CHEMISTRY

Constitution of Arbutin

HUGO SCHIFF has made some interesting experiments relating to the constitution of arbutin. This substance splits up into glucose and hydroquinone, just as salicin is resolvable into glucose and saligenin (Strecker). The relations between salicin and arbutin may be represented by the following formula:

$$C_6H_7\left\{\begin{matrix}O\\(OH)_4\\O\end{matrix}\right.\qquad C_6H_7\left\{\begin{matrix}O\\(OH)_4\\O\end{matrix}\right.$$
$$C_6H_4\left\{\begin{matrix}\\CH_2.OH\end{matrix}\right.\qquad C_6H_4\left\{\begin{matrix}\\OH\end{matrix}\right.$$

Salicin (Glycosalicyl alcohol). Arbutin (Glycohydroquinone).

The hydrogen in the oxhydryls of the glucosic portion of arbutin may in fact be replaced by acid radicals, just as the author formerly showed in the case of salicin (Zeitschr. (2), v. 1. 52). Moreover, the hydrogen belonging to the hydroquinone in arbutin is easily replaceable; whereas in salicin the hydrogen belonging to the saligenin is not capable of substitution.

Benzoyl-arbutins are obtained by means of benzoyl chloride; *acetyl-arbutins*, with acetyl chloride or acetyl oxide, which act at 60°—80°. The ultimate products of the reaction separated from the resulting solutions, after cooling, by means of ether, contain five acid radicals, and have this composition:

$$C_6H_7\left\{\begin{matrix}O\\(O.C_2H_3O)_4\\O\end{matrix}\right.\qquad C_6H_7\left\{\begin{matrix}O\\(O.C_7H_5O)_4\\O\end{matrix}\right.$$
$$C_6H_4\left\{\begin{matrix}\\O.C_2H_3O\end{matrix}\right.\qquad C_6H_4\left\{\begin{matrix}\\O.C_7H_5O\end{matrix}\right.$$

Pentacetyl arbutin. Pentabenzoyl-arbutin.

They are colourless bodies, insoluble in water, slightly soluble in ether, more soluble in hot alcohol, from whence they crystallise on cooling in small shining needles. The acid radicals may easily be taken out again by boiling with weak bases. Together with the pentabenzoylated compound, the author likewise obtained *dibenzoyl-arbutin*, in which the hydrogen might be further replaced by acetyl.

Dinitro-arbutin dissolves easily in acetic oxide, and is converted into

Pentacetyl-dinitro-arbutin

$$C_6H_7\left\{\begin{matrix}O\\(O.C_2H_3O)_4\\O\end{matrix}\right.$$
$$C_6H_2(NO_2)_2\left\{\begin{matrix}\\O.C_2H_3O\end{matrix}\right.$$

which may be separated from the acetic acid solution by water, and crystallised from hot alcohol in fine needles, insoluble in water, slightly soluble in ether. The alcoholic solution heated with sulphuric acid yields glucose, acetic ether, and dinitrohydroquinone, easily recognisable by the splendid colour which it gives with caustic alkalies. Dinitro-arbutin forms with basic lead acetate a crystalline orange-coloured lead-compound, in which the hydrogen of the oxhydryl is replaced by lead. Arbutin gives no precipitate, even with an ammoniacal solution of lead-acetate.

Recently precipitated silver-oxide is reduced, even at ordinary temperatures, by an aqueous solution of arbutin. On adding freshly prepared silver carbonate to a solution of arbutin heated to 50°—60° as long as carbonic acid is evolved, and heating for a short time with excess of the silver carbonate, a yellow solution is obtained, which no longer contains arbutin; but on separating the dissolved silver with a few drops of hydrochloric acid, and filtering, a solution is obtained, from which alcohol precipitates white flocks consisting of a compound formed by the union of 2 molecules of arbutin minus 2 atoms of hydrogen, viz.—

Diarbutin

$$C_6H_7O\left\{\begin{matrix}(OH)_4\\O\end{matrix}\right.$$
$$C_6H_4\left\{\begin{matrix}O\\O\end{matrix}\right\} = C_{24}H_{30}O_{14}$$

or

$$C_6H_4\left\{\begin{matrix}O\\O\end{matrix}\right.$$

Glycoquinhydrone

$$C_6H_7O\left\{\begin{matrix}O\\(OH)_4\end{matrix}\right.$$

This compound may be regarded as the glucoside of quinhydrone (green hydroquinone); it is related to arbutin in the same manner as helicoidin to salicin. Glycoquinhydrone is not at all bitter; it forms acetyl-derivatives when treated with acetic oxide, and an orange-coloured nitro-product with nitric acid. The latter, when decomposed in alcoholic solution by sulphuric acid, does not yield any substance that turns violet with potash. By means of zinc and sulphuric acid, hydrogen may be again added; and dinitro-hydroquinone thereby produced.

