XXXV. On some new species of animal concretions

Thomas Taylor

To cite this article: Thomas Taylor (1846) XXXV. On some new species of animal concretions , Philosophical Magazine Series 3, 28:186, 192-200, DOI: [10.1080/14786444608645396](https://doi.org/10.1080/14786444608645396)

To link to this article: <http://dx.doi.org/10.1080/14786444608645396>

Published online: 30 Apr 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

XXXV. *On some New Species of Animal Concretions.*

By THOMAS TAYLOR, Surgeon.

[Continued from p. 46.]

Resino-bezoardic Acid Calculi.

VERY shortly after commencing the examination of the calculi in the College collection, my attention was drawn to several concretions which possessed the easy fusibility and general characters of a resin, and which were described in the MS. Catalogue as "false West Indian Bezoars," on the supposition that they were artificial compounds. The peculiar characters however of the resin of which they consisted, and their finely laminated structure, which it would be impossible to imitate, left no doubt on my mind of their being genuine bezoars, and in January 1841 I described them to the Museum Committee as consisting of a *vegetable* resin, derived most probably from the resinous juices of the plants on which the wild goats of the East had fed. In the same year a very interesting paper appeared in the *Annalen der Chemie und Pharmacie*, by M. Goebel, describing a new species of calculus which he had found in the Zoological Museum at Dorpat, and to which, on the supposition of its being a biliary concretion, he gave the name of *lithofellinic acid*. A similar calculus from the Pathological Museum at Göttingen was shortly after examined by Professor Wöhler.

The similarity in chemical characters of the concretions examined by these chemists with the resinous concretions previously examined by myself, rendered it certain that they were identical in composition; but as it was important to determine whether they were biliary calculi or simply intestinal concretions, derived from the materials of the food, I repeated at some length my experiments, but without coming to any other conclusion than that formerly expressed. The reasons which have induced me therefore to place the calculi among the intestinal calculi in the College Catalogue are as follows.

In the first place, the greater number of them contain, as the subjoined analysis will show, a small quantity of a soft viscid resin, resembling a vegetable balsam.

Secondly. They resemble all other concretions formed in the intestines, by having a foreign body, as a piece of wood or a seed, for their nucleus.

Thirdly. They frequently attain a very large size, quite inconsistent with the notion of their being biliary concretions, or having been contained in the gall-bladder. There is one specimen in the Museum which measures three inches and a half in length, and the same in its greatest breadth. This

calculus is of a rude triangular figure; it has evidently been accompanied by other calculi, as both of its extremities possess the smooth depressed surfaces found in concretions which have been in contact with others. Another specimen, of an oval figure, is four inches in length by three in breadth. Against the notion that these concretions may have been formed from the natural or the altered constituents of the bile concreting around foreign bodies in the intestines, it may be remarked that we have no other instance of a biliary calculus being so formed*. The large biliary concretions which are sometimes passed *per anum* by the human subject, have undoubtedly received no increase in bulk while in the intestine, but have made their way into the intestine either through an ulcerated opening or through the dilated biliary duct, which is capable of undergoing dilatation to a much greater extent than is generally imagined.

The circumstance of the Oriental Bezoar being composed of a vegetable acid, as I have shown in a former paper, together with the assertion of most Oriental travellers, that the resinous concretions are found in the stomach of the animal (not a very likely spot for a biliary calculus), adds considerable weight in favour of their vegetable origin. It is however right to state that I have not been able to detect the presence of resino-bezoardic acid in several of the known resins. Our acquaintance with these substances is however so limited that it would require a very extended series of experiments to determine this question in the negative. In its chemical relations, resino-bezoardic acid closely resembles the pimaric acid of M. Laurent, which that excellent chemist has recently shown to be the natural acid of the fir. This fact, coupled with the circumstance that the calculi are not very uncommon, and that vast forests of pines abound in the regions inhabited by the goats, render it not improbable that this resin is derived from some of the fir tribe. As the term *lithofellinic acid* gives therefore an erroneous idea of the origin of these concretions, I have ventured to substitute that of *resino-bezoardic acid*, which does not differ materially from that of "résine animale bézoardique" given to them by Fourcroy. This name will also serve to identify the circumstances under which it was first discovered, should its natural source be hereafter ascertained.

