203 (1884).

Thus, frogs, with a dose such as 0·005–0·025 gram. given hypodermically in solution, show symptoms of narcosis, passing, after a varying but always comparatively short time, into a condition of greatly increased reflex excitability. With larger doses the narcotic period is considerably shortened, and tetanus comes on in a few minutes. The central nervous system only is affected, the peripheral nerves being left intact except as the result of exhaustion.

In rabbits, 0·01—0·02 gram caused well-marked but not very deep narcosis. On increasing the dose the reflex is found to become greatly exaggerated, while with a further increase tetanus is induced and finally death in convulsions.

In dogs, while small doses readily enough produce a narcotic action, the accompanying disagreeable effects so often seen with morphine—salivation, vomiting, and diarrhœa—are much more marked than in the case of the latter alkaloid.

Dimethylmorphine, $C_{17}H_{17}(CH_3)_2NO_3$.—This base appears to have been first obtained by Hesse,* when treating morphine of potash with methyl iodide. We found the best yield was afforded by warming together equivalent quantities of morphine, soda, and methyl iodide; then, on cooling, additional equivalents of soda and methyl iodide were introduced, and the solution again digested on the water-bath. After evaporating, with addition of water so as to get rid of the alcohol, the solution was exhausted with chloroform. The latter having been removed by evaporation, the residue was converted into hydrochloride by cautious addition of acid. The crystallized salt so obtained was purified by pressure, and recrystallization several times repeated. The hydrochloride of dimethylmorphine has the form of four-sided prisms, which effloresce on exposure to the air. Three different specimens of the hydrochloride when placed in the water-bath lost 8·93, 8·36, and 7·98 per cent. There was no further loss of weight at 140°.

$(C_{19}H_{23}NO_3, HCl)_2\,5H_2O = 9·12$ per cent. H_2O for 4 mols.

The chlorine was estimated in the salt dry in the water-bath, by precipitation with silver nitrate in presence of hot dilute nitric acid. There were obtained:—

9·85 per cent. Cl.			Required for
9·84	,,	mean	
9·98	,,	9·90	$(C_{19}H_{23}NO_3)_2H_2O$
9·95	,,		9·90 Cl per cent.

* *Pharm. Journ.*, [3], xii. 1029.

The platinochloride was prepared by adding to the aqueous solution of the salt platinic chloride in slight excess, the precipitate being filtered and washed with cold water. Portion of compound dried at 120° and ignited :—

0·280 gram gave 0·0522 gr. Pt. . . = 18·64 per cent.

Portion dried at 140°, ignited :—

0·309 gram gave 0·0576 gr. Pt. . . = 18·64 per cent.
$(C_{19}H_{23}NO_3, HCl)_2 PtCl_4 . H_2O$ . . = 18·65 ,,

It was found that the compound dry in water-bath lost no weight at 120°, and not, indeed, until the temperature was raised to 160°, at which point the salt decomposes, as is manifest by its appearance, and from the fact that the loss in weight is far more than can be accounted for by loss of combined water.

When the solution of dimethylmorphine hydrochloride was mixed with ammonia, a viscous precipitate was produced. After two days this precipitate became a mass of prismatic crystals. These were very well defined and all of the same form. After drying on filter paper by exposure to the air the crystals appeared to be anhydrous, as there was no loss of weight at 125°, while at 130°-135° the alkaloid fused without loss of weight.

The preparation, purification, and analysis of these substitution compounds are attended with peculiar difficulties, as we have not only to deal with ordinary impurities, but with the risk of the presence of isomers. For instance, methylmorphine methylchloride, dimethylmorphine hydrochloride, and the hydrochloride of methylmorphimethine of Hesse (methocodeine of Grimaux), have the same molecular weight : and consequently a chlorine estimation, and analysis of a platinum compound, could not by themselves distinguish one alkaloid from the other. The simple fact, however, that our salt gave an immediate and bulky precipitate with ammonia, is sufficient to show that it was not methylmorphine methochloride, whose solutions yield no precipitate with alkalies. That the salt was not a mixture is evident, not only from the analytical results, but also because the precipitated and crystallized alkaloid had the same pharmacological properties as the salt. There is a little difficulty regarding Hesse's "methylmorphimethine." Although the process we employed differs from that used by Hesse for the preparation of methylmorphimethine, it is conceivable that we might have arrived at the same result. That possibility seems to be excluded by Hesse's statements that

methylmorphimethine melts at 118·5°, and that the muriate contains two molecules of water. Grimaux's description of the physiological effects of methocodeine also indicates that it is a different base from dimethylmorphine. We are not at all clear that Hesse has really determined that in methylmorphimethine one of the hydrogen atoms replaced by methyl is not a hydroxyl hydrogen. However that may be, it is certain that the substance we have described as "dimethylmorphine" has the composition of that body, and cannot in the light of our present knowledge be otherwise named.

The chemical change represented in dimethylmorphine completely modifies the symptoms characteristic of the morphine group, so much so indeed that points of similarity are difficult to find.

The hydrochlorate of dimethylmorphine dissolved in water, and dimethylmorphine dissolved in water with the aid of acetic acid, were used for the experiments. Both solutions were neutral to litmus paper.

In frogs 5 milligrams caused slight depression, which soon passed off; the animal recovering its normal condition. When 0·01–0·025 grm. were given the frog soon showed symptoms of extreme depression, lost its power of jumping, and ceased to respond to pinching. The motor nerves remain unaffected, but the brain and spinal cord are greatly depressed. The most prominent effect, however, is poisoning of the muscles. At the point of injection the muscles pass into a state of *rigor mortis* almost at once, and this condition gradually extends over the whole body, death resulting from poisoning of the muscular system. The action of this body, however, is not comparable to that of members of the digitalis group, being rather allied to the saponin group. The heart is slowed and depressed, but does not pass through the characteristic phases of the digitalis heart.

In rabbits no narcosis was produced even with very large doses. In one case 0·05 grm. caused slight general depression and slowing of the respiration. When 0·5 grm. was given the animal became very depressed and died in eighteen minutes. Death was due to failure of respiration consequent on poisoning of the respiratory muscles. The muscles at the points of injection did not respond even to strong electric currents, those at a distance being, however, quite excitable, and the motor nerves apparently normal.

Ethylmorphine, $C_{17}H_{18}(C_2H_5)NO_3$.—30·3 grms. morphine hydrate were dissolved in methylated spirit with 4 grms. caustic

soda, and when the solution had cooled 15·6 grms. ethyl iodide were added (these being molecular proportions). The solution was gently warmed for half an hour, and then evaporated. After being diluted with water the solution was exhausted by successive treatment with chloroform. The latter having been got rid of by evaporation, the extract was converted into muriate. The crystals which separated on cooling were pressed and purified by being thrice recrystallized from water, with charcoal to decolorize. The hydrochloride was obtained in minute prismatic crystals, free from colour. These were dried by exposure to the air, then in water-bath, and finally in air-bath at 120°.

	Per cent.	Calculated.
Loss of weight under 100° .	= 4·48	4·46
,, ,, at 120° .	= 6·61	6·69

These numbers indicate that the formula of ethyl-morphine hydrochloride is $(C_{19}H_{23}NO_3.HCl)_2.6H_2O$, two molecules of water being driven off at the temperature of a water-bath, three at 120°, the remaining molecule being retained even at a higher temperature.

The chlorine was estimated in the same manner as formerly described.

		Calculated.
Found in the air-dry salt . .	8·80 per cent.	8·79
,, ,, salt dry at 120° . .	9·87 ,,	9·90

The platinochloride was prepared in the usual manner. It was found to be very soluble in water, and was therefore washed with alcohol, in which, however, it is by no means insoluble. When dry in the water-bath, 0·2605 grm. gave 0·0495 grm. Pt on incineration, = 19·00 per cent. 0·3098 grm. gave 0·0588 grm. Pt = 18·98 per cent. 0·433 grm. gave 0·0822 grm. Pt = 18·98 per cent.

Mean of three estimations .	= 18·98 per cent. Pt.
$(C_{19}H_{23}NO_3.HCl)_2PtCl_4$.	= 18·97 ,, ,,

The hydrochloride of ethylmorphine is extremely soluble in water, so that after the various operations of purifying, the yield of crystals is very small. It will be noted that the platinochloride is anhydrous at 100°, in which respect it differs from the corresponding compound of dimethylmorphine.

The action of this body has been briefly described by Bochefontaine (*Comptes Rend.*, xciii. 1881), who ascribes to it a purely tetanizing action. This, however, is due to the fact that he used only very large doses, thereby completely masking the preliminary narcotic effect, which we have found it to possess.

Our observations show that its action is exactly similar in every respect to that of methylmorphine, and that, therefore, so far as physiological effect is concerned, it is immaterial whether methyl or ethyl replace the hydrogen atom in morphine. To avoid repetition we omit, at the present time, the details of our experiments on animals.

Diethylmorphine. $C_{17}H_{17}(C_2H_5)_2N_2O_3$.—Several experiments were made with the object of preparing the diethyl compound by the same method as dimethylmorphine, but without success. In each case ethylmorphine and its additive compound were the principal products. We therefore endeavoured to form diethylmorphine by heating in a sealed tube molecular proportions of morphine, soda, and ethyl iodide. 15·15 grm. morphine, 4 grms. sodium hydroxide, and 15·6 grm. ethyl iodide were dissolved in dilute alcohol, the solution introduced into the tube, and the latter sealed and kept in boiling water for two hours. On opening the tube after it had cooled there was a slight escape of gas. The contents were evaporated and the residue exhausted with chloroform. When the chloroform had been driven off, the viscous residue was washed thrice with warm water, then stirred with alcohol and ether, and otherwise treated to cause crystallization, but no crystals appeared, even after three days. The substance was then mixed with hot water, and hydrochloric acid added to acid reaction. On cooling, the solution only crystallized to a small extent, and as with platinic chloride the crystals indicated a molecular weight of 1070, it is evident that they were a mixture. The fact that the crystals gave a well marked iodine reaction shows that they consisted in part at least of ethiodide. Therefore, the crystals having been removed, the mother-waters were mixed with excess of sodium carbonate, and the viscous precipitate washed several times with warm water. The precipitate was converted into hydrochloride, which even after evaporation of the solution to a syrupy consistence refused to crystallize. As the solution still indicated traces of iodine, it was diluted, digested with charcoal, filtered, and mixed with excess of sodium carbonate. The precipitate remained absolutely non-crystalline. It was washed until free from iodine compounds, and then again converted into muriate. From this solution the platino chloride was prepared by precipitation, the latter soluble salt being washed with small quantities of water and dried in the water-bath. On ignition,—

0·1122 grm. gave 0·0202 grm. Pt. = 18·00 per cent.

$(C_{21}H_{27}NO_3 . HCl)_2PtCl_4$. = 18·00 ,, Pt.

Whence it is manifest that our solution contained either diethylmorphine or an alkaloid having the same molecular weight, or a mixture of such bases. As we have not up to the present time succeeded in obtaining either the base or one of its salts in the crystalline form, it would be impossible to assert that the solution contained nothing but diethylmorphine. Considering, however, the manner of its formation, and the molecular weight indicated by the platinum compound, there is very strong ground for believing that the viscous precipitate above described consists essentially of diethylmorphine. It was suspected from the pharmacological observations that the substance contained ethylmorphine ethohydroxide, but that ought to have been entirely removed by the repeated washing with water. Neither the amount of material, nor the time at our disposal admitted of the matter being cleared up, so that it is left for future investigation along with other points that have emerged in the present inquiry.

Acetylmorphine, $C_{17}H_{18}(C_2H_3O)NO_3$.—This compound was first prepared by Wright,* who named it "diacetylmorphine," on the assumption that the formula of morphine is double that usually ascribed to it. Without expressing any opinion on that point, we use the name "acetylmorphine," as more convenient, and consistent with the formulæ used elsewhere. Fifteen grams morphine hydrate were added to 30 grams glacial acetic acid, and the solution boiled for seven hours, the flask being attached to an inverted condenser. The solution was then diluted, ammonia in slight excess added, and the acetylmorphine extracted in manner as described by Dr. Wright. The hydrochloride was purified by recrystallization, and the platinum salt formed therefrom in the usual way. After drying in the water-bath,—

0·2555 grm. gave 0·0457 grm. Pt . = 17·88 per cent.
$(C_{19}H_{21}NO_4 . HCl)_2.PtCl_4 . 2H_2O$ Pt = 17·87 ,,

Hydrochloride of acetylmorphine is sparingly soluble in water, so that it is necessary to make a solution of the acetate for hypodermic administration.

The introduction of acetyl into morphine alters the action of the latter very slightly qualitatively, but quantitatively both the narcotic and the tetanizing action are developed with rather smaller doses. Thus with 0·01 grm. frogs exhibit perfectly the two stages, a similar dose of morphine being quite insufficient to give a characteristic train of symptoms, slight lethargy only being

* *Chem. Soc. J.*, [2], xii. 1033.

produced. With a somewhat larger dose—0·02 grm.—tetanus supervenes in a few minutes, the narcotic stage being extremely short. The fatal dose for frogs ranges from 0·015 to 0·02 grm. With such doses the heart is only slightly slowed. In rabbits 1 mgrm. is sufficient to produce slight narcosis lasting for two or three hours, the animal having the appearance of being fast asleep. During this time the respirations fall from about 120 to sometimes as low as 12 per minute, the heart remaining unaffected. Larger doses deepen and prolong the narcotic effect, while if we ascend to slightly over 1 decigram, death occurs with tetanus. The action, therefore, is very similar to that of methyl- and ethyl-morphine, and it is probable that in all three bodies the same atom of H is replaced by the radical. The acetyl substitution body, however, appears to be more active than either of the others.

We are continuing this investigation on the effect of substitution of alcohol and acid radicals in morphine, and we propose extending the inquiry on similar lines to other alkaloids.

The PRESIDENT, in moving a vote of thanks to the authors of this paper, said it presented the result of the combined work of a scientific chemist and a scientific therapeutist. It was impossible to do justice to such a paper by merely listening to it; it was so elaborate, and was the result of such an enormous amount of experimentalization, that he was sure it would receive from those who were working in this direction the attention it deserved. One could not help thinking sometimes with regard to these other derivatives of opium, that as in family life a strong boy or a very beautiful girl might sometimes obscure the merits of other humbler and lesser-known members of the family, so morphine and codeine had monopolized a large amount of attention, to the exclusion of these lesser-known, but much-deserving characters, who certainly had at least the merits of exceedingly long and hard names.

Mr. BALKWILL said it had occurred to him in listening to this communication that it would be of great assistance to the members if these papers could be printed in sufficient number to be distributed through the room, so that members could follow them as they were read, and make notes upon them. He had laboured under the disadvantages of catching a few very interesting remarks here and there, but that was all; so that he could not venture to offer any observations on the paper itself.

Dr. THRESH said the printed slips Mr. Balkwill had seen were simply proofs kindly supplied by the Editor of the *Pharmaceutical Journal* for the convenience of the authors and officials at the Conference. The question now raised had been mooted at different times, but the expense that would be involved in providing independently copies of the papers sufficient for all attending the Conference would be so considerable that he did not think the Conference could afford it. No doubt if it could be done it would be a decided advantage.

Mr. LONG said it was perhaps rather an ungracious suggestion to make from those who did not contribute scientific matter, but if it were possible for gentlemen to send their papers in two or three weeks before, so that they might be published in the Journal and read before the Conference was held, the members would be in a much better position to deal with them.

Mr. NAYLOR said there was one point with reference to the experiments on the formation of diethylmorphine. He did not catch any statement as to the length of time which the morphia and iodide of ethyl were heated together in the sealed tube.

Mr. DOTT said they were heated together for two hours. He need only add that Dr. Stockman would have been very pleased to be present, but he had to go to America.

The next communication was a—

NOTE ON THE PHARMACY OF LOGWOOD.

By LOUIS SIEBOLD.

