CHEMISTRY

New Test for Alcohol

LIEBEN has discovered a new and very delicate test for the presence of alcohol, depending upon its conversion into iodoform. The liquid under examination is heated in a test-tube, into which are then introduced a few grains of iodine, and a few drops of potash-solution; whereupon, if alcohol is present, a yellow crystalline precipitate of iodoform is produced immediately or after some time, according to the degree of dilution of the liquid. This test is said to be capable of detecting 1 part of alcohol in 12,000 parts of water. For greater certainty, it is best to examine the precipitate with the microscope, iodoform exhibiting the appearance of hexagonal plates or six-rayed stars.

The test just described is capable of an important physiological application. It is generally supposed that alcohol introduced into the animal organism in the form of wine or other spirituous liquors becomes completely oxidised, and does not pass into the urine as alcohol, but in the form of some product of transformation. Lieben, however, by applying the new test to the urine of a man who had drunk a bottle of wine half an hour before, was able to detect the presence of alcohol in it. A second portion of urine voided by the same individual, an hour later, and a third, after another half-hour, still exhibited the peculiar reaction under consideration. The urine was of course distilled before applying the test, and it had been previously ascertained that none of the other volatile matters contained in it would produce a similar reaction.—[Ann. di Chim. app. alla Med., Sept. 1869, p. 136.]

Preparation of Silver Nitrate

P. SCIVOLETTO proposes the following modification of the process of preparing silver nitrate for use in medicine, photography, &c. This salt is usually prepared from old silver containing copper, by dissolving the alloy in nitric acid, evaporating to dryness, and calcining the residue as long as nitrous fumes continue to escape. The product is a mixture of silver nitrate and cupric oxide, from which the former may be dissolved out by water. The inconveniences of this process are the time it takes, and the difficulty of ascertaining when the cupric nitrate is completely decomposed. To obviate these inconveniences, the author, after evaporating the solution of the mixed nitrates to dryness, redissolves them in water, and precipitates the silver from the neutral solution by means of a clean spiral of copper foil. The precipitated silver is then redissolved in nitric acid, and the resulting nitrate is either crystallised, fused, or left in solution, according to the use to which it is to be applied.—[Ann. di Chim. app. alla Med., August 1869, p. 70.]

A. SAYTZEFF has discovered a new method of converting fatty acids into the corresponding alcohols, namely, by the action of dry sodium amalgam on a mixture of a fatty acid with the corresponding chloride; e.g. acetic acid and acetyl chloride yield ethyl alcohol. In this manner he has prepared ethyl, propyl, and butyl alcohol.—[Zeitschr. f. Chem. (2), v. 551.]

GRUNE has found that the photographic image, as ordinarily produced, is on the surface, and not in the substance of the collodion film. By transferring the film to wood, and then dissolving out the collodion by means of ether, a purely metallic image is left, admirably suited for the purposes of the engraver.

PHYSICS

Thalen's New Map of the Spectra of the Metals

M. ROBERT THALÉN has contributed to the Royal Society of Upsala an important memoir on the determination of the wave-lengths of the metallic lines of the spectrum. Dissatisfied with the pure results of refraction, as not being sufficiently refined to meet the requirements even of ordinary analytical accuracy, the author resolved to construct a new chart, based on the principle of wave-lengths. For the systematic examination of spectra, an electric source of light should always be employed, and entire groups of characteristic lines ought to be observed in all cases. The ordinary spectroscope, with a fine micrometer scale, gives readings which vary sensibly with the temperature and material of the refractive medium; and two such instruments cannot be compared with each other unless by specific tables, or graphically. Accordingly, the highest accuracy can only be attained by direct comparison with the dark lines of the solar spectrum, which themselves furnish an excellent micrometric scale. M. Thalén has therefore founded his experiments on the laborious achievement of Ångstrom, with whose "normal solar spectrum" he was early associated.

The actual course of operations was as follows. Each bright metallic ray, whose spectrum it was desired to study, was laid down on the plates given by Kirchhoff and Hoffmann (A to G) or by Ångström and Thalén (G to H); these rays were next referred to Ångström's plates of the normal spectrum of the sun, unless a direct comparison with the solar lines could be made; and, lastly, the rays were drawn in the order of their wave-lengths as thus obtained, and sometimes with the assistance of a graphic method, on a map which accompanies the memoir.

The instruments employed in this research consisted of a large Ruhmkorff induction coil, aided by a sufficiently powerful condenser; and a voltaic battery of fifty pairs furnished the light for certain determinations. The spectroscope consisted of two tolerably large telescopes (one being used as a collimator) and a carbon disulphide prism of 60°. In favourable cases, two such prisms or six flint-glass prisms of 60° were employed; but when the intensity was very feeble, only one (of the latter kind) could be used.

