words, at that time the tissues of the globe were most readily affected by strain of the muscles of the eye. It could be easily understood, under such a hypothesis, that the industrial classes were so little liable to near-sightedness, for they seldom reached the practice of the more intricate branches of their trade before their eighteenth year. In conclusion, Dr. Loring was of the opinion that, under proper precautions, the normal eye could be continued indefinitely. If children were not allowed to apply themselves too closely to their studies between their eighth and sixteenth years, and were, moreover, allowed the proper amount of out-door exercise, not much danger need be dreaded. It was important also to have the schools properly ventilated, and other hygienic conditions made as perfect as possible.—*N. Y. Medical Journal*.

DIPSOMANIA.

DR. BODINGTON very well urges in a late address, "The confusion between drunkenness as a disease, and drunkenness as a vice, must be cleared up. For my part, I look upon all habitual drunkenness as a disease, and I would boldly call it all dipsomania. It is in its character as a disease that we physicians are entitled to deal with it. I would sink the notion of its being a mere vicious propensity. When fully developed there are not two kinds of habitual drunkenness. The cases are, one and all, cases of dipsomania, of irresistible, uncontrollable, morbid impulse to drink stimulants."—*Medical and Surgical Reporter*.

DETECTION OF BISMUTH.

By W. M. HUTCHINGS.

THE mixture of equal parts of potassium iodide and sulphur recommended by Von Kobell for this excellent test has the great disadvantage of being very deliquescent; even if kept in closely-stoppered bottles it sooner or later becomes pasty, and indeed almost liquid, if the bottles are often open for use. As it is a great advantage to be able to have such mixtures ready for use, and, where possible, to keep them in little wooden boxes in the portable blowpipe apparatus, I have tried replacing the potassium iodide by cuprous iodide, and have been glad to find that, in addition to the advantage of being non-deliquescent, the mixture so made is in other respects superior for use with the test.

Von Kobell's mixture has another disadvantage, viz., that it itself yields a copious white sublimate, the brilliant red sublimate obtained when it is used with a substance containing a good deal of bismuth being caused by the mixture of this white with the dark brownish red given by bismuth iodide alone. When very little bismuth is present and a good deal of the mixture is used, the white frequently overpowers the red almost completely, and when other metals are present which also give white or light-colored sublimes it greatly assists in concealing the bismuth color. This disadvantage is also got rid of by using cuprous iodide and sulphur.

The precipitated cuprous iodide is washed free from all trace of potassium salts, dried perfectly, and then ground up to an intimate mixture with an equal volume, or rather more, of flowers of sulphur. This proportion is the best; when less sulphur is used there is more or less white sublimate of cuprous iodide obtained, and also the formation of bismuth iodide is not as copious. For testing pyritous or other sulphide substances, less sulphur, or even none at all, would be required; but it is best to have a mixture which is equally applicable to all bismuth combinations. This mixture can be kept rammed tight into little wooden boxes, and is always ready for use. On aluminium plate I find it decidedly more delicate as a reagent than the potassium iodide mixture, using in each case 2 volumes of reagent to 1 volume of the powdered substance to be tested, intimately mixing to a paste and heating gently on a charcoal slip.

The merest trace of the dark brownish red bismuth iodide is very conspicuous on the clean aluminium. The plate should be made pretty hot by blowing the flame upon it some distance above the ledge before commencing to heat the test mixture, in order to prevent the settling of any sublimate of iodine, or any condensation of moisture, which latter destroys the red bismuth sublimate. This precaution is particularly necessary when very little bismuth is present.

On ordinary charcoal or blackened porcelain support the dark-colored bismuth iodide is not nearly so conspicuous as on aluminium, and does not show as well as the brighter red obtained by using potassium iodide. But a few tests with a substance containing very little bismuth will convince anybody that aluminium plate, with the cuprous iodide mixture, is very much preferable to charcoal and potassium iodide; and I do not think that any one who has once used aluminium for blowpipe sublimes will ever again use charcoal or porcelain.

Substances containing mercury, when treated with the iodide mixture on aluminium plate, give a sublimate of mercuric iodide, which is partly red and partly yellow, the relative quantities of the two colors varying much in sublimes from the same substance. The red is much lighter and brighter than that obtained from bismuth with the cuprous iodide mixture. It might possibly be taken for the bismuth sublimate mixed with that of lead; but as the number of minerals containing mercury is so limited, and the presence of that metal is so easily proved by other tests, no mistake is likely to arise from this cause.