The object of this paper is to deal with the following questions:—

1. Which is the kind of logwood best suited for use as a medicinal agent?

2. What is the nature and condition in which this wood should be employed for pharmaceutical purposes?

In reference to the first question, I am decidedly of opinion that the woods of Campeachy or Honduras ought to be used in preference to those of San Domingo or Jamaica, on account of their greater richness in hæmatoxylin, the astringent principle of logwood. I have no doubt that you will all agree with me on this point, and will therefore at once proceed to the discussion of the much more important subject embodied in the second question.

As regards the nature and condition in which this wood ought to be employed by pharmacists, the Pharmacopœia affords no satisfactory information, and appears to ignore the fact that logwood of all kinds is met with in commerce in two essentially different states. The ground wood or chips met with in shops and sold by wholesale houses is not, as many of you may suppose, the unaltered wood obtained from the logs as imported; but it has been subjected to a long process of fermentation, involving considerable changes in its chemical composition. In order to bring about this fermentation, the ground wood obtained from the logs, either in the form of chips or a coarse powder, is thoroughly impregnated with water and laid up in large heaps exposed to the air for weeks. A rise of temperature takes place after a few days, which is checked or moderated by frequently turning over the heaps of wood, and thus exposing fresh surfaces to the action of the atmosphere. The process is completed in four to six weeks, according to the season of the year and the quantity operated upon. During this fermentation the pale colour of the original wood changes to a deep red, owing to the conversion of the hæmatoxylin into its oxidation-product, hæmatein; and some of the chips assume a greenish cantharides-like hue on the surface. The wood is then in the best condition for technical purposes; but the question arises whether it is equally suitable in this condition for use in medicine and pharmacy. The great difference between the unfermented and the fermented wood is well known to those engaged in dyeing and calico-printing, and to technical chemists acquainted with these industries; but it seems to have hitherto escaped the attention of pharmacists and the medical profession. The Pharmacopœia leaves it quite doubtful which of the two woods should be used for the preparation of the officinal extract and decoction, for the description given of the colour of the wood corresponds with that of the fermented article, while the sweetish taste referred to in that work is a characteristic feature of the unfermented wood, and is entirely absent from the other. Both have an astringent taste, but it is only in the unoxidized wood that this astringency is associated with a pleasant sweetish flavour, which to some extent masks its stronger astringency. The preparation of the decoction and extract from the unchanged wood presents no difficulties and furnishes satisfactory products possessing the characteristic sweetish astringency of the raw material, and exercising a marked beneficial effect when used as a gargle in cases of sore throat, or when administered internally for giving tone to

mucous membranes in general. The decoction and extract obtained from fermented wood, so far as my experience goes, appear to be less efficacious, and are certainly much less palatable. They have, moreover, the defect of undergoing further and progressive chemical changes during their preparation, owing to the formation of resinous and insoluble oxidation products from the hæmatein at elevated temperatures. The extract, particularly, suffers much in this way during its evaporation in open vessels, and is for this reason much less perfectly soluble in water than the extract prepared from unaltered wood. Solid logwood extract is not manufactured on a very large scale in this country, liquid extracts being generally preferred by dyers and printers. I recommend pharmacists and wholesale drug houses to prepare the solid extract themselves, since that imported from abroad for technical purposes is generally not pure enough for medicinal use, and is not unfrequently much adulterated. The question as to the condition in which the wood should be used by pharmacists, either for the extract or the decoction, I am strongly inclined to answer in favour of the unchanged wood, for the reasons already given; and I shall be very glad to hear the opinion of the meeting on this point. The subject is not an unimportant one, and I very much fear that fermented logwood has hitherto been almost exclusively employed in pharmacy, since the unchanged wood is rarely met with in commerce in the ground state or in chips.

In conclusion, I wish to recommend a clear fluid extract of 1·06 specific gravity, made from natural logwood of good quality, as an elegant, efficient, and very permanent preparation. Such an extract may be readily obtained by extracting the ground wood, in the form of a coarse powder, repeatedly with boiling water acidulated with a few drops of hydrochloric acid, evaporating the united and strained infusions at a moderate temperature until the residual extract is equal in weight to the wood employed, then allowing to settle for a week, and drawing off the clear extract from the sediment. The product has a fine red colour, is very palatable, and possesses in a high degree the medicinal properties of the wood. It can be kept for years without undergoing fermentation or any appreciable change.

Mr. MABEN said they were much indebted to Mr. Siebold for this paper, and he thought there could be no doubt with regard to the first question, that pharmacists ought to use the best log-

wood obtainable: but the second question was a little more complicated, and differences of opinion might prevail. In the first place he would inquire, What did logwood owe its medicinal qualities to? Was it the colouring matter or the tannin? It was usually prescribed as an astringent medicine. The tannin was probably more effective than the colouring matter, and it was a question whether the tannin was affected by the fermentation. If so, there was another element to be considered. This fermentation process was evidently adopted so as to age the logwood, so that the colouring matter might be developed. If they bought the wood unfermented, they got it of a much lighter colour; but if it were kept for a year or two, they would probably find it had got quite red. The difficulty would be to have a preparation which would always be identical in colouring. But this was not such a great difficulty after all, because the preparation Mr. Siebold had shown, which he made from unfermented logwood, was also a deep red. He presumed it was impossible to get the hæmatoxylin, even from unfermented logwood, except in the red condition. He was in hopes that Mr. Siebold would give a process for ascertaining the percentage of hæmatoxylin and hæmatein in the logwood of commerce, and also in logwood extract. It was a difficult process, and the methods proposed were so extremely unsatisfactory that he should have been delighted if Mr. Siebold could have given one that could be relied upon. They had frequently to examine samples for the percentage of colouring matter. Mr. Dechan, who did the work in his laboratory, tried to get a reliable process. He had tried with lead salts, silver, copper, mercury, iron, chromium, and others, but it was extremely difficult to get constant results. Chromium, perhaps, seemed most likely to succeed, but it failed to carry down all the colouring matter. On the whole, if the fermentation did not destroy the active medicinal property in the logwood, he was not sure that it would be quite advisable to change the established practice.

Mr. Conroy said there were one or two points he should like to have a little further information upon In the first place, Mr. Siebold did not quite explain whether there was any loss of tannin in the fermented wood. It occurred to him, seeing that logwood chips were used for dyeing purposes, that the cutters of wood found by experience that by exposing the wood the colouring matter and astringent properties became more developed. New wood, Mr. Siebold said, was much more efficacious than the old, from which he gathered that it contained more tannin, because it

was to the tannin its properties were chiefly due. Mr. Siebold was so conversant with the subject that no doubt he would throw further light upon this point.

Mr. HOLMES asked whether the extract Mr. Siebold had prepared had been subjected to therapeutic experiment, and found to be as valuable as that prepared in the ordinary way. Having tasted it, he found it to be perfectly astringent. He was much indebted to Mr. Siebold for clearing up some points which had hitherto puzzled him. He had tried to obtain in commerce the different kinds of logwood mentioned in the text-books, and had noticed the different colours of the specimens he had obtained. In fact, a gentleman who used logwood for dyeing animal tissues, in microscopic sections pointed out to him that some logwoods gave a bluish dye, whilst others a purplish, and asked him the reason, which at the time he could not explain; but he now supposed the bluer colour was due to absorption of ammonia during exposure to the atmosphere.

Mr. MARTINDALE said he was much obliged to Mr. Siebold for clearing up many doubts in his mind as to what the difference in colour was due to. He had seen logwood in commerce when freshly cut, and did not know that the process of fermentation was followed to prepare it for dyeing, but medical men would prefer it in a state of nature, as undoubtedly its properties were due to hæmatoxylin as well as to tannic acid. There was a great difference in the logwood extracts met with in the market. Some of the common extracts were scarcely soluble, and hardly yielded any colour when rubbed with water, whereas others would give a bright purplish colour, and be in great part soluble. Should the extract have that paler colour which the fluid extract, which had been shown, seemed to indicate it ought to have? He found a great difference in the colour also of the hæmatoxylin met with in commerce; some samples were of dark reddish colour, but he preferred it of a pale yellow colour rather than that which he supposed to be oxidized and changed to a dark brownish red.

Mr. BALKWILL said the real point was the medicinal use of this article, and if the pure wood, as presented so interestingly that afternoon, had very seldom reached the trade, it had still more seldom reached the profession, and he apprehended that the whole of the medicinal credit which logwood had in use depended upon it in its ordinary commercial form. Therefore one inquiry might well be, Which was the kind which medical men wished to have used? It was very possible that the wood in its natural condition

would make a better preparation than after fermentation, but that was a matter which had yet to be proved. Mr. Siebold spoke of logwood having lost its sweet taste in the process of fermentation; but if that were so, he was at a loss to know how those who had lived in the country, and had never seen this new wood before, should have no idea of any other wood than that which had a sweet taste. He was exceedingly glad of the suggestion of a liquid extract, for although the hard extract was in frequent use, he had never had any experience of its being dispensed, except when dissolved, and this process was always a little troublesome; it would be a great improvement, therefore, to have a fluid extract brought into use; but there should be experiments made as to the medicinal value of the unfermented wood.

Mr. Robinson said undoubtedly the logwood they were used to was astringent, but he did not clearly catch from Mr. Siebold whether he said it would be impossible to prepare such an elegant preparation as he had sent round with the ordinary fermented wood. Of course if it changed colour so rapidly, there would be great difficulty in dealing with it.

Mr. MacEwan said he had always understood that the darkening of logwood was partly due to exposure to atmosphere containing a little ammonia. Some might recollect that in making the decoction, if distilled water was used a much paler preparation was obtained than with ordinary tap water. That again seemed to indicate that alkali had the effect of darkening the colour. The change by fermentation was well known, but they should not overlook the fact that darkening was also due to the action of ammonia.

Mr. Siebold, in replying, said it seemed to be assumed by some of the speakers that tannin was the astringent principle of logwood; but this he was not prepared to admit. No doubt tannin did occur in small and variable proportions in this wood, but not in such quantities as to be of any importance. Indeed, most of the text-books left tannin entirely unmentioned among its constituents. The astringency of logwood, combined, as it was, with an agreeable sweetness, was mainly due to hæmatoxylin, and this, he thought, must also be regarded as its active medicinal principle. One of the speakers asked how the fresh wood was to be kept if it was so prone to change, and said that after a while it might become red in appearance and liable to further changes. But there really was no difficulty about this. If they would reduce the logs to a coarse powder—he should prefer that to chips—it could be kept in a dry

place for almost any length of time without any material deterioration. There would be a slight and gradual change in colour, but this was merely superficial; and if the wood were kept for years, carefully stored, it would still have a sweetish taste and be perfectly fit for use. Therefore they were perfectly safe with such a wood. They need not be afraid of a great change such as the fermentation he had described, which was not due to mere exposure to air, but required the presence of a large proportion of water. It was this soaking wet wood which, when exposed to the atmosphere, suffered the great change alluded to, and finally yielded a product containing nolonger hæmatoxylin but hæmatein; and the wood so changed would be entirely devoid of astringency but for the small quantity of gallic acid. This change was brought about by a ferment contained in the wood, which acted in the presence of water at ordinary slightly elevated temperatures, but, like all other ferments, was destroyed by the heat of boiling water. The conversion of hæmatoxylin into hæmatein could also be effected by mere atmospheric oxidation, without the intervention of the ferment, but then it required the presence of a large proportion of alkali. For this purpose a strong decoction of the unchanged logwood, or a solution of the extract, should be treated with an excess of caustic alkali, and then exposed to the air for several days; or a current of air should be passed through the powerfully alkaline liquid for several hours. Under these conditions oxygen was rapidly absorbed and hæmatein formed, which could then be separated by precipitation with acetic acid, provided the oxidation had not been allowed to go too far, so as to lead to the destruction of the hæmatein and the formation of resinous bodies. But, as already stated, this mode of atmospheric oxidation required the presence of a large proportion of alkali; and the traces of ammonia in the air, to which some of the speakers had alluded, could only effect but a very slight change. The statements contained in some books that these traces of ammonia in the air were the cause of the change occurring in the ageing of logwood must, he thought, be dismissed as erroneous. This change must be regarded as a true fermentation, the elevation of temperature accompanying it, and the fact that boiled preparations of fresh logwood, such as the liquid extracts he had recommended, were not liable to this change, went to prove that assertion. Mr. Holmes had inquired whether he, Mr. Siebold, had submitted his liquid extract to medical practitioners for trial. This he had not done so far, and his statements relative to its efficacy were based

on his own observations only. He would be glad, however, to submit samples of the preparation to any one willing to give it a trial. As to the general question whether medical men were likely to prefer the natural or the fermented wood, he thought they were not likely to know much of the different natures of these woods at present, since even most chemists were but little acquainted with them, and it was only after they had been made acquainted with the chemistry of the subject, and after actual trials based on such information, that they could pronounce an authoritative opinion. He had also been asked why he was so sure of the superiority of the unfermented over the fermented wood for medicinal purposes. Well, he had explained to them in his paper the decidedly greater suitability of the unfermented wood for pharmaceutical preparations, and it could hardly be supposed that unstable preparations more or less liable to never-ending changes, could be better suited medicinally. If they were, the onus of proof rested with those, if any, who advocated the use of the fermented wood, claiming it to be superior as a therapeutic agent. In the absence of any such proof, he contended that it was the proper course to give preference to the natural drug rather than to one altered by fermentative changes. Referring once more to the liquid extract he had recommended, he wished to point out the further advantage consisting in the avoidance of some chemical changes, resulting in the formation of resinous matter, which were always more or less liable to occur at the higher temperature required towards the end in preparing the solid extract, changes which invariably rendered the extract less perfectly soluble.

The same author then presented a—

NOTE ON THE APPLICATION OF DYEWOODS IN CHEMICAL ANALYSIS.

By Louis Siebold.

Previous reports on this subject have failed to state what kind of logwood is best adapted for analytical purposes. I therefore wish to point out the great superiority of the aged or fermented over the unfermented wood, and to call your attention to its extraordinary delicacy as a test for metals. A litre of water containing 1 milligram (or 1 part per million) of such salts as copper sulphate, alum, and stannous chloride, gives striking colour reactions with

a few drops of a fresh tincture of this fermented wood, reactions so distinct as to be visible throughout this large room, though the actual amount of metal present is only 1 part of copper in 4,000,000, and 1 part of aluminium in 17,000,000. With due care and sufficient practice much smaller proportions may be thus detected. With lead or iron the reactions, though very delicate too, are less so than with copper, aluminium, or tin. The detection of alum in flour and bread is also much easier, and the reaction much more delicate with the aged than with the unaged wood. As an excellent confirmatory test for alum, the reaction with fustic (yellow wood) in the presence of hydrochloric acid, described by Goppelsroeder in the *Zeitschrift für analytische Chemie*, vii. 208, deserves more attention from analysts in general than it has hitherto received.

The paper was illustrated by experiments showing the delicacy of the above tests and the best manner of executing them.

The PRESIDENT proposed a vote of thanks to Mr. Siebold for both these papers, and he only regretted there was not time to discuss the latter.

In the absence of the author Dr. THRESH read the following paper:

EXAMINATION OF COMMERCIAL COCOA BUTTER.

By EDGAR J. MILLARD.

When the examination of cocoa butter was undertaken, a preliminary review was made of the tests available for the detection of adulteration.

Although official under the name of oil of theobroma in the British Pharmacopœia, the tests therein are most meagre, being limited to a description of its physical properties, stress being laid, however, upon the melting point, which is stated to occur "usually between 30° and 35° C."

It was therefore necessary to see to what extent this could be used as a test, or rather what adulteration was possible, and yet leave the sample with an approximate melting point.

With this view a specimen of cocoa butter, which had previously been found to be pure, was incorporated with different percentages

of hard paraffin, wax, beef marrow, and tallow. The melting point of the original sample was 33° C., and the addition of as much as 10 per cent. of paraffin, wax, or tallow was found to vary the melting point only slightly outside the limits given as "usual" in the Pharmacopœia.