* Ambergis perhaps forms an exception to this statement. This substance is found in the intestines of the Spermaceti Whale, or floating on the sea. In the Catalogue I have placed it among intestinal concretions, although I have pointed out at the same time that it is a biliary product; its principal constituent, ambreine, bearing the same relation to the bile of the Whale as cholesterine does to that of Man.

Resino-bezoardic acid calculi are usually of an oval figure. Their external surface is smooth and polished, and has generally a greenish yellow, green, or a light brown colour. They are made up of thin concentric layers, which are frequently of a deeper tint than the exterior. In the centre of the calculus some foreign body is invariably found which forms the nucleus. These calculi are exceedingly brittle; the fracture is conchoidal, and has a resinous lustre. They vary considerably in size, but are usually larger than the ellagic acid species. One specimen in the Museum measures nearly ten inches in circumference. They melt like resin in the flame of a candle, and when more highly heated, give off white vapours, which have an aromatic odour, catch fire, burn with a brilliant flame, and leave behind a small shining carbonaceous ash.

Resino-bezoardic acid calculi readily dissolve in alcohol, with the exception of a small quantity of flocculent matter. The alcoholic solution varies in colour in different calculi, but is usually of a red or greenish-red tint. The solution gradually deposits small crystals, which, when examined by the microscope, are seen to consist of low six-sided prisms with flattened extremities. When the alcoholic solution is mixed with water the resin is thrown down. The precipitate appears under the microscope in the form of small crystalline tufts.

Digested in solution of potass these calculi readily dissolve, the solution is of a brownish green colour, and when neutralized by an acid, a thick curdy precipitate is produced, which by agitation adheres together, and while warm may be kneaded between the fingers or drawn into threads like cobbler's-wax. The viscosity of this precipitate is owing to another resinous matter which the calculi contain; for the pure resino-bezoardic acid similarly treated forms an amorphous precipitate which cannot be made to adhere together. They dissolve in solutions of ammonia and its carbonate. In concentrated sulphuric acid they also dissolve. The solution is of a red colour, and is rendered turbid by the addition of water. The precipitate is not crystalline, like that from its solution in alcohol, but consists of minute transparent yellow particles. Nitric acid acts with energy upon these calculi, nitrous acid is evolved, and a light red solution is formed, which quickly becomes yellow.

Analysis.

About 400 grains were reduced to a fine powder, mixed with distilled water, and subjected to distillation in a glass retort until about two ounces had passed over. The distilled

liquid was quite transparent, and possessed the peculiar aromatic odour of the calculus, but no volatile oil could be detected. The powder was separated from the rest of the water by filtration, and dried at 200° Fahr. It was dissolved in twelve ounces of boiling alcohol. The solution was of a bright red colour when viewed by transmitted light, and had a greenish tinge by reflected light; with the exception of a small quantity of flocculent matter it was quite transparent.

In order to separate the insoluble matter, the liquid while still hot was filtered, and the matter on the filter washed with a fresh portion of alcohol and dried. This matter was of a dirty brown colour, with a shade of green. It was when quite dry rather soft, so as to admit of being moulded between the fingers. When heated on platina foil it did not fuse, but softened, caught fire, and burnt briskly, emitting at the same time the odour of heated Indian rubber. It was insoluble in water, either hot or cold.

That this substance was not caoutchouc, was shown by its not being dissolved or softened when acted upon by absolute æther or oil of turpentine. A solution of caustic potass extracted some of its colour, but did not appear to dissolve it. The exact nature of this matter I am unable to decide; its vegetable nature is rendered probable by the total want of any animal odour while burning. It amounted to about two per cent.

The filtered alcoholic solution became slightly turbid on cooling; after standing a short time small crystals were deposited, and a crystalline crust formed upon its surface. Some of the crystals when examined by the microscope had the form of very regular six-sided plates, and others that of six-sided prisms. When a drop of the liquid was allowed to evaporate on a glass plate, and the residue examined by the microscope, crystals were formed, whose figure was not very distinct, but appeared to be that of a six-sided prism lying on its side; occasionally a six-sided plate was also visible.

The liquid was put into a retort, and about two-thirds of its bulk distilled over. It was transparent while hot, but on cooling deposited an abundant crop of small crystals. These crystals had the form of three-sided plates; when carefully fused upon a slip of glass, they were converted into six-sided plates.