A solution of arbutin produces with ferric chloride a deep blue colour, which gradually disappears. None of the derivatives of arbutin above described exhibit this reaction.

Schiff also finds that *amygdalin* contains seven, and *phlorizin* five oxhydryl atoms, the hydrogen of which may be replaced by acetyl. Hence he assigns to these bodies the following formulæ:

$$C_6H_7\left\{\begin{matrix}O\\(OH)_4\\O\end{matrix}\right.\qquad C_6H_7\left\{\begin{matrix}O\\(OH)_4\\O\end{matrix}\right.$$
$$C_6H_7\left\{\begin{matrix}(OH)_3\\O\end{matrix}\right.\qquad C_6H_3\left\{\begin{matrix}OH\\O\end{matrix}\right.$$
$$C_7H_6\left\{\begin{matrix}O\\CN\end{matrix}\right.\qquad C_8H_8\left\{\begin{matrix}O\\CO.OH\end{matrix}\right.$$

Amygdalin. Phlorizin.

(Zeitschr. f. Chem. (2) v. 519. Ann. Chem. et. Pharn. cliv. 237.)

SCIENTIFIC SERIALS

Poggendorff's Annalen, 1870, No. 7. The contents of this Number are:—(1.) "On the effect of Roughness of Surface on the Radiation of Heat," by G. Magnus. The author shows that the generally accepted explanation of the increased emission of radiant Heat by roughened surfaces, that it depends on a diminution of superficial density, is inadmissible. He attributes it to the refraction which takes place at the surface of emission, whereby the direction of the rays which leave the surface obliquely is changed. (2.) "On the Specific Gravity of Alcohol and of Mixtures of Alcohol and Water," by E. H. Baumhauer. A defence of the author's tables of the specific gravity of alcohol against Mendelejeff's criticisms contained in Poggendorff's *Annalen* for 1869, vol. 138. (3.) "On the Flow of Mercury through Capillary Tubes," by E. Warburg. The author's experiments prove that in glass tubes, whose diameter is a sufficiently small fraction of their length, the quantity of mercury which flows through them in a given time is directly proportional to the difference of pressure at the two ends, to the *fourth power* of the diameter, and inversely proportional to the length, but that it is independent of the absolute pressures at the ends so long as the difference remains constant. He concludes from these results that there is no friction, under the conditions of the experiments, between the mercury and the glass, but that the film of mercury in contact with the glass remains at rest while the inner portions flow through it. (4.) "Continuation of Investigations into the Electromotive Force between Liquids," by J. W. Müller. (5.) "On the Determination of the Proportion of Water in Glacial Acetic Acid," by F. Rüdorff. The author gives a table for deducing the proportion of water contained in acetic acid from the freezing point of the mixture. He gives 16·7° C. as the freezing point of pure acetic acid (without water), and finds that the presence of ½ per cent. of water lowers the freezing point by more than a degree. (6.) "On the Determination of the Freezing and Melting Points of Fats and other Compounds," by F. Rüdorff. The author points out the untrustworthiness of observations of melting points made, as they often are, by heating the substance to be examined in a capillary tube, or by coating the bulb of the thermometer with it. He recommends the observation of the freezing point, with a thermometer whose bulb is actually immersed in the substance, as a means of establishing its chemical identity instead of observing the melting point. To ascertain whether the observed temperature is the highest at which solidification can occur, he notices whether it is accompanied by rise of temperature, which always takes place if the body has been cooled below the normal freezing point. (7.) "On the Phosphorescence of Rarefied Gases after the passage of an Electric Discharge," by E. Sarasin. The author finds that the presence of oxygen, either free, or combined in a compound which is probably decomposed by the discharge, is an essential condition of the occurrence of the phosphorescence, and shows that this phenomenon is probably connected with the formation of ozone. Sulphuric acid vapour favours the production of phosphorescence in a high degree. (8.) "On the Electromotive Forces due to the contact of different metals," by E. Edlund. When an electric current traverses the point of junction of two different metals, a quantity of heat is absorbed or produced per unit of time which is proportional to the strength of the current and to the electromotive force acting between the metals. The author refers on this point to a previous paper (Poggendoff's *Annalen*, vol. cxxxvii.); in the present communication he endeavours to estimate the comparative electromotive forces acting between different pairs of