Similarly, the specific gravity was found to be an unreliable test, owing, as Ramsperger has pointed out,* to the variations which pure samples give. This variation, which in some cases is very wide, Ramsperger attributed to the different methods used in extracting the oil, and he gives, as illustrations, the specific gravity of a sample he obtained by expression as 0·85, b extraction with ether 0·97, and extraction by carbon disulphide 0·958.

Considering that nearly all the commercial cocoa butter is obtained by the first of these processes, this explanation was not considered sufficiently satisfactory, and it occurred to me as more probable that the high specific gravities were due to oxidation on exposure, somewhat in the same manner as palm oil undergoes by keeping a change resulting in its becoming harder and rancid, whilst its melting point is raised.

Although I have not been able to absolutely prove this beyond doubt, yet a sample examined two months ago, and which then had a specific gravity of 0·9199, after being purposely exposed, unwrapped, to the ordinary variations of temperature in a laboratory, was found to be 0·9233. It had then lost much of its agreeable odour and chocolate taste.

The U.S.P., however, gives the following specific test for the purity of cocoa butter:—"If two parts of oil of theobroma be dissolved in four parts of ether, in a test-tube, by immersing the tube in water of 17° C., and if this be afterwards plunged into water of 0° C., the mixture should not become turbid, nor separate a granular deposit in less than three minutes; and if the mixture, after congealing, be exposed to a temperature of 15° C., it should gradually become entirely clear."

The test is Bjorkland's modification of Fehling's, who published his in the *Handwörterbuch der Chemie* bearing his name. It was found to give distinct indications of the addition of as little as 5 per cent. of either paraffin, wax, stearin, or tallow.

By this method, therefore, all the samples were examined, whilst the specific gravity and melting point were also ascertained as of some interest.

* "Adulteration of Ol. Theobromæ," *Pharm. Journ.*, March 24, 1877.

The following eight samples were procured from some of the principal wholesale drug houses in London and Liverpool.

No.	Specific gravity.	Melting point.	Ether test, U.S.P.
I. . . .	0·9648	33° C.	clear.
II. . . .	0·9281	34° C.	clear.
III. . . .	0·9137	33° C.	clear.
IV. . . .	0·8961	32° C.	clear.
V. . . .	0·9174	34° C.	clear.
VI. . . .	0·9058	32° C.	clear.
VII. . . .	0·9009	33° C.	clear.
VIII. . . .	0·8748	30·5° C.	clear.

It will be seen by the above table that all the samples gave clear solutions in ether, even at 0° C.

To insure a fairly full and complete examination of cocoa butter as met with in pharmacy, the following ten samples were obtained from retail chemists in different parts of London and the country.

No.	Specific gravity.	Melting point.	Ether test, U.S.P.
I. . . .	0·9499	32·5° C.	clear.
II. . . .	0·9362	34° C.	clear.
III. . . .	0·9586	31° C.	clear.
IV. . . .	0·9798	34° C.	turbid.
V. . . .	0·9199	32° C.	clear.
VI. . . .	0·8974	33° C.	clear.
VII. . . .	0·9245	31° C.	clear.
VIII. . . .	0·9752	34° C.	turbid.
IX. . . .	0·9412	33 C.	clear.
X. . . .	0·9655	32·5° C.	clear.

It will be noticed that in the above table two samples gave turbid ethereal solutions. From experiments with the test previously conducted, I feel convinced that the turbidity, which was noticeable on first dissolving at 17° C., was not due to adulteration; but in each case, I am disposed to think, was caused by the slight rancidity or oxidation of the samples, which were also pale coloured or partially bleached from exposure; as, if adulterated, even to so small an extent as 5 per cent., a considerable deposit would have been formed at 0° C.

The results of the examination must be considered satisfactory, as out of eighteen samples tested only two come under even the shadow of suspicion. The result is, perhaps, not surprising, for

cocoa butter is one of the few medicinal substances of which the price has varied but very minutely during the last ten years.

Moreover, the demand for it is not of such a nature as to induce sophistication, and the source is, as far as I have been able to ascertain, wholly from the large and reputable chocolate or cocoa manufacturers.

The President moved a vote of thanks to the author for his paper.

In the absence of the author Dr. Thresh read the following paper :

QUINOLOGICAL WORK IN THE MADRAS CINCHONA PLANTATIONS.

By David Hooper, F.C.S.,

Government Quinologist.

The result of the work shown in the present paper, as in two papers previously submitted to the Pharmaceutical Conference, are taken from the annual report on the Government Cinchona Plantations of the Nilgiris. The experiments are supplementary to those already published, but when taken together are far from complete, for while disposing of some problems in quinology, others are opened up, and the more one works in this direction, the wider the field of research appears to become.

The report includes the testing of a number of Crown barks in order to show the variation in alkaloidal strength of individual trees growing together under the same conditions, the effects of the stripping process in different months of the year, and the value of bark obtained from trees when treated with different manures. The amount of lime in a full grown tree is given. Further attention is paid to the renewal of Ledger barks, and analyses of some of the rarer species of cinchona are tabulated.

The trees of *Cinchona Officinalis* growing on plot "XI.," Dodabetta, have been subjected to several experiments in order to solve some questions connected with the cultivation of this species. The plot is five acres in extent; it has a northerly aspect, and possesses a deep, black soil. The whole plot was coppiced in the autumn of 1879; the trees were, therefore, in April, 1886, six and a half years old; they were fairly uniform in height, but not so in thickness. Twelve trees were taken indiscriminately from different parts of the central portion of the plot, and strips of the bark taken as samples for examination. The result of their analysis will

demonstrate (1) the similarity or otherwise of trees grown in the same plot under apparently similar conditions of altitude, aspect, and soil; and (2) the effect of one or two or three stems coming from the same coppiced tree. The following is a description of the twelve trees:—

1. Tree with thick single stem.
2. Two stems of equal size, sample made up of strips from both.
3. Two stems, sample taken from larger one.
4. Two stems, sample taken from larger one.
5. Two stems with "crispy" bark, sample from both.
6. Three stems, sample from largest.
7. One stem with two suckers.
8. Two stems, several suckers, sample from larger stem.
9. Two large stems, sample from one.
10. Two large stems, sample from both.
11. One large stem, two tall suckers.
12. Two stems of equal size with suckers, sample from one.

The following is their analysis:—

	Quinine.	Cinchonidine.	Quinidine.	Cinchonine.	Amorphous alkaloids.	Total.
1	3·90	1·73	·09	·37	·32	6·41
2	3·74	1·82	·16	·34	·32	6·38
3	2·89	1·22	·05	·41	·23	4·80
4	1·75	·85	—	·29	·26	3·15
5	2·77	1·34	·10	·28	·57	5·06
6	3·25	1·44	·12	·21	·70	5·75
7	2·47	1·20	—	·42	·38	4·47
8	3·12	1·39	trace	·62	·45	5·58
9	2·51	1·27	·06	·36	·26	4·46
10	3·32	1·76	·03	·52	·35	5·98
11	2·75	1·34	·10	·10	·30	4·59
12	2·54	1·21	·09	·50	·29	4·60
Average . .	2·91	1·38	·07	·37	·37	5·10

A glance at the above table will show how trees of the same age and growing in the same situation, vary in alkaloidal strength. The quinine, with a corresponding amount of totals, ranges from 3·90 per cent. in No. 1 to 1·75 per cent. in No. 4; and the quinidine from 0·16 per cent. to an entire absence in two cases. It seems quite probable that there is no advantage in raising one stem only from a coppiced tree, as two or three stems have equally rich bark. Compare, for instance, Nos. 7 and 11 with Nos. 2 and 10. No. 6 specimen is a rich bark, although representative of three stems;

a much larger quantity of bark would be harvested from such a tree than from one with a single stem. But it must be borne in mind that these three stems occupied more than their proper share of space, and therefore it would be erroneous to suppose that any great advantage would be gained by growing three stems from one stool, except where the neighbouring trees are inferior in vigour of growth. When of two stems the sample is taken from the larger, it shows no better yield of alkaloids than if it were taken from both. From these results it is worthy of notice that very little dependence can be placed upon the appearance of a tree as indicating its market value.

The above twelve trees were operated upon on April 10, they were afterwards labelled and covered in the usual way. On the 10th of each month during the ensuing year the plot was visited and a sample taken from the remaining bark of one of the trees: No. 1 in May, No. 2 in June, and so on. The results of such an investigation would prove how the stripping of trees affected the bark left upon them, and would show in which month the yield of alkaloid is greatest.

	Quinine.	Cincho-nidine.	Quini-dine.	Cincho-dine.	Amorphous Alkaloids.	Total.
1. May . . .	3·38	1·56	·08	·23	·34	5·59
2. June . . .	2·91	1·18	·14	·32	·56	5·11
3. July . . .	2·33	1·37	—	·46	·53	4·69
4. August . .	1·54	·55	—	·11	·79	2·99
5. September .	2·33	1·13	—	·11	·44	4·01
6. October . .	2·78	1·32	—	·11	·52	4·73
7. November .	2·63	1·21	—	·19	·38	4·48
8. December .	3·39	1·43	—	·43	·60	5·85
9. January . .	2·58	1·30	—	·48	·54	4·90
10. February. .	3·35	1·63	·05	·56	·31	5·96
11. March. . .	3·95	2·01	·07	·33	·62	6·98
12. April . . .	2·65	1·23	·09	·38	·45	4·80
Average . . .	2·82	1·33	·03	·31	·50	5·08

The facts adduced from this table might be summed up as follows. For six months after the first bark was taken from the trees there was a decrease in alkaloids in the bark left, and in the remaining six months there was an increase. It would appear that the tree had sustained a shock for some time after the removal of the strips, and the original bark had been weakened by the process of renewing going on in its vicinity, as on the seventh month, November, the renewal had well set in over the stripped portions of the tree, and the old bark had begun to recover itself.

In November, December, January and February, the addition of alkaloids was not great, but in March this was very noticeable, and this corroborates Broughton's experiments in showing March to be the month when the yield of alkaloids is greatest. When the cycle of the year was completed in April, 1887, the bark on the twelfth tree was better than twelve months ago, but only slightly; however, the decrease of quinine and totals in the first six months is counterbalanced by the increase in the last six months, so that by taking the average of these figures for the year it will be seen that there is a close correspondence between them in this and the previous table.

Experiments with Manures.—Plot "XI.," Dodabetta, was in April of last year divided, as near as possible, into five equal portions. Four portions were respectively treated with cattle, stable, lime and stable, and bone manures; the fifth portion in the centre was left in its natural state. In April of this year the entire plot was harvested by means of the stripping process, and the green bark from each portion was collected and dried separately, and its weight ascertained. The trees in each portion were counted, so that the average amount of bark from a number of trees could be calculated and compared with the weight of others differently manured.

The result of the harvest proved that the amount of bark per tree was highest in the portion containing cattle manure, and the next that from prepared bones, but the quantities of bark from the stable and lime and stable manured portions did not materially exceed the amount of natural bark from the unmanured trees.

Turning now to the effect of manuring trees in order to increase the alkaloidal yield of the bark, the following analysis of the five samples will show how that object has been attained. It will be seen that all the manures have raised the value of the barks, but in different degrees; the analyses are therefore arranged according to the following order, the best being placed first:—

	Quinine.	Cinchonidine.	Quinidine.	Cinchonine.	Amorphous Alkaloids.	Total.
Bone Manure .	3·30	1·59	·10	·38	·43	5·80
Cattle Manure .	3·25	1·50	·13	·35	·41	5·64
Lime and Stable Manure . .	3·18	1·40	·08	·21	·48	5·35
Stable Manure .	3·05	1·41	·12	·32	·38	5·28
Unmanured .	2·88	1·45	·11	·21	·25	4·93

The increase in each instance is not very great; if the unmanured be compared with the highest in the table, the quinine will be found to have an addition of only 14·58 per cent., and the rest smaller in proportion. In last year's report it was shown that a succirubra and a hybrid gave a much superior yield of quinine under the influence of cattle compost than these did, and the manure applied to them had been down only six months before the samples were taken for analysis. It is well known that officinalis is one of the slowest growers of all the cinchonas, so that it is very probable that manure requires a longer period to stimulate the yield of alkaloids in this, than it would in other species. The experiments at Dodabetta point to cattle manure and bones as the best agents (of the series tried) for manuring cinchonas; the one increased the bark per tree more than the rest, and the other increased the alkaloids in the bark, and, as both these objects are sought for by all scientific cultivators, it is very likely that the application of a mixture of the two would have still more favourable results than if they were used separately. Cattle manure is organic, and contains ammonia compounds; bones are phosphatic, and consist principally of phosphate of lime. A combination of these typical manures is found in "guano," the excrement of sea fowl; it might, in consequence, be inferred that the use of this substance in cinchona plantations would be attended with an excellent out-turn. The prepared bones were made by breaking up the bones to a coarse powder and treating them with 10 per cent. by weight of sulphuric acid; this would cause the insoluble phosphate to become soluble, and therefore more readily absorbed by the plants when put in the soil. In the absence of the more expensive artificial manures, it is satisfactory to find such good bark resulting from the use of cattle manure, one that is more available on these hills than any other.

Amount of Lime in a Cinchona Tree.—After determining last year the inorganic constituents of cinchona bark, and finding lime to be the principal, I was rather astonished at the lime and stable manure not occupying a higher position in the table given in the previous section. Not only does bark contain lime, but also all parts of the tree, and as the ashes of the branches, leaves and wood had been severally estimated, an approximation could be obtained of the amount of lime removed from the soil by a full-grown tree. The specimen was a twenty-year old tree of *C. succirubra*, growing at Naduvatam, the various parts were weighed, and as the amount of lime in each ash was known, the percentage of lime in each part could be calculated.

		Ash. Per cent.	Lime in Ash. Per cent.	Lime. Per cent.
Stem Bark, 21 lbs. Root Bark, 5 lbs.	26 lbs.	3·50	32·8	1·14
Branch and Twig .	5 lbs.	4·00	32·8	1 31
Leaves . . .	2 lbs.	5·00	27 7	1·38
Wood . . .	200 lbs.	·27	15·0	·04

Bark of Stem and Root . . .	4·74	ounces.
Bark of Branches and Twigs . .	1·04	,,
Leaves.	·44	,,
Wood of Stem and Root . . .	1·28	,,
	7·50	,,

The tree contained $7\frac{1}{2}$ ozs. of quicklime, or nearly 10 ozs. of pure slaked lime, equivalent to more than $12\frac{1}{2}$ ozs. of the "chunam" of this country.

Renewal of Ledgers.—In two former reports I have shown the effect on hybrid Ledger bark after being twice and three times renewed. It was seen that the renewal was richest in the first and second years, but not so much in the third. I have this year received from the same estate in the Ouchterlony Valley the fourth sample, and for comparison its analysis is quoted, together with the figures of former years.

	Quinine.	Other Alkaloids.	Total.
Original Bark. .	1·35 .	5·87 .	7·22
First Renewal .	2·46 .	4·22 .	6·68
Second ,, .	3·60 .	3·99 .	7·59
Third ,, .	3·87 .	3·71 .	7·58
Fourth ,, .	3·03 .	3·98 .	7·01

Thus, a fourth renewal may be borne by a Ledger, but with a decrease in the richness of the bark as compared with previous years. It cannot, however, be called a poor bark with 4 per cent. sulphate of quinine and 7 per cent. total alkaloids. The bark is in a better condition than when it was first renewed, and it would be of interest to continue the experiment, to know how long it could be renewed with profit.