The value of this test of Von Kobell's is very great; it deserves to rank as one of the best—in some cases the best—test for bismuth. As little as 0.2 or 0.1 per cent. can be safely detected by it in many cases, and with great rapidity. In pyritous ores, which fuse to a regulus or in smelted regulus, a considerable amount of bismuth might be present and not be detected by the ordinary sublimate of bismuth oxide, which is frequently very difficult to obtain from such combinations. But a fraction of a per cent. can be found by this test without resorting to the wet way.

Substances containing lead give a copious light yellow sublimate when heated with the iodide and sulphur mixture, and when lead is present beyond certain limits this yellow overpowers the bismuth reaction. According to Cornwall (*Chemical News*, vol. xxvi., p. 150), when lead oxide was mixed with 5 per cent. bismuth oxide and tested on charcoal by Von Kobell's mixture, the bismuth could only just be detected, and not with distinctness. But I find that when lead oxide containing only 1 per cent. bismuth oxide is tested with the cuprous iodide mixture on aluminium plate a very fine brownish red sublimate is always obtained by heating very gently and observing after a few seconds. Later on the yellow covers this up; but the bismuth iodide always comes off first, and can be seen if observed in time. In all cases sublimes must be allowed to get quite cold before

judging them; lead iodide is reddish when hot, but pure light yellow cold.

Cornwall's tests in open glass tubes (*Chemical News*, vol. xxvi., p. 150), which will detect bismuth when present in such small quantity with lead and antimony that the above method fails, can be better applied with the cuprous iodide mixture than with potassium iodide, and so much sulphur as he recommends (5 volumes) does not require to be added.

These mixtures are also very useful for detecting lead in cases where the ordinary sublimate of the oxide cannot be obtained.—*Chemical News*.

SPONTANEOUS FERMENTATION.

By MM. PAUL CAZENEUVE and CHARLES LIVON.

WHEN the urine of animals is exposed to the air the urea becomes hydrated, and is resolved into carbonate of ammonia, while vibriones make their appearance in the liquid. These facts meet with various interpretations. Müller, Pasteur, and Van Tieghem ascribe the hydration of the urea to the action of a special *Torulacea*. Pasteur and Joubert consider that this action of the *Torulacea* is due more directly to the secretion of a soluble ferment, a sort of diastase. Fremy considers that a "hemi-organic" substance, present in all animal and vegetable liquids, is the immediate cause of the transformation of the urea. M. Béchamp finds in all animal humors molecular granulations, to which he ascribes life, and lets them play an active part in all fermentations under the name of microzymas. He supposes that in urine there are abnormal microzymas, which transform urea into carbonate of ammonia. Verneuil thinks that leucocytes may modify urea like the *Torulacea* of Pasteur and Van Tieghem. M. Bouley ascribes the change possibly to pus, blood, or mucus, while Poggiale hesitates to attribute this part of hydration exclusively to the *Torulacea*. As regards the origin of the vibriones, there are two conflicting schools—the heterogenists (Dr. Bastian, Onimus, etc.), who believe in the creation of the little beings in the midst of the urine by the concurrence of physico-chemical forces; and the physiological school, of which Pasteur is the most eminent representative, and which ascribes the birth of vibriones to vibriones, the air being a means of transport of these animalcules and their germs. The authors have experimented on the subject—not in glass vessels, like M. Pasteur—but in the bladders of living animals, or, as they rather curiously express it, *in anima vili*! The urine of dogs was rendered alkaline, either by the administration of bicarbonate of soda, acetate of potassa, etc., or by certain nervous lesions, but when withdrawn from the bladder by means of an operation it was invariably found free from ammoniacal fermentation, and contained neither *torulaceæ* nor vibriones. If, however, air was admitted into the bladder by a slit, ammoniacal fermentation speedily set in, and vibriones made their appearance.

NEW METHOD OF DETERMINING CASEIN AND FATS IN MILK.

By JULIUS LEHMANN.