metals by the heating or cooling effects of a current of measured strength. The junction formed of each pair to be examined was enclosed in the bulb of an air thermometer, and the difference between the expansions produced, when the current passed in opposite directions, was measured. The electromotive order of the metals deduced from the results did not agree with the order given by electroscopic observations (*elektrische Spannungsreihe*), but it agreed with the thermo-electric order, though the electromotive forces were not found to be proportional in all cases to the thermo-electromotive forces between the same pairs of metals. (9.) "On the Properties of Pictures formed by Photographic Lenses," by Dr. Hermann Vogel. The author calls attention to certain inherent defects of pictures formed by perfect photographic lenses, that is to say, defects not due to distortion or aberration in the lenses. (10.) "On the Velocity of Light in Quartz," by Victor von Lang, contains very careful measurements of the deviations produced by a quartz prism in the ordinary and extraordinary rays for various angles of incidence. Incidentally, a measurement of the ratio of the two coefficients of expansion of quartz is also given, deduced from the change produced by alterations of temperature in the refracting angle of the prism. (11.) "On the Specific Heat of Saline Solutions and Mixtures of Liquids," by A. Wüllner. The author disputes, on the authority of the experiments made in his laboratory by Dr. Schüller, Jamin's conclusion that when two liquids are mixed together, and therefore each of them is uniformly diffused through the whole of the space occupied by the mixture, the specific heat of each increases in proportion to increased space occupied by it. (12.) "On the Fusion of Leaden Bullets by striking against an Iron Plate," by Edward Hagenbach. This paper describes the melting of leaden bullets fired against an iron target, and contains a calculation showing that the kinetic energy due to the velocity assigned by "a competent military authority" is sufficient to account for the result. (13.) "An Experiment on boiling together two liquids which do not mix," by August Kundt. If steam is passed into liquid sulphide of carbon, or if sulphide of carbon vapour is passed into water, the resulting mixture of water and sulphide of carbon boils at 42·6° C., that is to say, at a temperature four degrees lower than the boiling point of sulphide of carbon alone. Also, if water and sulphide of carbon, which have been heated separately to between 43° and 46·6°, be mixed together, the mixture boils until its temperature has fallen to about 43°. These facts are in accordance with the observation of Magnus and Regnault that the vapour-tension of a mixture of two mutually insoluble liquids is equal to the sum of the vapour-tensions of the separate liquids. (14.) "On Microscopic Tridymite," by Ferdinand Zirkel. The author describes the characters of this mineral as seen under the microscope, and shows that it is of frequent occurrence in microscopic crystals. (15) "On Acoustical Attraction and Repulsion," by K. H. Schellbach, contains experimental proofs of the statement that "the sonorous vibrations of an elastic medium urge specifically heavier bodies towards the centre of disturbance, and specifically lighter bodies away from it."

Palæontographica. Beiträge zur Naturgeschichte der Vorwelt. Herausgegeben von Dr. W. Dunker and Dr. K. A. Zittel. Band xvii., Lief. 6, 1870. This new part of the well-known "Palæontographica" contains an interesting contribution to fossil entomology in the description of the species of diptera obtained from the brown coal of Rott in the Siebengebirge. It is from the pen of the distinguished entomologist, L. von Heyden. The species, which are figured, are forty-one in number, belonging to sixteen genera, and all but nine of them belong to the moisture-loving families of the monocerous group (*Tipulidæ*, *Culicidæ*, &c.). Of *Chironomus* there are five well-marked species, and no less than six different forms of larvæ and pupæ, and there is also the larva almost certainly of a species of *Stratiomys*.

The most important article in the *Journal of Botany* for December is a continuation of Dr. Braithwaite's Recent Additions to our Moss Flora, accompanied by two plates. Dr. Seemann continues his Revision of the Natural Order *Bignoniaceæ*, and Mr. Ernst gives Jottings from a Botanical Note-book, relating chiefly to Caracas plants. The other articles belong exclusively to specific British botany. With the new year it is intended to increase the amount of type in the journal by about one-third, without any corresponding increase in price.