The Influence of Prolonged Covering.—The mossing system was introduced to encourage the growth of the renewed bark, and to protect it from the influence of the weather; for the same reason it was adopted to thicken and enrich the original bark left on the tree, and now, after repeated trials, it has been proved that both barks are really benefited by such a covering if allowed to remain on for six months to three years. But, as in original barks, if left for several years without any special protection, the alkaloids remain

stationary or even decline, so in covered barks, whether "mossed" or "renewed," the alkaloids are not improved by continuing the covering longer than four or five years. The following analyses of crown barks mossed for three, seven and nine years will illustrate what has been said:—

	Quinine.	Cinchonidine.	Quinidine.	Cinchonine.	Amorphous Alkaloids.	Total.
Renewed 9 years	3·40	·98	·34	·43	·44	5·39
,, 7 ,,	3·33	1·00	·32	·75	·78	6·18
,, 3 ,,	4·20	·85	·22	·65	·70	6·63
Mossed 9 ,,	2·71	1·31	·17	·55	·26	5·00
,, 3 ,,	3·49	1·50	·20	·45	·62	6·17

Analyses of Rarer Species of Cinchona.

	Quinine.	Cinchonidine.	Quinidine.	Cinchonine.	Amorphous Alkaloids.	Total.
C. Anglica 1 . .	4·16	·64	·27	·34	·68	6·09
,, 2 . .	1·57	·47	1·40	·89	1·00	5·33
,, 3 . .	1·06	1·21	·28	1·52	·54	4·61
,, 4 . .	·84	·55	·38	1·02	·90	3·69
C. Verde 1 . .	2·65	1·18	—	·63	·86	5·32
,, 2 . .	1·58	1·17	—	1·62	·40	4·77
C. Morada . .	1·69	2·28	—	·59	·68	5·24
C. Nitida . . .	1·42	2·45	—	1·48	·67	6·02
C. Micrantha, branch . . .	—	—	—	1·50	·45	2·05
C. Micrantha, natural . . .	—	—	—	1·92	·40	2·32
C. Micrantha, renewed. . .	—	2·45	—	2·12	1·02	4·59

C. Anglica.—No. 1 was from a private estate at Naduvatam, and the others were from different plots on the Government plantations, Naduvatam; all except the first are probably hybrids.

C. Verde.—No. 1 is from a young tree growing in the Wynaad. No. 2 is four years old, from the Nilgiris; it is poor for its age, and its alkaloids are not at all representative of a *Calisaya*.

C. Morada.—This sample came from the same estate as the last, and is of the same age; from its analyses it appears to be a hybrid.

C. Nitida.—This is one of the "Grey barks" of commerce, and is noted for containing cinchonine. Its composition, however, most resembles succirubra bark.

C. Micrantha.—This is another "Grey bark." A most interesting fact is disclosed by these analyses, and one which has, I believe, never been noticed before, namely, the conversion of cinchonine into cinchonidine by renewing. Cinchonine is the chief alkaloid in micrantha; young barks contain about 4 or 5 per cent. Broughton found 7 per cent. in one almost pure, and as the above samples were from old trees, the amount had therefore deteriorated. The renewed bark, which was very thick, was also from an old tree, and it is seen the cinchonidine predominated over the cinchonine, which reigned almost supreme in the natural bark, and the change, to all appearance, was brought about by no other means than the renewal of the bark from the cambium layer.

Votes of thanks were passed to the authors of these papers on the motion of the PRESIDENT.

The last paper read was entitled—

NOTES ON CRUDE CARBOLIC ACID AND ITS SUBSTITUTES.

BY ALFRED H. ALLEN, F.I.C., F.C.S.,

President of the Society of Public Analysts.

The general characters of carbolic acid are well known. The better qualities of the commercial product are well represented by the articles manufactured by F. C. Calvert & Company. Their "No. 1 carbolic acid," in the form of colourless crystals, may be regarded as chemically pure and absolute, and free from homologous phenols, the proportion of which gradually increases in the lower grades, till the liquid known as "No. 5 carbolic acid" consists chiefly of cresylic acid, with smaller proportions of higher homologues and traces of naphthalene and other impurities. For ordinary disinfecting purposes such an article appears to be fully as serviceable as pure carbolic acid; but according to Dr. Tidy this statement does not extend to the lime compound of cresylic acid, which is said to be practically valueless as a disinfectant, whatever may be the value of the carbolic compound with lime. This view is borne out by the experience of one of the best-known manufacturers, and hence it may be accepted that in cases where

the base of a carbolic powder is slaked lime the resultant "carbolate of lime" is of little value for antiseptic purposes.

Besides lime a variety of other substances have been employed and patented as bases for the manufacture of carbolic powders. Thus "Macdougall's disinfecting powder," the oldest preparation of the kind, is made by adding a certain proportion of crude carbolic acid to a crude sulphite of calcium, prepared by passing sulphurous acid gas over ignited limestone. Sulphurous acid is introduced into other powders by the direct addition of a solution of calcium bisulphite, and the use of other sulphites has also been patented. "Calvert's carbolic acid powder" is made by adding carbolic acid to the siliceous residue resulting from the manufacture of sulphate of aluminum or patent alum, from shale or kaolin. Calcium sulphate is likewise a suitable absorbent, and kieselguhr has been patented by Mr. Chas. Lowe for the stronger powders. As much as 50 per cent. of carbolic acid is readily absorbed by kieselguhr. The use of peat as an absorbent of carbolic acid has been patented by Knights & Gall. Limestone is also used as a base, and spent gas lime has been patented by Austin. A mixture of bleaching powder and carbolic acid recently received protection. Macdougall Brothers have patented the use of soluble salts as absorbents of carbolic acid, the resultant powder being more readily removed and less liable to choke up drain pipes than the preparations commonly employed. A step in the same direction is the "borophenol," patented by Borland, which is made by absorbing carbolic acid in dried borax.

Although the term "carbolic acid" has been extended, commercially, so as to include products consisting chiefly of cresylic acid and still higher homologues of phenol, it appears a straining of its legitimate signification to apply it to products from which the real carbolic acid has been previously extracted. This, however, is sometimes done, and "carbolic acid" and "carbolic powders" are sold in which real carbolic acid is conspicuous by its absence. But if the inexact description of cresylic acid as carbolic acid is objectionable, the matter becomes more serious when the article is purposely mixed with neutral tar oils or other hydrocarbons of little direct value as antiseptics.* This has been done in cases within my knowledge to the extent of fully

* Usually the crude carbolic acid of the best makers contains only a trifling quantity of hydrocarbons, but the article is not always equally good. A make of crude carbolic acid sent out in May last by one of the best known firms had so offensive a tarry odour that it was found impossible to employ it indoors.

50 per cent., the "carbolic acid" and "carbolic powders" sold to corporations and local boards of health affording a fertile field for the operations of the blender.

Another illicit practice which is increasing is the complete or partial replacement of carbolic or cresylic acid from coal tar by the mixture of phenoloid bodies obtained from the tar or oil produced by condensing the waste gases from blast-furnaces burning bituminous coal. "Blast-furnace creasote oil" is now produced in enormous quantities in Scotland, and has already found an extensive application for creasoting timber, or producing the "Incigen" and "luminator" lights, and as a liquid fuel. It contains from 20 to 35 per cent. of phenoloid bodies soluble in caustic soda, as against 5 to 10 per cent. in coal-tar creasote oil of London make (Newcastle coal).

Here, then, is a cheap and abundant source of phenoloid bodies, but it is evident that the unacknowledged substitution of them for coal-tar acids is objectionable, even assuming them to be comparable to the latter in antiseptic value.

Our knowledge of the phenoloid bodies extracted by caustic soda from blast-furnace creasote oil is chiefly due to the researches made in this building by Mr. Watson Smith. He found a sample of phenoloids extracted from blast-furnace tar to contain only 1·33 per cent of real phenol boiling at 182° C., whereas the tar acids from Lancashire coal tars yield about 65 per cent. of crystallizable carbolic acid. The fraction which would contain the *cresols* (cresylic acid) amounted to 4·5 per cent. of total phenoloids. The larger fraction (10·4 per cent.) distilling between 210° and 230°, probably consisted mainly of *phlorol* (mixture of the xylenols, $C_8H_9.OH$) and *creasol*, $C_6H_3(CH_3):(OH)(OCH_3)$. A large proportion of the phenoloids distilled at a temperature above 230°, but their nature requires further study. The fraction distilling above 360° gave, on treatment with soda and exposure to air, unstable colouring matters which are probably allied to the eupitonnic acid obtained from wood-tar. The tars obtained by condensing the gases from gas-producers and coke-ovens contain phenoloid bodies not unlike those of blast-furnace tar. Similarly, the crude oil or tar produced in the south of Scotland by the distillation of bituminous shale yields to soda phenoloid bodies to the extent of 1 or 2 per cent. Creasol seems to be wholly absent, but on the other hand *phlorol* is present, as also a *cymenol* ($C_{10}H_{13}.OH$) boiling at 237°, and two phenols isomeric therewith. The *pyrogallic ethers*, boiling respectively at 253°, 265°, and 285°, found by

Hofmann in wood-tar creasote, have also been isolated from the shale product, as also other bodies of very high boiling point, which have not yet been fully examined.

These results show that a certain similarity exists between the phenoloids of low temperature tars, whether they be obtained by the distillation of wood or shale, or by the condensation of the gases from blast furnaces, coke ovens, or gas producers. In minor though important points differences exist, but they present a far greater resemblance to each other than they do to the coal-tar acids. My own experiments also show that in their analytical characters the phenoloids from blast-furnace tar approximate more closely to those from wood-tar than they do to the coal-tar acids, though more or less carbolic and cresylic acids appear to be constantly present, and the proportion of xylenols is considerable.

Here, then, we have apparently an article which on *primâ facie* grounds we should expect to have a high antiseptic value. It must be remembered that it was to the phenoloids of wood-tar that Reichenbach, in 1832, first applied the name of *creasote* or "flesh preserver." When, soon after, Runge discovered carbolic acid in coal-tar, it was confused with the wood-tar principle, and it is probable that the antiseptic properties of carbolic acid itself would not have received such prompt and wide recognition but for the advantage it derived from its confusion with the original wood-tar creasote of Reichenbach. In short, wood-tar creasote has been superseded by the cheaper product from coal-tar, except for certain limited applications.

Hence the production from blast-furnace tar, and at a cheaper rate, of a substance somewhat allied to wood-tar creasote, appears likely to furnish us with a new and valuable antiseptic. The Eglinton Iron Company are now preparing to produce the article on a large scale, and are introducing it on its merits, with a full admission of its nature and origin, instead of surreptitiously selling or using it for adulterating carbolic acid. At my suggestion the Eglinton Iron Company have adopted for their product the name "Neosote," a word which signifies "new preserver" or "new preservative," and may serve to suggest the similarity of the article to creasote.

The Eglinton Company recognise the highly complex nature of the crude mixture of phenoloid bodies obtained by treating their blast-furnace tar with soda, and hence all their "neosote" is subjected to a process of further purification, which greatly improves it. Thus the strong, disagreeable odour of the crude

product is destroyed, and the highly irritating and acrid bodies are also removed. These objectionable constituents are probably identical with, or closely allied to, the *carulignol* of wood-tar creasote, a single drop of which causes bleeding when placed on the tongue.

Refined "neosote" from blast-furnace tar is, when freshly prepared, almost as colourless as water, but it acquires a sherry colour by keeping. Experiments purposely made to test its antiseptic value indicate that it is fully able to compare with crude carbolic acid, while its caustic properties (when applied in a concentrated condition to the skin) are very much less marked than those of the coal-tar product. In short, when properly purified, neosote presents a considerable resemblance to wood-tar creasote.

But while there appears to be a useful and legitimate field in the future for the properly purified phenoloids from blast-furnace and allied tars, it is only right to state that there are already in the market products of a very crude and objectionable character, the illicit introduction of which may seriously affect the public confidence in an article which I believe has a fair future if judged on its intrinsic merits. As an illustration of the results such products yield when assayed, I may quote the following figures obtained in my laboratory. The distillation was performed on 100c.c. of each sample, which was heated over a naked flame in a small flask with a side-tubulure, the thermometer being immersed in the liquid. A was a sample of Calvert's "No 5 carbolic acid." B was an article which was recently sent round to manufacturers of disinfecting powders under the description of "crude carbolic acid," but the analytical results show clearly that it was not a gas-tar product at all, but an exceedingly impure creasote from a low-temperature tar. C is the crude mixture of phenoloids obtained from blast-furnace tar by the Eglinton Iron Company, and even in its unpurified condition presents a marked contrast to the sample B. Sample D was manufactured from C by a process which is not yet made public, but of which distillation forms a part. It represents an ordinary quality of "neosote." E is a special product obtained from D by further refining and redistillation.

In each case the figure expressing the distillate below 200°, or the lowest temperature mentioned, includes the proportion of water stated to be present.

Colour.	A. Reddish.	B. Dark Coffee-Brown.	C. Coffee-Brown.	D. Straw Yellow.	E. Colourless.
Specific gravity	1·0430	1·0574	1·0501	1·0328	1·0380
Water	8·5	4·0	8·0	none	none
Hydrocarbons	0·8	9·6	2·3	1·3	—
Phenoloids	90·7	86·4	89·7	98·7	—
Fractional Distillation :—					
Per cent. distillate below 190° C.	13·0	—	—	—	none
,, ,, 200° C.	90·0	—	9·5	none	36·0
,, ,, 210° C.	96·0	—	10·0	69·5	95·0
,, ,, 220° C.		7·5	27·0	94·0	
,, ,, 230° C.		7·0	48·7	—	
,, ,, 240° C.		22·0	62·7	—	
,, ,, 250° C.		31·0	71·2	—	
,, ,, 260° C.		37·5	76·7	—	
,, ,, 270° C.		43·0	81·2		
,, ,, 280° C.		47·5	84·2		
,, ,, 290° C.		53·0	86·7		
,, ,, 300° C.		58·5	90·2		
,, ,, 310° C.		64·5	—		
,, ,, 320° C.		68·5	—		

The PRESIDENT proposed a vote of thanks to Mr. Allen for this very important paper, which he was sure would be carefully studied.

GENERAL BUSINESS.

Reappointment of Unofficial Formulary Committee.

The PRESIDENT said there were a few matters of business to which he would now invite attention. The Executive Committee had recommended in the annual report that the Unofficial Formulary Committee be reappointed. That Committee did not apply for any fresh grant, the former grant of £25 not being yet expended. Whilst recognising the services of that Committee, it was only right to specially mention the names of two gentlemen, and he was sure the other members would not think him invidious in making that selection. First he wished to mention the services received from the Chairman, Mr. Martindale, and that he of all men should have been willing to go *con amore* into a work of this kind reflected the highest credit on his unselfishness. There had been also an enormous amount of work done by the Secretary to the Committee, Mr. Naylor, who was as modest as he was capable.

He concluded by moving the reappointment of the Formulary Committee.

Mr. WILLIAMS, in seconding the motion, said the Committee deserved the thanks of the Conference. Of course the first year's work was more difficult than he hoped it would be hereafter, because the Committee had had to organize and arrange the plan of operations. He knew what an enormous amount of labour had been gone through, and the Conference ought to be very grateful to the gentlemen who had undertaken this responsible and very valuable work. It was a misfortune the members of it could not more frequently meet, for he understood the great amount of correspondence was a drawback to the easy working of the Committee; still, it was impossible to draw gentlemen from distant parts of the country to discuss personally the questions which came before them.

The motion having been carried unanimously,

Mr. MARTINDALE thanked the members for the very kind appreciation they had shown of the work which had so far been done. It was not much, but the Committee had gained a little experience which tended to give hopes for the future, and by another year he hoped there would be a greater number of formulæ prepared.

The Bell and Hills Library Fund.

The PRESIDENT said it was now his pleasing duty to ask the Manchester Pharmaceutical Association to accept the contribution of books to their library from the Bell and Hills Library Fund. These books he hoped and believed would be a useful addition to the library. There was in Manchester a Pharmaceutical Association of many years' standing, as was to be naturally expected in a city like Manchester, and he hoped the young pharmacists of the neighbourhood would find this contribution of service to them.