THE author, after pointing out the impossibility of deciding on the quality of milk otherwise than by a quantitative analysis, and after pronouncing all known methods too tedious and circumstantial, speaks of his experiments on the behavior of milk upon baked plates of porous clay. From these experiments it appears that if milk is poured slowly upon such plates by means of a pipette or small glass syringe in a continuous stratum of about 2 mm. in thickness, there remains, after the lapse of one or two hours, a consistent coating with a sharply-defined outline, of a pale yellowish color and a fatty lustre, which can be readily removed from the plate by means of a sharp horn spatula in the form of fine translucent laminae. After exposure for some time to moderately dry air, or especially if dried over sulphuric acid, they become so brittle that they can be broken between the fingers. At a temperature of about 30° fat exudes out of the laminae and covers their entire surface. After extraction with ether there remains a white, translucent, easily friable mass. This, when thoroughly freed from fat, consists of casein, containing ash, and very small proportions of albumen and milk-sugar. Hence the two latter substances are capable of being separated from the serum by means of clay plates. It further appears that in this manner casein may be separated with the same properties as if it had been precipitated by rennet. If rubbed up with water it swells to a white flocculent matter, which remains behind on filtering the mixture through blotting-paper. On treatment with lime-water it returns to the state in which it originally existed in the milk. It then passes through filter-paper along with water, and can be precipitated with acetic acid. If the casein still retains the proportion of fat which was left with it upon the plates of clay, it forms, when rubbed up with lime water, a liquid quite similar to milk. In this casein, and in that precipitated with rennet, the proportion of ash is, on an average, 8.5 per cent., while that precipitated with acetic acid contains only 1.8 per cent., the chief constituent of which in the latter case, is di-hydro-calcium phosphate, while in the two former it is neutral tri-calcium phosphate. The above observations confirm the view of Hoppe-Seyler, of Soxhlet, and Hammarsten, that casein exists in milk not in solution, but merely in a strongly swollen state. If dissolved it would be absorbed by the clay plates like the albumen. The same observations prove that the fat-globules in milk are not enveloped in capsules of solid matter, since the fat exudes at a gentle heat, and can be readily washed away with ether. The application of these observations to the quantitative determination of casein and milk-sugar depends, in the first place, on the existence of earthenware plates with pores so fine as not to absorb the milk-globules as such. The author has been able to procure such plates from one firm only. The method of performing the analysis is as follows: Suitable plates, after having been heated for some time to about 100° and cooled again, are held in a sloping position, quickly drenched with a thin stream of water upon their smooth surface, and placed on a glass vessel of suitable width, the bottom of which is covered with a thin layer of concentrated sulphuric acid. The milk in question, previously diluted with an equal weight of distilled water, is cautiously run upon the middle part of the plate in a connected layer by means of a small glass syringe, and covered with a smooth-edged glass capsule to prevent evaporation. To ascertain the weight of the portion taken for analysis the syringe is weighed both before and after pouring the milk upon the plate. From 9 to 10 grms. of diluted milk are sufficient. After the lapse of one or two hours the serum will be found to have been absorbed to such an extent that the cake can be removed by means of a sharp horn spatula

specially designed by the author for this purpose, and placed in a balanced watch-glass. This residue is then dried in the air-bath at 105°, which can be completed in two hours, and weighed. In this manner the joint weight of casein and fat is obtained. The dry matter, without being previously pulverized, is placed upon a tared filter, dried at 105°, by means of forceps, and washed in the first place with a small quantity of ether. It is then thrown into a small smooth glass mortar provided with a spout, and most finely pulverized, with the addition of a few drops of absolute alcohol; ether is added, so as to wash the whole into the filter, where it is further washed till completely free from fat. After the evaporation of the filtrate of alcohol and ether the fat remains in the small flask, which must be previously tared, and which is weighed again when the evaporation is completed. In order to determine the casein, it is merely needful to dry the filter with the residue as long as any loss of weight takes place, and then to weigh. As the casein contains a considerable proportion of ash, this must be separately determined and deducted. The casein thus obtained, on being submitted to ultimate analysis by the soda-lime process, was found to contain 15.57 per cent. of nitrogen as calculated for the pure substance free from ash. On comparing the results with those obtained by Hoppe-Seyler's process, the amount of casein appears greater according to the former, especially as in the latter method a part of the precipitate obtained with acetic acid is re-dissolved on washing. The 1.8 per cent. of ash contained in the casein obtained on Hoppe-Seyler's method has hitherto been left entirely unnoticed. The author announces that as soon as a stock of suitable clay plates have been prepared he will give the address of the firm from whom both these and all other articles required for the execution of the process may be obtained.—*Annalen der Chemie*.