SOCIETIES AND ACADEMIES

LONDON

Zoological Society, December 6.—Robert Hudson, F.R.S., V.P., in the chair. The Secretary read a report on the additions to the Society's menagerie during the months of October and November, amongst which particular attention was called to an example of Geoffroy's Cat (*Felis Geoffroyi*), from Paraguay, purchased Oct. 10, and a specimen of the Antarctic Wolf (*Canis antarcticus*), from the Falkland Islands, presented by Mr. H. Byng, Acting Colonial Secretary of that colony.—An extract was read from a letter received from Dr. R. C. Cunningham, giving particulars of the habits of a Manatee, as observed by him in the public gardens at Rio.—A ninth letter was read from Mr. W. H. Hudson, on the Ornithology of Buenos Ayres.—Dr. J. Murie read the second part of his memoir on the anatomy of the Sea Lion (*Otaria jubata*), as observed in the male of this species which died in the Society's Gardens in 1867.—Mr. J. B. Perrin read a paper containing notes on the anatomy of the Smaller Fin-Whale *Balænoptera rostrata*), as observed on dissection of a young female specimen of this species captured at Weymouth in April, 1870.—A communication was read from Dr. G. Hartlaub and Dr. O. Finsch, containing the description of a remarkable new Finch from the Navigators' Islands, proposed to be called *Lobiospiza notabilis*.—A communication was read from the Rev. O. P. Cambridge, containing notes on a collection of *Arachnidea* made by Mr. J. Keast Lord in the Peninsula of Sinai and on the African borders of the Red Sea.—A paper was read by Mr. G. Gulliver, F.R.S., containing observations on certain points in the anatomy and economy of the Lampreys.—Dr. A. Günther read a notice of the hitherto unrecorded occurrence of *Lates calcarifer*, a fish belonging to the Perch family, in Australia.—A communication was read from Dr. J. E. Gray, containing the description of the skull of the adult *Eupleres goudoti*. This Madagascar mammal was previously only known from an immature specimen in the Paris Museum.—A second communication from Dr. Gray contained notes on *Hapalemur simus*, a new Lemur, described from a specimen lately living in the Society's Gardens.—Messrs. Sclater and Salvin communicated descriptions of five new species of birds from the United States of Columbia.—A second communication from the same authors contained an account of the collections of birds recently made by Mr. George M. Whitely on the line of the Inter-Oceanic Railway of Honduras.—Mr. Sclater read descriptions of three apparently new species of Tyrant Birds, of the genus *Elainea*, to which were added remarks on other known species of the same group.—Mr. St. George Mivart read a paper on the myology of a species of Chameleon (*Chameleon parsoni*).—Mr. Gould exhibited and pointed out the characters of two new species of Humming Birds recently collected by Mr. Buckley in Ecuador, which he proposed to call *Chætocercus bombilius* and *Thalurania hypochlora*.

Anthropological Society, December 6.—Dr. J. Beddoe, President, in the chair. Mr. W. R. Cooper exhibited and shortly described two Græco-Egyptian terra-cotta figures from the Hay Collection, showing a remarkable form of the head.—A paper was read by Mr. A. L. Lewis, "Suggestions and Reflections respecting the Peoples inhabiting the British Isles." The author divided the inhabitants of Britain into three leading types: 1st, the Kymric, long-headed, dark-haired, and light-eyed; 2nd, the Iberian, dark-haired and dark-eyed; 3rd, the Teutonic, broad-headed, light-haired, and light-eyed; the first two types being included under the collective name of Celt. After touching on some of the physical racial questions connected with the intermixture of these types, the paper concluded with some remarks tending to controvert certain popular ideas in reference to their mental characteristics, and their respective love of freedom, honesty, and chastity.

Entomological Society, Dec. 5.—Mr. A. R. Wallace, President, in the chair. Mr. Edward Saunders exhibited three new British *Hemiptera*, belonging to the genera *Salda*, *Plociomerus*, and *Hadrodema*. Mr. F. Smith exhibited *Baridius scolopaceus*, a beetle new to Britain, also *Calodera rubens*, both species captured in Kent. Mr. Butler exhibited a dark dwarf of *Vanessa urticæ*. Mr. Pascoe exhibited two new forms of *Longicornia* from the Himalayas. Mr. Albert Müller exhibited photographs of galls caused by several species of *Cynips*, sent by Mr. Bassett, of Waterburg, U.S.A. Mr. S. S. Saunders exhibited a living spider,