Mr. WILKINSON, on behalf of the Manchester Pharmaceutical Association, was very glad to thank the donors of these very valuable books. The Association had existed in Manchester for a number of years, ever since 1852, with more or less success, and he hoped the present assemblage of the Conference in that town would be the means of giving it greater prosperity. He was sure these books would be much studied, and would be of great service to the students.

Place of Meeting for 1888.

The PRESIDENT then proposed that the Conference follow the usual practice, and that the meeting be held next year at the

same place as the meeting of the British Association, which would be in the city of Bath.

Election of Officers.

Dr. THRESH than read the following list of officers for the ensuing year, suggested by the Executive Committee for the acceptance of the Conference.

President.—F. B. Benger, F.C.S., Manchester.

Vice-Presidents.—M. Carteighe, F.I.C., F.C.S., London; C. Symes, Ph.D., Liverpool; S. Plowman, F.R.C.S., London; W. Martindale, F.C.S., London.

Treasurer.—C. Umney, F.I.C., F.C.S., London.

Honorary General Secretaries.—J. C. Thresh, D.Sc., F.C.S., Buxton; W. A. H. Naylor, F.I.C., F.C.S., London.

Other Members of the Executive Committee.—W. N. Allen, Dublin; M. Conroy, F.C.S., Liverpool; R. H. Davies, F.I.C., F.C.S., London; D. B. Dott, F.R.S.E., Edinburgh; A. W. Gerrard, F.C.S., London; T. Maben, Hawick; N. H. Martin, F.L.S., Newcastle; F. Ransom, Hitchin; and G. S. Woolley, Manchester.

Auditors.—W. Wilkinson, Manchester.

A ballot paper bearing the above names was handed in, and no other names being tendered the whole were declared elected.

Mr. BENGER thanked the members for the great honour they had done him, and for their confidence in asking him to be the President next year. However much he might doubt the wisdom of their choice, he could not doubt the kindliness of their feelings, and it was only his confidence in the continuance of that kindness which rendered him willing to undertake such responsible duties. He would promise to do his best, and trusted the Conference might not seriously suffer for what he could not help regarding as rather an error of judgment.

Mr. SCHACHT said he had a very agreeable duty to perform, but it was not simply a matter of form, either in his own mind, or, he was sure, in that of any one present. He had simply to move—

> "That the cordial thanks of the non-resident members of the British Pharmaceutical Conference be given to the Local Committee, especially to Messrs. Woolley, Benger, Hart, Kemp, Gibbons, and Wilkinson, for the very successful way in which the arrangements connected with the Manchester visit had been made and carried out."

All would agree with him that the continuance of the existence of the Conference depended very largely on the efforts made on these occasions by the Local Committee; an immense deal of labour fell on those individuals, and year by year the Conference was greatly indebted to them. On the present occasion all visitors and strangers had had ample proof of the care with which everything had been arranged, and the kindness and cordiality with which the arrangements had been carried out.

Mr. MARTINDALE, in seconding the motion, said this visit to Cottonopolis was an occasion he had looked forward to with great pleasure, and he had enjoyed meeting with several old friends, and especially some members of the Local Committee, very much.

The PRESIDENT, in putting the resolution, said he desired to support it with all his heart. He had received so many constant marks of attention, that he could not adequately express his indebtedness to his friends in Manchester.

The resolution was carried unanimously.

Mr. WOOLLEY said the members of the Committee were deeply gratified at the cordial way in which this resolution had been received. He could assure Mr. Martindale that the chemists, not only of Manchester, but of the district, had also been looking forward to this visit with great interest. He was himself very gratified by the way in which the prospect of entertaining this Conference was taken up and looked forward to, and the arrangements made by the pharmacists of the entire district. He trusted that what had been done had tended to promote the pleasure of the members while there. Of course in entertaining a large meeting like that, there must necessarily be some shortcomings; for instance, Manchester had an evil reputation with regard to the weather, but quite recently they had been within a very few days of a water famine, so that the rain which had fallen was not altogether a misfortune. The Committee had been in communication with the weather office at Matlock, and he had reason to believe that they would have a very satisfactory day on the morrow.

Mr. BENGER, on behalf of the Local Committee, also thanked the meeting for their appreciation of what had been done. It was only the accidental circumstance of his being the Local Secretary that led to his name being more prominent than that of other gentlemen, and he was sure any one else would have worked with as much earnestness as he had under similar circumstances. They were amply repaid for any trouble they had taken by the pleasure they felt at seeing so large a meeting.

Mr. WILKINSON also acknowledged the vote of thanks.

Mr. REYNOLDS said he had been asked to move a resolution expressing their grateful feelings for the splendid accommodation placed at their disposal by the authorities of Owens College, and if he added a few words it was because he had been rather intimately connected with an institution of that kind, and attached importance to the growth all over England of these great scientific colleges. There was a fitness in their meeting in that place, inasmuch as there was an affinity between the purposes of the College and their own objects, and the future would show that that affinity would have closer developments. Already in this College, *primus inter pares* of eight or ten having similar aims, pharmacy was recognised, and one of their own body, Mr. Elborne, held a recognised position in the institution. That was a matter of the greatest interest to them, and what happened there would happen a little later on in connection with that educational problem which they had not yet solved in all the other great centres. Dr. Leech's admirable address that morning, which was especially interesting as showing how they were in touch with the sciences and arts which were not exactly within their own borders, must have interested every one who considered what influences might bear on the future of pharmacy. The precision which had been given to the methods of diagnosis by the stethoscope, thermometer, and other means seemed likely to be followed with regard to therapeutics, so that there would be much greater certainty as to the action of drugs. They were all deeply interested in that, and it was very pleasant to know that they were recognised as having such an interest. In connection with strophanthus, Professor Birch, of the Yorkshire College, Leeds, was engaged on the investigation of a different species, which was regarded at one time as a false strophanthus, the *Kickxia africana*, and he had already arrived at most interesting results, Mr. Christy having placed a large quantity of seed at his disposal. It would thus be seen that not only there, but in other institutions these investigations were going on, to the great advantage of science. He begged to move—

> "That a hearty vote of thanks be given to the Principal and Council of Owens College for the use of the Chemical Theatre, and to Professors Leech, Marshall and Young for promoting the success of the Conference."

Mr. DOTT seconded the motion. The resolution was carried unanimously.

Mr. Young, of Edinburgh, said he understood there was to be a conversazione at the Exhibition building on the following day, and the Executive Committee of the Exhibition, recognising the presence of so many strangers in Manchester, had intimated their desire that all the members of the Conference should be present as well as other strangers connected with another society; it therefore became them to return a hearty vote of thanks for their kindness. He need not say a word with reference to the Exhibition itself, which they heard of in all quarters as being one of the best which had yet been held. He had the pleasure of being present a few hours on the previous day, and never spent a more enjoyable afternoon. He had, therefore, much pleasure in proposing—

> "That the best thanks of the Conference be given to the Executive Committee of the Manchester Exhibition for including the members of the Conference in their invitation to the Conversazione on Thursday evening."

Dr. Symes, in seconding the motion, said this invitation might be taken as further evidence of the genial manner in which their Manchester friends had come forward to make their visit agreeable.

This motion was also carried unanimously.

Mr. Conroy then moved—

> "That the hearty thanks of the Conference be accorded to the President for the very able and courteous manner in which he has conducted the business of the meeting."

Mr. Balkwill had great pleasure in seconding the motion. Although he had come a long distance to attend the Conference, he had been fully rewarded by the enjoyment he experienced in listening to the address, and that had been increased by the eminently courteous and happy way in which the President had conducted the business of the Conference. He felt that in some passages in that address the President had used words which would help the whole of their body throughout the length and breadth of the land, and when he spoke about the band of men who were interested in pharmacy at the commencement of the Pharmaceutical Society, he could not but feel that as from time to time he had had an opportunity of coming in contact with those who were in the centre and heart of that Association, he realized that they had still amongst them men of the same spirit. Foremost amongst these men was the President, and to him as repre-

senting that little circle, and for all his work in the Society and Conference, and in the interests of pharmacy, he did feel that in seconding this vote of thanks he was only the mouthpiece of the whole body.

Mr. SCHACHT, as the senior Vice-President present, put the motion, which was received with acclamation.

The PRESIDENT said he was perfectly incompetent properly to acknowledge this vote of thanks which had been so kindly expressed. He felt, when invited to be President, so totally incompetent for the office that, staying as he was at Ilkley, when he received the letter from Mr. Plowman, intimating the desire of the Committee, he felt that he must take a few hours to decide, and his first impression was that it would be wise to decline. But he thought that was scarcely manly, and he perhaps rashly accepted. He felt most intensely the honour which had been conferred upon him. He had given a most inadequate address, and he had endeavoured to conduct the transactions without any discourtesy to any member of the Conference. He begged to say that to meet so large, varied, and representative a gathering of pharmacists as he had the honour to preside over, had been the one event in his public life which he should always remember with the greatest pleasure. They had met under signal advantages in a lofty and appropriate building, and in the city of Manchester, of which he knew but little, but where he had several treasured friends, prominently Mr. Woolley and Mr. Benger. To come there and to meet them all, and to have heard the important contributions to scientific knowledge in the papers which had been read and discussed, had been to him a matter of the most intense interest. He could not sit down without referring to the important services rendered by their friends the Secretaries. Perhaps it had not occurred to the members that gentlemen who drew up the agenda for the meetings of course could not include themselves, and hence they might, by a pure act of forgetfulness, not receive the recognition they deserved, but they owed very much to the thoughtful preparation for days and months beforehand of these gentlemen, and when the time for the meeting came, the quiet and easy way in which the work went on was greatly owing to the work of these men, who, as a rule, got no formal vote of thanks. He wished therefore, in passing, to acknowledge the great services of Dr. Thresh and Mr. Naylor, and thanked the members most heartily and sincerely for the vote of thanks they had passed.

THE EXCURSION.

The train from Manchester to Matlock Bath left the Central Station at 9.10 on Wednesday morning, with over 200 passengers. Unfortunately the morning was a dull one, nor did it improve on the journey, and when the train arrived at Matlock Bath, shortly before eleven, it became too evident that the Matlock weather clerk had not been amenable to the process of squaring which Mr. Benger had attempted on the previous day. No rain had fallen on the journey, however, and though sunshine was lacking, the party expressed their satisfaction with the picturesque character of the latter part of it—the Derbyshire Peak district. The Local Committee could not have done better than to select the village of Matlock Bath as the centre for the day's pleasure. There are certain historical events associated with it; its mineral wealth is a story of the Roman period, and its numerous natural caves are weird enough to recall the primitive life of the Early Britons, and sufficiently interesting to pass an hour or two in on a rainy day. But the face of nature was of greater interest than the bowels of the earth, and he must have been a soulless man who did not appreciate the wild character of the scenery. The High Tor is what the Matlock Bath people claim for their "very own," and this gigantic rock had to be surmounted by the party. It is not so high as the Matterhorn, but it was a good stiff pull to the top, and it looked quite 600 feet from there to the smooth but muddy Derwent, which flowed past its base. A glimpse of sunshine would have been welcome here; rain came instead, but did not spoil the natural grandeur of the view, which reminded one somewhat of the scenery of Saxony. The Tor was not sufficiently attractive, however, to keep the party on the top of it for two hours, and most of the company wandered to other parts, including the Heights of Abraham, and the numerous caverns and petrifying wells, for which the district is famous. A heavy rain fell between twelve and one, but every seat in the marquee at the Royal Hotel was filled by a few minutes past one, when luncheon was served. An excellent collation was provided; so much so that we heard the committee profusely complimented on their crowning achievement. Before the company rose from the table, Mr. G. S. Woolley, the Chairman, gave the loyal toasts. These having been responded to, he gave "The Health of the Conference," to which Mr. S. R. Atkins felicitously replied. In submitting the next toast, that of the "Local Committee," Mr. J. R.

Young remarked that all future committees would do well to take the Manchester one as their example. Mr. F. B. Benger, in the course of his reply, said he regretted that in one particular the Committee had failed—they had not succeeded in squaring the clerk of the weather.

The concluding toast, proposed by Mr. G. F. Schacht, was "The Health of the Chairman," which was received with great enthusiasm.

The members then took their seats in carriages for a drive, which occupied fully two hours: the pleasure was considerably marred by a heavy rain-shower, which began to fall at 2.30, and continued until the party returned. In the course of the drive the party passed Lea Hurst, the Derbyshire home of Miss Florence Nightingale, and the ruins of Wingfield Manor. This is believed to have been built by Ralph, Lord Cromwell, in the time of Henry VI., and during the Civil Wars was a place of great importance. Mary Queen of Scots was imprisoned in the manor. Amongst the other notable buildings pointed out was Stancliff Hall, the residence of Sir Joseph Whitworth. Arrived at the hotel, a veritable "tea-fight" was the first part of the proceedings. The party returned to Manchester by train at six o'clock.

THE CONVERSAZIONE AND RECEPTION.

The Conversazione and Reception by the President and Officers of the Conference was held in a suite of apartments at the Grand Hotel. Between two and three hundred members and friends were present, and a very enjoyable evening was spent. A selection of music was played by a string quartette band, and a number of glees, choruses, etc., sung by an excellent glee party. A collection of interesting microscopic objects had been got together by Mr. Hart and Dr. Thresh, and were exhibited on tables in one of the rooms. This pleasant reunion greatly facilitated the transaction of the business of the Conference on the following days, old acquaintances were renewed, and the foundations of new friendships were laid. The utility of such a gathering was so manifest that it will, doubtless, now be considered a permanent institution.

UNOFFICIAL FORMULARY.

INTRODUCTORY REMARKS.

The British Pharmaceutical Conference, at its Annual Meeting held at Birmingham, in August, 1886, appointed a Committee of ten of its Members to prepare a Formulary of Unofficial Remedies.

The proposal that this step should be taken was received by the Members present with such cordial approval that there could be no doubt that it expressed the feeling of a general want. The revision of the British Pharmacopœia has been undertaken at periods so long apart that the remedies introduced as new preparations in the latest edition have usually enjoyed extensive use during many years before their official recognition. Such a period of probation appears fitting, rather than the introduction to the medical world of new and untried remedies in the pages of the national Pharmacopœia. If this position be accepted, it rests either with individuals or with associations to advise as to the best formulæ for the administration of such remedies. This may involve considerations as to the material to be employed, its preliminary preparation, the most suitable solvent and process, the best proportions, and finally what adjuvants are most appropriate.

More than ten years since, the Société de Pharmacie of Paris, moved by identical considerations, appointed a Committee to prepare such a formulary, and the result was a valuable contribution to pharmacy.* The American Pharmaceutical Association has also issued a comprehensive provisional formulary.

The Committee of the British Pharmaceutical Conference cannot feel surprise if circumstances appear to have placed upon the body which they represent the responsibility of undertaking a like duty for Great Britain.

They have only to look back for the past fifty years to find that English pharmacists have supplied and continue to supply to medicine and pharmacy the most valuable of the published compilations of unofficial formulæ, a condition similar to that long found in France and in the United States.

It is self-evident that when new remedies are first introduced, the conditions of their fair trial demand that the preparations employed should be made *Secundum artem*. It is also an important consideration, in the interest of the patient, that qualities

* Vide *Pharmaceutical Journal*, Series 3, vol. vii. p. 1,039 *et seq.*

that may be nauseous should be corrected or disguised by combination. The prescriber of the present day accords much more consideration to this than was the case formerly, and the term "elegant pharmacy" has become recognised as descriptive of a large and popular class of medicines. These cannot wait for the authority of the national Pharmacopœia, but they are important in the equipment of the practitioner of medicine, and their composition ought to be uniform and known both to prescriber and dispenser. To the prescriber, the Unofficial Formulary is offered with the belief that the principles upon which it is constructed will receive his approval, and that it will constantly suggest eligible combinations of medicines which he desires to employ. To the dispenser it affords information of the composition of medicines which he is called upon to supply, enabling him to prepare them, and to have supplies in a fresh condition, where demand might be too infrequent to secure this in the case of purchased stocks. It may reasonably be trusted that the Formulary will gradually relieve both classes from some of the incubus caused by the use of remedies of secret composition. Whilst the present issue is of limited scope, it is hoped that early additions will be made.