The crystals obtained at different times were purified by being repeatedly crystallized from their alcoholic solution, which removed nearly the whole of their colouring matter. They possessed all the characters of the lithofellinic acid of Professor Goebel, and constituted the bulk of the calculus.

The mother-liquor was mixed with water, when a precipitate separated which by agitation was converted into a viscid turpentine-looking substance that adhered to the sides of the glass. When a drop of the mother-liquor was evaporated on a glass plate, very few crystals could be detected, but a great number of thick, viscid oily-like drops: by heating the glass vapours arose, and a hard uncrystalline resin was left. When the alcoholic solution of the crystals was mingled with water, a crystalline precipitate was thrown down, which beneath the microscope appeared in the form of small irregularly-shaped prisms, arranged in stellate groups. This difference in the character of the two precipitates appeared to indicate that the mother-liquor contained either a volatile oil or some soft resin in addition to the crystalline resin previously described. To determine this question the whole was placed in a retort, and submitted to distillation; the spirit came over quite free from any essential oil, merely retaining the peculiar odour of the calculus: the last portions smelt much stronger, and were slightly turbid. The precipitate had melted and formed a deep red oil, which adhered to the sides of the retort; when cold it was soft and ductile between the fingers. It was readily soluble in solutions of potass and ammonia, the solutions were rendered milky by the addition of an acid, but no precipitate fell. The milky liquor when examined by the microscope gave the appearance of oily globules. The soft resin remaining in the retort was now divided into two portions; to the one solution of ammonia was added, and to the other æther.

The ammoniacal solution was perfectly clear and of a bright red tint; it was neutralized by muriatic acid, a viscid precipitate separated, which was collected together, washed, broken into fragments, and put into a glass tube together with æther. It only partially dissolved, and after standing some days six-sided prisms were found adhering to the tube, the æthereal solution was evaporated, and a resinous matter more fusible than the former was left.

That portion of the soft resin which had been digested with cold æther did not entirely dissolve, but left some crystals of resinous matter undissolved; the æthereal solution was evaporated, and the residue, which was quite similar to that which had been previously treated with ammonia, was mixed with it and both dissolved in alcohol, sp. gr. 0.840. The tincture was set aside for some weeks; only a small quantity of crystalline matter was deposited, together with a little soft resin; it was therefore distilled, and the residue again treated with absolute æther, in which, with the excep-

tion of a very small quantity of resin, it entirely dissolved. On distilling off the æther a semi-fluid viscid balsam of a dark-red colour was left, which did not solidify at the temperature of the air, and acquired a pellicle on its surface by exposure to air. When heated a portion of it was volatilized, giving off at the same time the odour of melted caoutchouc. It readily caught fire and burnt brightly; its combustion was unaccompanied by the slightest trace of the odour given out by animal matter. It readily dissolved in caustic potass, and the addition of an acid threw it down unchanged: it possessed a biting acrid taste, felt particularly about the fauces; by exposure to the air it became a hard resin.

When submitted to distillation in a small tube retort, no oil passed over until the resin had acquired a temperature at which it began to decompose, when an empyreumatic oil came over: the quantity submitted to distillation was, however, too small to render the experiment quite satisfactory.

The only conclusions that can be drawn from this analysis are, that the principal constituent of the calculus is a vegetable resin, which is characterized by crystallizing in the form of six-sided prisms; that it is accompanied by a small quantity of a soft resin, probably containing volatile oil; that in addition to these it contains some other substances, as colouring and extractive matter, the precise nature of which it is impossible to determine, but which are doubtless also of vegetable origin.

M. Goebel detected in the concretion examined by him a small quantity of the colouring matter of the bile. In no one of the concretions examined was I able to satisfy myself of the presence of that substance. It is probably therefore only an accidental constituent. Its presence is however no proof of their biliary origin, since the colouring matter and other constituents of the bile are frequently found in hair-balls and other concretions known to be formed in the intestine.