The registration in the solar spectrum of the lines of incandescent bodies may be effected by different methods. When the voltaic arc is operated with, or even the induction spark (provided, in this case, that the electrode is made of the metal submitted to experiment), it is convenient to bring the rays from the two sources of light into the slit of the collimator in such a manner that the solar and metallic spectrum are one above the other. If the lines of the latter have sufficient intensity, the reference is effected without difficulty. On the other hand, when the intensity of the electric spectrum is feeble—which is generally the case when the spark is taken between electrodes moistened with saline solutions—it is better that the two pencils should enter the slit in the same direction, so as to be mutually superposed. As the bright lines are now scarcely visible on the illuminated background of the solar spectrum, the latter must be temporarily excluded by a screen; the vertical wire in the eye-piece of the telescope is made to coincide exactly with a bright metallic line; and then, on re-introducing sunlight, its position among the dark lines is seen with precision. It is not unworthy of notice that the exactness of this observation is impaired by a somewhat singular circumstance. If the wire and the Fraunhöfer lines are seen simultaneously in the focus of the eye-piece, the wire being placed among the weaker and narrower lines, it commonly happens that these entirely disappear, or can only be made out with difficulty. The great difference between the intensities of the two objects, and the diffraction fringes produced by the two sides of the wire, are, no doubt, the causes of this curious phenomenon.

M. Thalén gives a table in which the normal spectrum of the sun is recorded in wave-lengths, and compared with the refraction spectrum of Kirchhoff. By its aid, the metallic lines on the chart accompanying the author's paper may be identified with those of the refraction spectra alluded to, and an approximate value can be obtained of the wave-length corresponding to any line. The chart itself gives, in millimetres, the wave-lengths of metallic lines within about 0·0000001 of their true value. It was drawn by hand on paper upon which the scale had already been printed without the usual damping process; in this manner all shrinking was avoided. It is rendered still more valuable by a long appendix of tables, in which all its numerical elements are appropriately distributed among the respective metals. Only the most intense lines, such as are obtained by the induction apparatus, have as a rule, been submitted to measurement.

The following are the names of the metals whose lines coincide with those of the solar spectrum: sodium, calcium, magnesium, iron, manganese, chromium, nickel, cobalt, and *titanium*. The chart contains lines belonging to forty-five metals. Iridium, rhodium, ruthemium, tantalum, and niobium were examined, but without any definite result. The spectrum of air is given at the bottom of the chart, for the sake of reference, and some integers, roughly representing the intensity of the lines.

Some of the lines which show very strongly with metallic electrodes become very weak when a saline solution is taken, and the more so as this is diluted. Two large and well-marked groups belonging to zinc and cadmium appear only when the metal itself forms the electrode, not the slightest trace of them appearing with a saline solution.

In a concluding note, M. Thalén points out the probable existence of titanium in the sun. Titanic oxide only gave feeble

lines, of which a few characteristic individuals were mapped with difficulty. These were afterwards found in the spectrum of calcic chloride, with which some gas-carbon electrodes had been impregnated; but with electrodes of a different material the lines did not reappear. Perfectly pure titanic chloride, however, readily furnished them; and titanium was also obtained, by a chemical process, from the ash of the coal which had yielded the gas-carbon. A direct comparison of the numerous and delicate titanium lines with those of Fraunhöfer, under high dispersive power, left no doubt whatever that titanium must now be added to the list of solar metals.

PHYSIOLOGY

Gases of the Secretions

PFLUGER has investigated the gases of urine, milk, bile, and saliva. The quantity of nitrogen gas is very much alike in all, being in urine ·9, in milk ·75, in bile ·5, in saliva ·75 per cent. in volumes. The quantity of oxygen, on the contrary, varies much more, being in urine ·075, in milk ·095, in bile ·1, in saliva ·5 per cent. Pflüger attributes the larger quantity of oxygen in saliva to the fact that in the much less rapid secretions of bile, &c., the epithelium of the secreting passages consumes, during secretion, a large portion of the oxygen contained in the secreted fluid. In the more swiftly secreted saliva, the oxygen escapes in a large measure this consumption. The quantity of carbonic acid varies according to the reaction of the secretion. In alkaline, bile, and saliva, it reaches 56·1, and 64·7 per cent.; in neutral or acid urine, milk, and bile, it sinks as low as 13·7, 7·6, 5 per cent. respectively.—[Archiv. für Physiol. ii. 156.]

According to Bogoljubow, the carbonic acid of the bile depends largely on the quality and quantity of food taken. It seems to diminish during the stay of the bile in the gall bladder.—[Centralblatt f. Med. Wissen. 1869, No. 42.]

Changes in Milk

KEMMERICH brings forward observations to show that in standing milk, especially at blood-heat, an increase of the *casein* takes place at the expense of the *albumen*. He also confirms the statements of previous observers, that in milk (and cheese) the quantity of fat increases on keeping. He attributes, however, this "ripening of the cheese," to the action of fungi.—[Archiv. für Physiol. ii. 401.]

Effect of Alcohol on Animal Heat

CUNY BOUVIER affirms as the result of experiments on rabbits (apparently carefully conducted with due sense of sources of error) that alcohol lowers the temperature of the body, in small doses to a slight in large doses to a very marked degree.—[Archiv. für Physiol. ii. 370.]