The formulæ now published have been selected by the Formulary Committee from those suggested for consideration by its several members. They include a few formulæ from the United States Pharmacopœia, some already published in the "Extra Pharmacopœia" by Mr. W. Martindale and Dr. W. Wynn Westcott, and one or two from the "Physician's Pharmacopœia" by Mr. J Baily. The foot-notes relating to the description of drugs, and the authorities for their botanical sources, have been kindly supplied by Mr. E. M. Holmes, curator of the Museum of the Pharmaceutical Society of Great Britain.

Suggestions for alterations or additions are invited, addressed, "The Hon. Secretary, Formulary Committee, 17, Bloomsbury Square, London, W.C."

In order to indicate clearly that the formulæ of the Unofficial Formulary are intended, it is suggested to the prescriber to add the letters "B.P.C." (British Pharmaceutical Conference).

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FORMULÆ.

The weights and measures adopted in the following formulæ are those recognised by the British Pharmacopœia. The drugs and preparations are also those of the British Pharmacopœia, unless otherwise defined.

Chloral cum Camphorâ (*Chloral with Camphor*).

Take of

Camphor	1 oz.
Hydrate of Chloral	1 ,,

Rub together in a warm mortar until completely liquefied, and filter if necessary.

Elixir Cascara Sagrada (*Elixir of Cascara Sagrada*).

Take of

Tincture of Fresh Orange Peel	2 fluid oz.
Rectified Spirit	1 ,,
Cinnamon Water	3 ,,
Syrup	6 ,,
Liquid Extract of Cascara Sagrada	8 ,,

Mix.

Dose.—15 minims to 2 fluid drachms.

Elixir Guaranæ (*Elixir of Guarana*).

Take of

Guarana, * in No. 60 powder	4 oz.
Light Magnesia	½ ,,
Oil of Cinnamon	6 minims.
Syrup	2 fluid oz.
Proof Spirit	a sufficient quantity.

Mix intimately the powders, and moisten them with three fluid ounces of proof spirit. After twenty-four hours' maceration, mix with eight ounces of coarse sand, and pack in a percolator; pass through proof spirit until sixteen ounces are obtained, then transfer

* A dried paste prepared from the crushed or ground seeds of *Paullinia sorbilis*, Martius.

the mass to a press-bag and apply pressure. To the percolate add the syrup and oil of cinnamon, and make up to one pint by addition of the expressed liquid, previously reduced by evaporation if necessary.

Dose.—½ to 2 fluid drachms.

Elixir Simplex (*Simple Elixir*).

Take of

Oil of Bitter Orange*	30 minims.
Rectified Spirit	6 fluid oz.

Dissolve, and add—

Distilled Cinnamon Water . . .	7 fluid oz.
Syrup	7 ,,

Mix. Filter through paper moistened with proof spirit, and well sprinkled with kaolin, returning the first portions of filtrate until it passes through bright.

Dose.—20 to 60 minims.

Emulsio Olei Morrhuæ (*Emulsion of Cod Liver Oil*).

Take of

Cod Liver Oil	40 fluid oz.
Tragacanth, in powder	200 grains.
Simple Tincture of Benzoin . . .	½ fluid oz.
Spirit of Chloroform	½ ,,
Glycerine	2 ,,
Oil of Cassia†	2 fluid drms.
Distilled water . . .	a sufficient quantity.

Place the oil in a dry winchester quart, and pour in the tragacanth, tincture of benzoin, and spirit of chloroform previously well mixed; agitate briskly for a minute; then add all at once one pint of distilled water and agitate as before. Lastly, add the essential oil, glycerine, and sufficient distilled water to produce four pints. Shake vigorously for a few minutes.

Dose.—2 to 8 fluid drachms.

Extractum Grindeliæ Liquidum (*Liquid Extract of Grindelia*).

Take of

Grindelia,‡ in No. 20 powder . . .	20 oz.
Rectified Spirit . . .	a sufficient quantity.

* A volatile oil obtained by mechanical means from the rind of *Citrus vulgaris*, Risso. Should be free from terebinthinate odour.

† A volatile oil distilled from the bark of *Cinnamomum Cassia*, Blume.

‡ The leaves and flowering tops of *Grindelia squarrosa*, Dunal; and *Grindelia robusta*, Nuttall.

Moisten the powder with eight fluid ounces of the spirit, pack it tightly in a percolator, and pour on sufficient menstruum to saturate the powder and leave a stratum above it. When the liquid begins to drop, close the lower orifice and macerate for forty-eight hours; then allow percolation to proceed, gradually adding menstruum until the grindelia is exhausted. Reserve the first seventeen fluid ounces of the percolate, distil off the spirit from the remainder, and evaporate the residue to a soft extract: dissolve this in the reserved portion, and add enough menstruum to make the liquid extract measure one pint.

Dose.—10 to 30 minims.

Extractum Hamamelidis Liquidum (*Liquid Extract of Hamamelis*).

Take of

Hamamelis Leaves,* in No. 40 powder.	20 oz.
Rectified Spirit,	
Distilled Water . .	of each, a sufficient quantity.

Moisten the powder with eight fluid ounces of a mixture of one volume of rectified spirit and two volumes of distilled water, pack it tightly in a percolator, and pour on sufficient menstruum to saturate the powder and leave a stratum above it. When the liquid begins to drop, close the lower orifice and macerate for forty-eight hours; then allow percolation to proceed, gradually adding menstruum until the hamamelis is exhausted. Reserve the first seventeen fluid ounces of the percolate, and evaporate the remainder to a soft extract; dissolve this in the reserved portion, and add enough menstruum to make the liquid extract measure one pint.

Dose.—2 to 5 minims.

Extractum Hydrastis Liquidum (*Liquid Extract of Hydrastis*).

Take of

Hydrastis,† in No. 60 powder . . .	20 oz.
Rectified Spirit,	
Distilled Water .	equal parts, a sufficient quantity.

Moisten the powder with eight fluid ounces of the diluted spirit, pack it tightly in a percolator, and pour on sufficient menstruum to saturate the powder and leave a stratum above it. When the liquid begins to drop, close the lower orifice and macerate for

* *Hamamelis virginica*, Linné.

† The rhizome of *Hydrastis canadensis*, Linné.

twenty-four hours; then allow percolation to proceed, gradually adding menstruum until the hydrastis is exhausted. Reserve the first seventeen fluid ounces of the percolate, distil off the spirit from the remainder, and evaporate the residue to a soft extract; dissolve this in the reserved portion, and add enough menstruum to make the liquid extract measure one pint.

Dose.—5 to 30 minims.

Injectio Curare Hypodermica (*Hypodermic Injection of Curare*).

Take of

Curare* (the South American India arrow poison)	5 grains.
Distilled Water	a sufficient quantity.

Reduce the curare to powder in such a way as to prevent its coming in contact with the naked hand, and add distilled water to form a thin paste. Transfer to a small funnel plugged with absorbent wool, and gradually pour upon it distilled water until one fluid drachm is obtained. If the injection be required in haste, proceed in the following manner:—

To the five grains of curare reduced to powder add one fluid drachm of distilled water, throw on a filter, and when the liquor ceases to drop pour over the contents of the filter distilled water sufficient to produce one fluid drachm.

Dose.—1 to 6 minims.

Linimentum Opii Ammoniatum (*Ammoniated Liniment of Opium*).

Take of

Soap Liniment	6 fluid oz.
Compound Camphor Liniment . .	6 ,,
Tincture of Opium	6 ,,
Belladonna Liniment	1 ,,
Stronger solution of Ammonia . .	1 ,,

Mix and filter.

Liquor Ferri Hypophosphitis Compositus (*Compound Solution of Hypophosphite of Iron*).

Take of

Hypophosphite of Calcium . . .	320 grains.
Hypophosphite of Sodium . . .	320 ,,
Hypophosphite of Magnesium . .	160 ,,
Sulphate of Iron	240 ,,
Carbonate of Sodium	320 ,,
Hypophosphorous Acid, sp. gr. 1·136 .	1 fluid oz.
Distilled Water . . .	a sufficient quantity.

* A dry inspissated extract of varying composition, prepared in South America from the bark of different species of Strychnos (principally *Strychnos toxifera*, Schomburgk) and other plants.

Dissolve the hypophosphites of calcium, sodium, and magnesium in eight ounces of water. Dissolve the sulphate of iron and carbonate of sodium in separate portions of water; mix and wash the precipitated carbonate of iron with sweetened water until the washings cease to give a precipitate with solution of nitrate of barium. Transfer the moist precipitate to the solution of the hypophosphites, and add gradually the hypophosphorous acid. Make up to one pint by the addition of distilled water.

Each fluid drachm contains about 2 grains each of hypophosphite of sodium and calcium, 1 grain of hypophosphite of magnesium, and $1\frac{1}{2}$ grain of hypophosphite of iron.

Dose.—$\frac{1}{2}$ to 2 fluid drachms.

Liquor Picis Carbonis (*Solution of Coal Tar*).

Take of

Prepared Coal Tar	4 oz.
Tincture of Quillaia	1 pint.

Digest at a temperature of 120° F. for two days, allow to become cold, and decant or filter.

Pilula Ferri, Blaud (*Iron Pill, Blaud*).

Take of

Sulphate of Iron	60 grains.
Carbonate of Potassium	36 ,,
Sugar, in powder	12 ,,
Tragacanth, in powder	4 ,,
Glycerine,	
Distilled Water	of each 2 minims.

Reduce the sulphate of iron to fine powder, add the sugar and tragacanth, and mix intimately. Finely powder the carbonate of potassium in another mortar, and thoroughly incorporate with it the glycerine and water. Transfer this to the mortar containing the sulphate of iron, beat thoroughly until the mass becomes green and assumes a soft pilular consistence, and divide into twenty-four pills.

Each pill contains about 1 grain of ferrous carbonate.

Dose.—1 to 3 pills.

Pix Carbonis Liquida Præparata (*Prepared Coal Tar*).

Place commercial coal tar in a shallow vessel, and heat at a temperature of 120° F. for one hour, stirring frequently.

Syrupus Apomorphinæ Hydrochloratis (*Syrup of Hydrochlorate of Apomorphine*).

Take of

Hydrochlorate of Apomorphine	5 grains.
Dilute Hydrochloric Acid	2 fluid drms.
Rectified Spirit	7 ,,
Distilled Water	7 ,,
Syrup	18 fluid oz.

Mix the rectified spirit and distilled water, dissolve the hydrochlorate of apomorphine in the mixture by agitation; add the hydrochloric acid, and mix with the syrup.

Dose.—½ to 1 fluid drachm.

Syrupus Butyl-Chloral (*Syrup of Butyl-Chloral*).

Take of

Hydrate of Butyl-Chloral	320 grains.
Syrup	sufficient to produce one pint.

Dissolve the hydrate of butyl-chloral in the syrup previously made hot.

Dose.—1 to 4 fluid drachms.

Syrupus Calcii, Manganesii et Potassii Hypophosphitum (*Syrup of the Hypophosphites of Calcium, Manganese, and Potassium*).

Take of

Hypophosphite of Calcium	320 grains.
Hypophosphite of Manganese	160 ,,
Hypophosphite of Potassium	160 ,,
Boiling Distilled Water	4 fluid oz.

Rub together in a hot mortar till nearly the whole is dissolved and add

Syrup	sufficient to produce one pint.

Filter or decant.

Dose.—½ to 1 fluid drachm.

Syrupus Cascara Sagrada (*Syrup of Cascara Sagrada*).

Take of

Liquid Extract of Cascara Sagrada	4 fluid oz.
Liquid Extract of Liquorice	3 ,,
Carminative Tincture	2 fluid drms.
Syrup	sufficient to produce one pint.

Mix.

Dose.—1 to 4 fluid drachms.

Syrupus Ferri Hypophosphitis (*Syrup of Hypophosphite of Iron*).

Take of

Sulphate of Iron	232 grains.
Distilled Water (cold)	2 fluid oz.

Dissolve. Then take of

Hypophosphite of Calcium	160 grains.
Hypophosphorous Acid, sp.gr. 1·136	2 fluid drms.
Distilled Water (cold)	4 fluid oz.

Dissolve; mix the two solutions in a closed bottle, and after standing one hour, filter the mixture on to

Sugar	15 oz.

Wash the precipitate with

Distilled Water, sufficient to produce one pint of Syrup.

Dissolve without heat. This syrup should be kept in perfectly full bottles, and syphoned off bright when required.

Dose.—½ to 2 fluid drachms.

Syrupus Ferri Phosphatis Compositus (*Compound Syrup of Phosphate of Iron*).

Take of

Iron Wire, free from oxide	37½ grains.
Concentrated Phosphoric Acid, sp.gr. 1·5	1 fluid oz.
Distilled Water	5 fluid drms.

Put these into a glass flask, so that the liquid completely covers the iron wire, plug the neck with cotton wool, and heat gently till dissolved. Add this solution to the following when the former has cooled:—

Precipitated Carbonate of Calcium	120 grains.
Concentrated Phosphoric Acid	4 fluid drms.
Distilled Water	2 fluid oz.

Mix, and add

Bicarbonate of Potassium	9 grains.
Phosphate of Sodium	9 ,,

Filter, and set aside. Then take of

Cochineal	30 grains.
Distilled Water	7½ fluid oz.

Boil for fifteen minutes and filter, pouring over the filter a

sufficient quantity of distilled water to produce seven fluid ounces of filtrate.

To this add

Refined Sugar	14 oz.

Heat till dissolved, and strain. When cold, add the former filtrate set aside, and a sufficient quantity of distilled water to make the whole measure one pint. Thus made, the syrup will contain in each fluid drachm about $\frac{1}{2}$ grain of phosphate of iron and $\frac{4}{5}$ grain of phosphate of calcium, with small quantities of the phosphates of potassium and sodium. It should be kept in bottles quite full.

Dose.—$\frac{1}{2}$ to 2 fluid drachms.

Syrupus Ferri, Quininæ et Strychninæ Phosphatum (*Syrup of the Phosphates of Iron, Quinine, and Strychnine*).

Take of

Strychnine, in powder	5 grains.
Concentrated Phosphoric Acid, sp.gr. 1·5	75 minims.
Distilled Water	225 ,,

Dissolve, and add

Phosphate of Quinine	120 grains.

Dissolve by the aid of a gentle heat, and add

Syrup of Phosphate of Iron, sufficient to produce one pint.

Mix thoroughly. Each fluid drachm contains 1 grain of phosphate of iron, $\frac{3}{4}$ grain of phosphate of quinine, and $\frac{1}{32}$ grain of strychnine.

Dose.—$\frac{1}{2}$ to 1 fluid drachm.

Syrupus Hypophosphitum Compositus (*Compound Syrup of Hypophosphites*).

Take of

Quinine (alkaloid)	20 grains.
Strychnine	1 grain.
Distilled Water	½ fluid oz.
Hypophosphorus Acid, sp. gr. 1·136	1 fluid drm. or a sufficient quantity.

Dissolve, filter, and add

Syrup . . .	sufficient to produce 5 fluid oz.

Then add

Syrup of the Hypophosphites of Calcium, Manganese, and Potassium	5 fluid oz.
Syrup of Hypophosphite of Iron	10 fluid oz.

Mix; to produce one pint of syrup.

Each fluid drachm contains $\frac{1}{160}$ grain of strychnine and $\frac{1}{8}$ grain of quinine.

Dose.—$\frac{1}{2}$ to 2 fluid drachms.