INCOMBUSTIBLE SILICATE BOARD.

THE process for manufacturing silicated paper board, principally designed for roofing, simply consists in impregnating sheets of the paper board alternately in a solution of silicate of soda or of potash, and in another of chloride of barium or of another salt. The chloride of barium can be replaced by other soluble salts which are cheaper, provided that they give insoluble silicates, such as the salts of lime, aluminium, magnesia, iron, lead, zinc, etc. The entire mass of the board is thus impregnated with a silicate of baryta or other equally insoluble substance, and, at the same time, with a certain quality of silica. These substances not only enter, but form, in the very substance of the sheet, an insoluble varnish which protects it against the weather, increases its resisting power, and renders it incomcombustible. Instead of making use of prepared board, the matters can be incorporated in the pulp. This proceeding is equally applicable to paper, wood, stuffs, etc. It will take various colors, and is extremely light and economic.—*Bulletin du Musée de l'Industrie de Belgique*.

HEAT, SULPHURIC ACID AND WATER.

According to E. Maumené, sulphuric acid recently heated does not liberate the same amount of acid with water as an identical acid which has been preserved for some months. This phenomenon seems to him to introduce into thermochemical researches a source of error of which no account has been taken.—*E. Maumené*.

PHYLLIC ACID.

DOUGAREL has succeeded in isolating from the leaves of the cherry-laurel, a new acid to which he gives the name phyllic acid. The leaves are extracted with boiling alcohol; the extract left on distilling off the alcohol, is treated with ether; the solution is clarified with animal charcoal, the ether distilled off, and the amorphous grains dissolved in dilute potash solution and several times crystallized. On re-dissolving and adding an acid, phyllic acid is precipitated as a resinous mass. It is soluble in alcohol, ether, chloroform, CS₂, essential oils and fats, but insoluble in water. Several times precipitated from ether, it forms a fine powder without odor or taste, having a density of 1.014, rotating in alcoholic solution, α_D = +28, melting at 170°, and decomposing at 200°. Analysis of the potassium salt fixed the molecular weight at 624; and ultimate analysis, consequently, the formula C₂₂H₁₄O₁₀, which the author regards as provisional only. The sodium and ammonium salts are well crystallized. The acid has also been obtained from the leaves of the quince, apple, peach, almond, sycamore, lilac and 'abor-andi.—*Bull. Soc.*

SOLUBILITY OF SUGAR IN WATER.

By M. H. COURTONNE.

100 grms. of water at 12.5° dissolve 198.647 grms. of sugar, and at 45°, 245 grms. In other words, a solution of sugar saturated at 12.5° contains 66.5 per cent., and a solution saturated at 45° contains 71 per cent.

IODOUS ACID.

By M. J. OGIER.

WE may operate, either by causing ozonized oxygen to act upon the vapor of iodine, or by submitting a mixture of oxygen and iodine to the electric effluve. In each case the products are the same: the ultimate stage of an oxidation sufficiently prolonged is always a white or yellowish matter, unalterable in the air, soluble in water without apparent decomposition, and in which the oxygen and iodine were found united in the proportions suitable for iodic acid. In certain cases the author obtained a product sparingly soluble in water, the properties of which agreed with Millon's hypiodic acid. The following arrangement was adopted for the formation of iodosous acid: A rapid current of ozone was led by a tube to the bottom of a flask containing iodine kept at 44° to 50°. The ozone being immediately destroyed on contact with the vapor of iodine, the solid particles formed were carried with the excess of oxygen along a lateral tube. A series of narrow glass tubes containing platinum spirals serves to break the gaseous current, and to arrest these particles whose tenuity is extreme. The product is a pale yellow powder, exceedingly light. If treated with water iodine is precipitated. If exposed to moist air it seems to disappear in a few seconds.

TO TEST SOAPS, dissolve twenty parts in water, and mix with five parts of diluted sulphuric acid. The fat rises to the top, and the mineral impurities fall to the bottom. In this manner, says a scientific contemporary, the most flagrant adulterations can be detected.