Metamorphosis of Muscle

O. NASSE, extending the previous observations of MacDonnell and others, affirms that *glycogen* is a normal constituent of muscle, the quantity existing in frog's and rabbit's muscle amounting to 3—5 per cent. of the wet mass. He also states that in living quiescent muscle sugar is totally absent, or present in inappreciable quantity only. The conversion of glycogen accompanies rigor mortis, whether natural or artificial, and is also brought about by muscular contraction. Nasse further shows that muscular contraction and rigor mortis are accompanied by a consumption of the total carbo-hydrates of the muscle. The amount of sugar (or glycogen) lost under these circumstances is insufficient, however, to account for the acid (paralactic) produced at the same time; indeed the two processes run by no means parallel, and apparently are not connected.—[Archiv. für Physiol. ii. 97.]

Vertebrate Epidermis

F. E. SCHULTZE describes various modifications of the uppermost layers of the epidermis in vertebrata, distinguishing between *cuticular thickenings* of living cells and *cornification* of dead ones. In particular he describes curious laminated cuticular thickenings of the epidermic cells of various species of *hippocampus*. These cells he proposes to call *flame*-cells, from their curious resemblance to the flame of a candle.—[Max Schultze's Archiv. v. 295.]

Development of Grey Matter of Brain

ACCORDING to Arndt, the grey matter of the convolutions of the rabbit at birth consists of nuclei imbedded in a protoplasmic matrix, studded with granules, and very faintly fibrillated. After birth the matrix becomes increasingly fibrillated, the granules partly coalesce and partly become dispersed. The nuclei become separated through a greater development of the matrix, and a nucleolus appears in them by coalescence of previously existing nucleolini. Part of this differentiated matrix is directly gathered round various nuclei to form the ganglionic cells and their branches, other parts become arranged in strands to form the axis cylinders of nerves, while the rest remains as the permanent granular faintly fibrillated matrix of the adult brain. Arndt tries to accommodate the "Cell theory" to these new facts.—[Max Schultze's Archiv. v. 317.]

Regeneration of Spinal Cord

MASIUS and VAN LAIR assert that if strong frogs be operated on in early or mid winter, complete reparation of structure with restoration of powers takes place, even when sections of the whole spinal cord 1–2 mm. in length have been removed. Degeneration occurs first at either cut surface: the central end swells by deposition of new tissue into a hollow cup-shaped bulb; the peripheral contracts into a cone fitting into the former; and so union takes place.—[Centralblatt, Med. Wissen. 1869, No. 39.]

SOCIETIES AND ACADEMIES

Syro-Egyptian Society, Nov. 2.—Mr. W. H. Black, F.S.A. in the chair. The latest communication from Dr. Livingstone, that he has found what he believed "to be the true sources of the Nile, between 10° and 12° south (latitude) or nearly the position assigned to them by Ptolemy," was received with much satisfaction; and the passages in the Greek text of Ptolemy's geography, relative to "the mountain of the moon," from which the lakes "of the Nile receive the snows," *twice placed by him in 12½ south latitude*, were read; and the old traditional maps, showing a mountain range of about 10° of longitude in extent, with streams running northward into two lakes (as published in the Amsterdam edition of 1605), were compared therewith. A resolution was then passed, sympathising with Dr. Livingstone in his laborious researches, and congratulating the present age on this confirmation of ancient scientific literature by means of modern exploration.

Mr. Black described the results of his own recent application of the symbolic and mathematic teaching of the great pyramid to the geometric geography of Africa; stating the full conformity of that monument to the geodetic laws and uses of other uninscribed megalithic monuments in Asia and Europe, which have been erroneously assigned to religious and superstitious purposes. He promised to illustrate the subject further, and to demonstrate by diagrams the results then verbally described, at a future meeting of the society.

Anthropological Society, Nov. 2.—Dr. Beigel, V.P., in the chair; the following new members were announced:—*Fellows.*—Captain G. J. D. Heath; Dr. Samuel E. Maunsell, R.A.; Messrs. Thomas Milne, M.D.; E. W. Martin; Robert Watt; Horace Swete, M.D.; Lieut. Wm. Francklyne; and Wm. Pepper. *Hon. Fellow.*—M. Le Baron d'Omalius d'Halloy. *Corresponding Member.*—Professor Dr. August Hirsch.

Mr. Pike read a paper on the Methods of Anthropological Research. He considered it useless to speak of methods of research without some previous definition of the objects of research. The real difficulty in anthropology was to know what to observe, and how to verify. He believed that the science could advance only by a double method of observation—the observation of mankind individually and in masses, and that the conclusions suggested by the observation of masses, races, or nations must be verified by the observation of individuals, and *vice versâ*. For this reason he thought it was a mistake to speak of ethnology as a science, as it consisted only of a series of disjointed observations without conclusions, and without the means of verifying conclusions if made. Mr. Pike then reviewed at considerable length the ramifications of Anthropology into anatomy, physiology, psychology, and the various subdivisions of those studies, suggesting that all kinds of unsuspected correlations were yet to be discovered by a rigorous application of a scientific method. The relations of mind to body, of faculty to faculty, of one part of the body to another, were still removed but little from the realms of mystery from which only anthropology could thoroughly drag them away. Mr. Pike concluded by describing anthropology in one of its aspects as the only kind of philanthropy which could be of service to mankind—philanthropy founded upon science.