Tinctura Benzoini Simplex (*Simple Tincture of Benzoin*).

Take of

Benzoin, in powder	2 oz.
Rectified Spirit	1 pint.

Macerate for twenty-four hours with frequent agitation, then filter, and add sufficient rectified spirit, if required, to produce one pint.

Tinctura Bryoniæ (*Tincture of Bryony*).

Take of

Fresh Bryony Root,*	
Rectified Spirit,	
Distilled Water	of each a sufficient quantity.

Ascertain the percentage of moisture in the root by drying 100 grains of it over a water-bath. Bruise the remainder, after having calculated the moisture it contains, and reckon this as part of the water to form, with rectified spirit, a mixture equal in strength to proof spirit. Produce a tincture by macerating for seven days of such a strength as that ten fluid ounces shall represent one ounce of the dried root.

Dose.—1 to 10 minims.

Tinctura Carminativa (*Carminative Tincture*).

Take of

Cardamom Seeds, bruised	600 grains.
Stronger Tincture of Ginger	1¼ fluid oz.
Oil of Cinnamon	100 minims.
Oil of Caraway	100 ,,
Oil of Clove	100 ,,
Rectified Spirit	sufficient to produce 1 pint.

Macerate the cardamoms in fifteen fluid ounces of the spirit for a week, decant, express, and dissolve the oils in the mixed tinctures, making up to one pint with rectified spirit.

Dose.—2 to 10 minims.

* *Bryonia alba*, Linné; and *B. dioica*, Jacquin.

Tinctura Convallariæ (*Tincture of Lily of the Valley*).

Take of

Lily of the Valley flowers and stalks,* dried in No. 20 powder. . . .	2½ oz.
Proof Spirit	a sufficient quantity.

Moisten the powder with a suitable quantity of the menstruum, and macerate for twenty-four hours; then pack in a percolator, and gradually pour proof spirit upon it until one pint of tincture is obtained.

Dose.—5 to 20 minims.

Tinctura Coto (*Tincture of Coto*).

Take of

Coto Bark,† bruised	2 oz.
Rectified Spirit	1 pint.

Macerate for seven days, with occasional agitation; then press, filter, and add sufficient rectified spirit to produce one pint.

Dose.—10 to 30 minims.

Tinctura Ergotæ Ammoniata (*Ammoniated Tincture of Ergot*).

Take of

Ergot, in No. 20 powder	10 oz.
Aromatic Spirit of Ammonia	a sufficient quantity.

Moisten the powder with a suitable quantity of the menstruum, and macerate for twelve hours; then pack in a percolator, and gradually pour aromatic spirit of ammonia upon it until one pint of tincture is obtained.

Dose.—10 to 60 minims.

Tinctura Erythrophlœi (*Tincture of Casca*).

Take of

Casca Bark,‡ in No. 20 powder . . .	2 oz.
Rectified Spirit . . .	a sufficient quantity.

Moisten the powder with a suitable quantity of the menstruum, and macerate for twenty-four hours, then pack in a percolator, and gradually pour rectified spirit upon it until one pint of tincture is obtained.

Dose.—5 to 10 minims.

* *Convallaria majalis*, Linné.

† A bark of unknown origin obtained from Bolivia. In flat or curved pieces about 1 centimetre in thickness, and of variable length. The taste is aromatic and very biting. The transverse section is of a cinnamon brown colour externally, and darker towards the inner surface.

‡ The bark of *Erythrophlæum guineense*, G. Don.

Tinctura Eucalypti (*Tincture of Eucalyptus*).

Take of

Eucalyptus Leaves,* in No. 20 powder	4 oz.
Rectified Spirit	a sufficient quantity.

Moisten the powder with a suitable quantity of the menstruum, and macerate for twenty-four hours; then pack in a percolator, and gradually pour rectified spirit upon it until one pint of tincture is obtained.

Dose.—15 minims to 2 fluid drachms.

Tinctura Euphorbiæ Piluliferæ (*Tincture of Euphorbia Pilulifera*).

Take of

Euphorbia,† in No. 20 powder	4 oz.
Proof Spirit	a sufficient quantity.

Moisten the powder with a suitable quantity of the menstruum, and macerate for twenty-four hours; then pack in a percolator, and gradually pour proof spirit upon it until one pint of tincture is obtained.

Dose.—10 to 30 minims.

Tinctura Hamamelidis (*Tincture of Hamamelis*).

Take of

Hamamelis Bark,‡ in No. 20 powder	2 oz.
Proof Spirit	a sufficient quantity.

Moisten the powder with a suitable quantity of the menstruum, and macerate for twenty-four hours; then pack in a percolator, and gradually pour proof spirit upon it until one pint of tincture is obtained.

Dose.—5 to 60 minims.

Tinctura Hydrastis (*Tincture of Hydrastis*).

Take of

Hydrastis,§ in No. 60 powder	2 oz.
Proof Spirit	a sufficient quantity.

Moisten the powder with a suitable quantity of the menstruum, and macerate for twenty-four hours; then pack in a percolator,

* *Eucalyptus Globulus*, Labillardière.

† The herb *Euphorbia pilulifera*, De Candolle, collected when in flower and carefully dried. The involucral glands of the perianth are without appendages. The mature seeds are minutely wrinkled.

‡ *Hamamelis virginica*, Linné.

§ The rhizome of *Hydrastis canadensis*, Linné.

and gradually pour proof spirit upon it until one pint of tincture is obtained.

Dose.—20 minims to 1 fluid drachm.

Tinctura Iodi Decolorata (*Decolorised Tincture of Iodine*).

Take of

Iodine	250 grains.
Rectified Spirit	5½ fluid oz.

Dissolve by the aid of a gentle heat. When cold transfer to a stoppered bottle, and add of

Stronger solution of Ammonia .	10 fluid drms.

Keep the mixture in a warm place until decolorised, after which dilute it with

Rectified Spirit .	sufficient to produce 1 pint.

Tinctura Pruni Virginianæ (*Tincture of Wild Cherry*).

Take of

Wild Cherry Bark,* in No. 20 powder .	4 oz.
Distilled Water	7½ fluid oz.

Macerate for twenty-four hours, in a closed vessel, and add

Rectified Spirit	12½ fluid oz.

Macerate for seven days; then press, filter, and add

Proof Spirit . .	sufficient to produce 1 pint.

Dose.—20 to 60 minims.

Tinctura Quillaiæ (*Tincture of Quillaia*).

Take of

Quillaia Bark,† in No. 20 powder . .	2 oz.
Rectified Spirit	1 pint.

Moisten the powder with a suitable quantity of the menstruum, and macerate for twenty-four hours; then pack in a percolator, and gradually pour rectified spirit upon it until one pint of tincture is obtained.

Tinctura Strophanthi (*Tincture of Strophanthus*).

Take of

Strophanthus seeds,‡ reduced to No. 30 powder, and dried at 110° F. . .	1 oz.

* *Prunus serotina*, Ehrhart. The bark collected in autumn.

† *Quillaia Saponaria*, Molina.

‡ The seeds, deprived of the apical hairy appendage, of a species of Strophanthus growing in Eastern Africa, and usually referred to *S. Kombe*

Pack in a percolator, and moisten with pure ether (sp. gr. ·720). Macerate for twenty-four hours, then allow percolation to proceed, continuing the addition of ether until the fluid passes through colourless (about eight or ten fluid ounces suffice). Remove the marc from the percolator, and dry it, gradually heating it to 120° F. Again reduce it to powder, repack in the percolator, and moisten with rectified spirit. Macerate for forty-eight hours, then pour on successive quantities of spirit, percolating slowly, until one pint of tincture is obtained.

Dose.—2 to 10 minims.

Oliver. The seeds are plano-convex, of a greyish green or pale-brown colour, 18 millimetres long and 4 millimetres broad in their greatest diameter, rounded at the base and tapering at the apex, covered with appressed silky hairs, which become much shorter towards the apex of the seed, and furnished on the flat side with a longitudinal ridge, disappearing below the middle of the seed.

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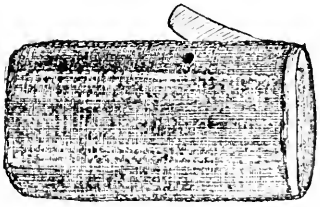

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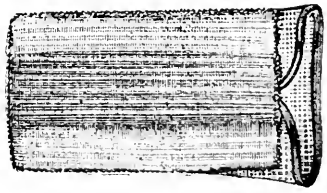

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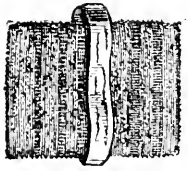

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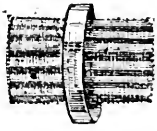

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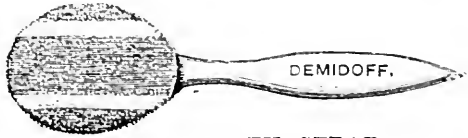

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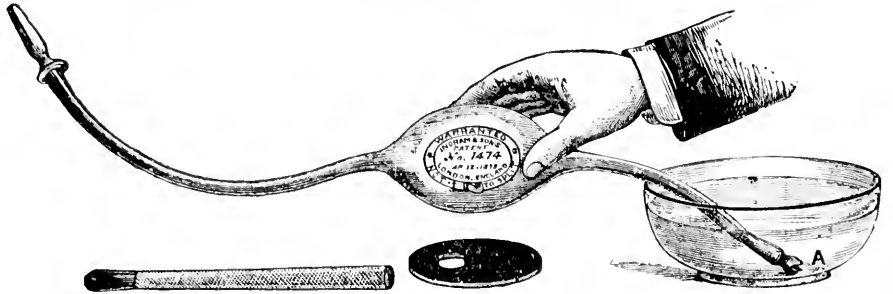
Patented in England, No. 1,474, April 12th, 1878; in France, No. 126,909, October 11th, 1878; and in America, No. 212,939, March 4th, 1879.



A—Metal Pin Valve.

All Imitations may be detected by the Ribs on the surface, and are always liable to split.

Favourably noticed in *British Medical Journal*, 13th December, 1879, and in *Lancet*, 3rd January, 1880, and in *British Medical Journal*, September 30th, 1882.

WARRANTED NOT TO SPLIT.

INGRAM'S IMPROVED PATENT SEAMLESS ENEMA is fitted with IMPROVED VALVES, which prevent the admission of air with the fluid, and CAN at any time BE REPAIRED if necessary.

CAUTION. **IMITATIONS OF INGRAM'S IMPROVED PATENT SEAMLESS ENEMA** are made of several pieces of Sheet India Rubber, which are cemented together and shaped in a mould, THUS PRODUCING RIBS ON THE SURFACE; AND ENEMAS SO MANUFACTURED ARE ALWAYS LIABLE TO SPLIT AND LEAK AT THE SEAMS, AND THUS TO BECOME QUITE USELESS.

INGRAM'S IMPROVED PATENT SEAMLESS ENEMA may be distinguished from ALL IMITATIONS by its ENTIRE FREEDOM FROM RIBS OF ANY DESCRIPTION on its surface, and by having an IMPROVED METAL PIN VALVE at the suction end, and it is acknowledged to be the only PERFECT ENEMA OBTAINABLE.

To be obtained of all Surgical Instrument Makers, Druggists' Sundriesmen, Chemists and Druggists, in the three following qualities:—

No. 1a. Highly Polished, in Red, Green, Blue, Black, or White.
No. 1b. Unpolished, in Red, Green, Blue, Black, or White.
No. 2. Unpolished, in Drab only.

DRUGS, CHEMICALS, AND PHARMACEUTICAL PREPARATIONS.

BARRON, SQUIRE & CO.,

(LATE DREW, BARRON & CO.),

Wholesale and Export Druggists,

BUSH LANE, LONDON, E.C.,

MANUFACTURERS OF ALL DESCRIPTIONS OF PHARMACEUTICAL PREPARATIONS,

Beg to inform Merchants, Shippers, &c., that all Indents entrusted to them will receive careful attention and prompt execution.

Messrs. B., S. & Co. request the attention of their friends and the Trade, at home and abroad, to their having PURCHASED THE BUSINESS of Messrs. JAMES BASS & SONS, Hatton Garden, and with it the various Formulæ from which their Special Preparations have been made, and pledge themselves to supply them in all their integrity.

Telegraphic Address: "NORRAB, LONDON."

BULLOCK'S PEPSINA PORCI.

Dose—2 to 4 grains.

Messrs. BULLOCK & Co. beg to direct attention to an article by G. F. DOWDESWELL, Esq., B.A. (Cantab.), F.C.S., F.L.S., &c., on "Medicinal Pepsine and Artificial Digestion," which appeared in the *Practitioner* for March, 1880. In this paper Mr. DOWDESWELL gives the results of upwards of 200 experiments, which conclusively demonstrate the marked superiority of BULLOCK'S PEPSINA PORCI AND ACID GLYCERINE OF PEPSINE over every other Pepsine or preparation of Pepsine—ENGLISH, FRENCH, GERMAN, OR AMERICAN; and confirm the equally favourable reports of Dr. PAVY (1863), Professor TYSON (1870), and the late Professor GARROD (1878), as to the pre-eminent value of BULLOCK'S PEPSINA PORCI. It may be added that many Pepsines and their preparations are inert.

BULLOCK'S ACID GLYCERINE OF PEPSINE.

Dose—1 to 2 drachms.

Possesses at least three times the digestive power (and in most cases considerably more) than any other preparation of Pepsine and Glycerine, or fluid form of Pepsine whatever.

May be prescribed with most substances compatible with acids. In 4-oz., 8-oz. and 16-oz. bottles, and in bulk.

*** *In prescribing either of the above preparations, it is suggested to insert in parenthesis as follows* (BULLOCK).

J. L. BULLOCK & CO., 3, Hanover Street, Hanover Square, LONDON, W.

Mackeys' New Soluble Transparent and Pearl-coated Pills.

Far superior to any other in use at present. Unequalled for purity in composition, solubility in coating, uniformity in size, perfection in form and finish. This coating contains no resinous gum or any ingredient that in the slightest degree interferes with the solubility of these Pills, and the following advantages may be noticed:—They never crack or split. The coating does not peel off. They are moderate in price. The ingredients are carefully selected, and of unimpeachable quality. The transparent coating, which dissolves in about half a minute, is put on while the mass is soft, thus keeping the Pill in a perfectly soluble condition without employment of any heat. The coating, which is unimpaired by age, is quite transparent, and the taste of the Pill is perfectly covered. The excipients chosen tend to preserve the soluble character of the Pill, and increase the medicinal effect of the drug.

In ordering Pills, please state if the new Transparent Coating or Pearl Coating is required.

TERMS—NET one month, or 5 per cent. for cash with order on amounts exceeding 20*s*. On opening accounts, cash is required.

Pil. Aperiens, coated, 1 lb., 5 9; uncoated, 1 lb., 4 9.
„ Cathartic, „ 1 lb., 5 9 „ 1 lb., 4 9

BRITISH PHARMACOPŒIA PILLS.

No. in Price List		1 lb. tins coated £ *s.* *d.*	1 lb. tins uncoated £ *s.* *d.*
1	Pil. Aloes Barb. . . 4 or 5 gr.	0 5 6	0 4 6
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3	Pil. Aloes et Ferri. . „	0 6 0	0 5 0
4	Pil. Aloes et Myrrhæ . „	0 11 6	0 10 6
6	Pil. Assafœtidæ Co. . „	0 6 0	0 5 0
7	Pil. Gamboge Co. . .		
8	Pil. Coloc. Co. (Scam. Virg.), „	1 2 0	1 1 0
	Ditto, with Resin Scammony	0 14 0	0 13 0
9	Pil. Coloc. et Hyos. (Scam. Virg.) 4 & 5 gr.	0 19 0	0 18 0

BOXED PILLS FOR RETAILING.

Aperient, Antibilous, Cough, Dinner, and other Pills, may be had in Boxes containing 1 or 2 dozen in each, labelled with directions; with or without the address of Retailer. Prices in card, turned wood, or patent damp-proof boxes, according to quantity, may be had on application.

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10	Pil. Coloc. et Hyos., with Resin Scammony	0 14 0	0 13 0
11	Pil. Ferri Carb. . . . . 4 gr.	0 5 6	0 4 6
13	Pil. Hydrarg. . . . . 4 & 5 gr.	0 4 9	0 3 9
14	Pil. Hydr. Subchlor. Co. 5 gr.	0 6 6	0 5 6
15	Pil. Ipecac. et Scillæ . . 5 gr.	0 7 0	0 6 0
17	Pil. Plumbi c. Opio . . 4 gr.	0 11 0	0 10 0
18	Pil. Quininæ. . . . 1, 2 & 3 gr.	Subject to mkt. fluctuations.	
19	Pil. Rhei Co. . . . . 4 & 5 gr.	0 5 9	0 5 0
21	Pil. Scillæ Co. . . . . 5 gr.	0 5 6	0 4 6

A GOOD FAMILY APERIENT PILL

Is supplied in quantities of not less than 14 lbs. for £3 3*s*. They are composed of Aloes, Jalap and Colocynth, with Podophyllin, and are therefore Useful Antibilious Pills.

Pill List, containing over 1000 Formulæ, on Application.

MACKEYS' EMULSION OF COD LIVER OIL with Hypophosphite of Lime, Magnesia, and Soda. (As recommended by Dr. Churchill.) Contains 50 per cent. of Pure Cod Liver Oil, combined with tonic, nutritious agents. Specially recommended for those unable to take Cod Liver Oil. The taste of the Oil is completely covered, does not repeat, and is easily assimilated.

Patentees and Sole Manufacturers of Ammonio Citrate of Cerium and Neutral Soluble Salts of Cerium.

MISTURA CERII CO. is particularly successful in all cases of vomiting in Pregnancy, of Irritable Stomach, Dyspepsia, etc. It allays vomiting no matter the cause, when all other remedies have failed.

MISTURA BISMUTHI COMP., the only genuine. (Registered.) Bears the name of Mackey, Mackey & Co., Inventors and Makers.

COCAIN, IODOL, LANOLIN, SALOL, URETHANE, and all new preparations.

GLYCERINOLE PEPSINÆ CUM EUONYMIN. MISTURA CASCARÆ SAGRADÆ COMP.

WINE OF COCA. A Good Palatable Tonic for Fatigue of Mind and Body. A New Restorative Tonic of Vocal, Mental, and Physical Powers. For sleeplessness this wine is almost always successful, and superior to opiates, etc., as it produces no reaction.

QUINQUININE, the only genuine. (Registered.) Syr. Hypophosphit. Comp. Price 3*s*. 4*d*. per lb. Vinum Hypophosphitum Co., 2*s*. 4*d*. per lb.; Liquor Hypophosphitum Co., 5*s*. 4*d*. per lb.

MACKEYS' LIQUOR SANTAL CUM COPAIBA CUBEBA ET BUCHU. Employed with great success in Gonorrhœa and Gleet. Where the disease is chronic, Mackeys Liquor Santal acts like a charm. Dose, one to two drachms. Price 8*s*. per lb.

GRANULAR EFFERVESCING AMMONIO CITRATE OF CERIUM. Each drachm contains two grains of Pure Citrate of Cerium in a soluble form.

MACKEYS' EPULIXON. (Registered.) Invaluable for the Antiseptic Treatment of Surgical Cases, Wounds, Sores, an l Offensive Discharges of all kinds.

MACKEYS' PHOSPHORATED REFRESHING SALINE. Is the best Tonic Aperient known.

MACKEYS' CHLORODYNE.

"I and my people like your Chlorodyne very much; it is far superior to any other makers."—M. Brown, M.D

TEREBENE. Terebene Lozenges. Terebene Emulsion.

STROPHANTHUS. The New Cardiac Tonic.

TINCTURA STROPHANTHI. Dose.—2 to 6 minims.

SYR. CERII QUININÆ ET STRYCHNINÆ BROMID. Sedative Nerve Tonic. In the treatment of Epilepsy, Chorea, Hysteria, Neuralgia, and all diseases of the Nervous System. Dose.—1 drachm to 2 drachms.

LIQUOR CERII CUM BISMUTHO. Dose.—½ drachm to 1 drachm.

LIQUOR SANTAL CUM COPAIBA, CUBEBA, ET BUCHU. This elegant preparation is miscible with water in any proportions, and is one of the best remedies for Gonorrhœa or Gleet; unpleasant eructations are avoided, and the energy of the digestive organs is unimpaired. In aggravated attacks, and when the disease is subcutaneous, or of a chronic character, the Liquor Santal acts like a charm. Dose.—1 drachm to 2 drachms, diluted.

MACKEY, MACKEY & CO.,

Wholesale and Export Druggists and Manufacturing Chemists,

1 and 2, BOUVERIE STREET, E.C.

COX'S TASTELESS PILLS.

BY ROYAL LETTERS PATENT.

DATED AND SEALED APRIL 13TH, 1854.

Surgeons and Chemists supplied with an excellent Aperient Pill (the formulæ for which will be forwarded), covered with a thin, non-metallic film, rendering each Pill perfectly tasteless, at 1*s.* a gross. Postage free.

Any formulæ dispensed and covered, and samples, with list of Pills, from over 600 different forms, which are kept in stock, will be forwarded free on application.

They were introduced to the medical profession by the present proprietors more than thirty years ago, and many thousands of unsolicited testimonials have been received from the highest medical authorities. They are now used, and have been used for many years past, by the largest and best conducted hospitals and dispensaries. Of course a success like this has led to many imitations, and highly varnished pills, made to resemble ours, have been introduced by some unscrupulous people. Many of these pills pass through the stomach unaltered, and a useful invention is thus likely to be brought into disrepute.

The most impudent assertions are made by some who combine in one incongruous whole, the trades of druggists' sundrymen, retail druggists, soap-makers, and horse and cattle medicine vendors.

We make and sell nothing but pills, and have testimonials from regular customers, residing in China, Australia, and every part of the civilized world, as well as from friends in almost every town and village in the kingdom; and our trade, which is constantly increasing, is perhaps four or five times as large as all the rest of our copyists put together.

The following are some of our Prices FOR CHEMISTS ONLY:

We strongly recommend our Aperient Pills, as a good general saleable Pill. These, with the Pharmacopœia Pills quoted below, are sent out to every part of the United Kingdom in half-pound parcels, package, postage, and carriage free, on the same day as the order is received; and, to avoid booking and other expenses, 1*d.* in the shilling will be allowed if stamps or P.O.O. are remitted with order.

Any Pills can also be obtained from any Wholesale Druggist. In ordering, please specify "COX'S TASTELESS PILLS."

QUOTATIONS FOR OTHER PILLS ON APPLICATION.

No. in Catalogue.	*Pil. Aperiens et Cathartic.*	*Prices per Pound in Four or Five Grain Pills.*		*No. in Catalogue.*	*Pills of the British Pharmacopœia.*	*Prices per Pound in Four or Five Grain Pills.*	
		Coated.	*Uncoated.*			*Coated.*	*Uncoated.*
1 & 2	Pil. Aper (Cox) c. Cal.	6/-	5/-	122	Pil. Assafœtidæ Co.	6/-	5/-
3 & 4	„ „ (Cox) sine Cal. . .	6/-	5/-	66	„ Cambog. Co. . .	6/-	5/-
				24	„ Coloc. Co. . . .	13/-	12/-
193	„ Cathartic Fort. (Cox). .	6/-	5/-	30	„ „ et Hyos. .	12/-	11/-
				62	„ Ferri Carb. . .	5/-	4/-
332	„ Cochia	5/-	4/-	71	„ Hydrarg. . . .	5/-	4/-
				92	„ „ Sub-chlor Co. . .	6/-	5/-
	PILLS OF THE BRITISH PHARMACOPŒIA.			77	„ Ipecac. c. Scillæ	6 6	5/6
6	Pil. Aloes. Barb. . . .	5/-	4 -	99	„ Plumbi. c. Opio.	11/-	10/-
8	„ „ et Assafœtidæ . .	5/-	4/-	104	„ Rhei Co. . . .	6/-	5/-
9	„ „ et Ferri . .	5 -	4/-	119	„ Saponis Co. . .	12/-	11/-
10	„ „ et Myrrh .	12/-	11/-	115	„ Scillæ Co. . . .	5/-	4/-
7	„ „ Soc. . . .	6 -	5 -				

The Registrar of Trade Marks (after giving the usual public notice prescribed by Parliament, to allow of opposition) has granted us the above "Trade Mark," thus officially recognising us as the "*Original Makers of Tasteless Pills*," and no Pills will be sent out without this Mark on all bottles or packages.

ARTHUR H. COX & CO.,
Tasteless Pill Manufacturers,
ST. MARTIN'S PLACE, BRIGHTON.
Telegraphic Address, "COX, BRIGHTON."

NOTICE.

NEPENTHE.

FERRIS & CO. v. GOODMAN.

Notice is hereby given that by an Order of the Chancery Division of the High Court of Justice, made the 18th day of July, 1884, in the above action, **it was ordered** that the Defendant and others be perpetually restrained from selling, or offering for sale, any formula or recipe for "**Nepenthe,**" and from otherwise prejudicing the sale thereof by, or injuring the title thereto, or Trade Mark therein, of the Plaintiffs, **Messrs. Ferris & Co., of Bristol, the registered proprietors thereof.**

And it was further ordered that the Defendant do pay the costs of the said Action.

Dated this 12th day of August, 1884.

(Signed) CHILTON & GREEN-ARMYTAGE, Bristol,
Solicitors for the said Plaintiffs.

NEPENTHE.

(Prepared exclusively from Opium.)

The safest and best preparation of Opium; produces neither headache, sickness, nor constipation. Dose, the same as that of Tinct. Opii, P.B.

Price 8s. per pound.

In the analysis of 10,000 *prescriptions recently published in* THE CHEMIST AND DRUGGIST, *Nepenthe occurred more frequently than any other proprietary article except Vaseline and Chlorodyne.*

The word NEPENTHE being registered under the Trade Marks Act, Messrs. FERRIS & CO. have the SOLE RIGHT to use it; and the trade are respectfully warned against any infringement of their Trade Mark, "NEPENTHE," or the use of any mark so nearly resembling it as to be calculated to deceive; and against the application of any false Trade description; and against any interference with their privilege (*see* "*Merchandise Marks Act*, 1887," 50 *&* 51 *Vict., ch.* 28); and also against dispensing any but Messrs. Ferris & Co.'s preparation when NEPENTHE is ordered in a prescription.

Trade and Wholesale Terms for NEPENTHE upon Application.

FERRIS, BOORNE, TOWNSEND & BOUCHER,

MANUFACTURING CHEMISTS, BRISTOL.

PARIS,
GOLD MEDAL,
1867.

AND AT
PHILADELPHIA,
1876.

E. H. THIELLAY'S

EAU FONTAINE DE JOUVENCE, GOLDEN;

OR, GOLDEN HAIR FLUID.

For Rapidly changing Dark Hair into Flaxen or Sunny Shades.

N.B.—This article is now put up in round bottles, instead of flat squares; the glass is extremely strong, hermetically stoppered, and calculated to resist the strongest possible pressure of the liquid when in hot climates.

There are only three sizes issued at present, namely—

Contents	63 grammes,	125 grammes,	250 grammes.
Price	3 6	6 -	10 6 per bottle.
Wholesale	21/-	36 -	63/- per dozen.

The Contents being respectively $\frac{1}{15}$, $\frac{1}{8}$, $\frac{1}{4}$, of a litre.

Subject to quantitative discount.

ALSO

EAU FONTAINE DE JOUVENCE

IN EVERY SHADE.

AUBURN.	DARK.	BROWN.
BLACK.	PROGRESSIVE.	RESTORER.

RESTAURATIVE AND SPECIALE.

WHOLESALE DESCRIPTIVE PRICE LIST ON APPLICATION.

OTHER SPECIALITIES.

COMPANION to the E. F. Jouvence. A delicious oleo-fragrance to fix the tint after operation.

EUCALYPTIA. Genuine, from the *Eucalyptus globulus*. A powerful stimulant for debilitated hair.

MOUSQUETAIRE. For the special training and cultivation of the MOUSTACHE, as used at Whitehall. Invaluable to medical men attending hospital wards.

ARABIAN FLUID. Permanent restorer of eyebrows and eyelashes, etc.

Through the Wholesale Houses, or from the Manufactory,

5, AMERSHAM ROAD, NEW CROSS, LONDON, S.E.

SHOW ROOMS AT CHARING CROSS STATION, W.C.

Shippers and Merchants supplied on the usual Terms, and at a considerable reduction for export in Bond.

EUGENE GERAUT & CO.,

PATENTEES AND MANUFACTURERS OF

SODA-WATER MACHINES,

Filling Machines, Syphons, Seltzogenes, etc.

SYPHONS

In White, Amber, Blue, or Green Bottles. Made of Pure English Block Tin. Tops warranted free from Lead. Will retain their brilliant polish.

WHOLESALE PRICES.

Short Levers, 22/6 per dozen nett; Cap or Piston Tops.
Long Levers, 24/- per dozen nett; Cap or Piston Tops.
Nickel-plated Top, 3/- per dozen extra.
Strongly Silver-plated Top, from 8/- per dozen upwards.

Customer's Name Stamped on the Metal Tops free for One Gross.

Names and Trade Marks Ornamentally Engraved on the Bottles by the Acid Process, from 1½*d.* to 2*d.* each extra. Each Syphon thoroughly tested before being sent out.

SAMPLES SENT ON APPLICATION.

SODA-WATER MACHINERY, GENERATORS, WASHING VESSELS, AND GASOMETERS.

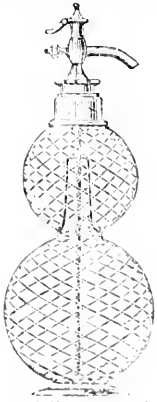
From £40 to £120 (See our Catalogue.

	£	s.	d.
Syphon Filler	4	10	0
Ditto, with Syruping Machine combined	15	15	0
Bottling and Corking Machine	7	10	0
Ditto, with Syrup Dosing Machine combined	15	15	0

GUN METAL SYRINGE.

Strongly Silver-plated, for introducing Syrup into Syphons, 15/- each.

EUGENE GERAUT & CO.'S NEW PATENT LEVER SELTZOGENES,



For the immediate production of Eau de Vichy, Soda Water, Sparkling Lemonade and Aerated Waters.

WHOLESALE PRICES.

	s.	d.		s.	d.
Three pint, wire	8	9	Three pint, cane	9	2
Five pint, do.	13	0	Five pint, do.	13	9
Eight pint, do.	22	0	Eight pint, do.	23	5

Silver-Plated Tops, 5/- extra.

For orders of £2 worth at a time we allow 5% discount.

Powders for the above:	12 charges. Per dozen boxes.	10 charges. Per dozen boxes.
Three-pint size, in handsome labelled boxes	21s. 0d.	18s. 6d.
Five-pint ditto	ditto	30s. 0d.	26s. 0d.
Eight-pint ditto	ditto	51s. 0d.	44s. 6d.

LIBERAL DISCOUNT.

Our well-known Seltzogenes are improved yearly, and have already stood a public test of upwards of Twenty Years, and are acknowledged as the VERY BEST.

Best SYRUPS, warranted to be made of the choicest and finest fruits, specially prepared to be used with our celebrated Seltzogenes, are supplied by us.

Illustrated Catalogue on Application.

OUR ONLY ADDRESS IS

139 and 141, FARRINGDON ROAD

(*lately called* 1 *and* 2, *CORPORATION BUILDINGS, FARRINGDON ROAD*),

Established] **LONDON, E.C.** [Since 1853.

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