Resino-bezoardic acid, when freed from the other substances with which it is mixed in the calculus, possesses the following properties:—It slowly dissolves in cold alcohol, more rapidly in hot; according to Goebel, one part of resino-bezoardic acid requires 29·4 of alcohol to dissolve it at 68° of Fahrenheit and 6·5 of boiling alcohol; in cold æther it is very sparingly soluble, 444 parts being required, but only 47 when boiling. Its alcoholic solution has an acid reaction, and the resin is slowly deposited from it in the form of short six-sided prisms. The crystals are exceedingly small; they have generally a yellow tint, but may be obtained quite colourless by previously digesting the alcoholic solution with animal char-

coal: they are hard, brittle, and easily reduced to powder, inodorous, and have a bitter resinous taste; their summits are generally quite flat, but are sometimes bevelled at their edges. Three-sided prisms are occasionally deposited, which apparently result from an extension of each alternate face of the six-sided prism.

The crystallized acid fuses at 401° Fahrenheit, and when not heated beyond that temperature becomes on cooling an opaque crystalline mass. If the fused acid be heated only a few degrees above 401° Fahrenheit, it forms when cold a transparent glass, without the slightest trace of crystalline structure: when alcohol is poured over the fused mass a number of minute cracks are suddenly formed, which possess considerable regularity. If a thin layer of alcohol is allowed to remain over it, the whole is quickly converted into an aggregated mass of regular crystals. The most remarkable circumstance is that the melting-point of the vitreous or amorphous resino-bezoardic acid is nearly 180° lower than that of the crystallized acid, Prof. Wöhler having determined that the crystallized acid melts at 400° Fahrenheit, while the amorphous fuses at a temperature between 220° and 230° Fahrenheit. In this respect resino-bezoardic acid resembles sugar, sulphur, amygdaline and silvic acid; all of which bodies have two distinct fusing-points, according as they are either in a crystalline or amorphous state: this property Wöhler believes to be possessed by all dimorphous bodies. The above fact may be readily observed in the following manner, which serves as a very characteristic test of resino-bezoardic acid. Let a few grains of the powdered resin be strewed over a thin slip of glass and held over the flame of a candle until a portion only of the resin is melted: if the edges of the semi-fused portion be examined by the microscope groups of very regular six-sided plates are seen; the perfectly fused portion is glassy and devoid of crystalline structure. This test does not always succeed with the raw calculus, owing to the foreign substances which it contains. When heated beyond its melting-point this acid gives off white vapours, which have an aromatic odour; it finally catches fire and burns like resinous bodies in general.

Resino-bezoardic acid is insoluble in water and muriatic acid. It is thrown down from its alcoholic solution by water as a white precipitate, which under the microscope appears in the form of small prismatic crystals arranged in stellate groups. It is readily soluble in a solution of potass, soda, ammonia, and carbonate of ammonia, and is precipitated on the addition of an acid. The precipitate at first forms a dense white

coagulum, but shortly becomes pulverulent; when examined by the microscope it is not crystallized, but consists of minute transparent amorphous particles. It melts at 220° Fahrenheit, and is evidently the amorphous state of the acid.

When the potass solution is evaporated a transparent gummy mass is left, which is insoluble in solution of potass, but dissolves in pure water. When the potass solution is concentrated by boiling, the compound of the resin and alkali separates from the liquid and swims on its surface; when cold it forms a hard yellowish mass like resin, which dissolves in æther, alcohol and water. When the ammoniacal solution of this acid is evaporated, the resin separates unaltered. Nitric acid decomposes this acid; nitric oxide gas is evolved, and a beautiful red solution formed, which quickly becomes yellow.

Concentrated sulphuric acid dissolves the resino-bezoardic acid: the resin is precipitated unaltered on the addition of water in the amorphous state.

3.777 grs. of the crystallized acid, which had been rendered perfectly colourless by digestion with animal charcoal, when dried at 180° Fahr. in a current of dry air and burnt with chromate of lead, gave 3.64 water and 9.793 carbonic acid. This result agrees with the analyses of Messrs. Ettling and Will and Professor Wöhler, who found—

	Ettling and Will.		Wöhler.		T. Taylor.
Carbon	71.19	70.80	70.83	71.09	70.71
Hydrogen	10.85	10.78	10.60		10.71
Oxygen	17.96	18.42	18.57		18.58
	100.00	100.00*	100.00†		100.00

Messrs. Ettling and Will, who have analysed some of its salts, regard the formula of the crystallized acid as $C_{42}H_{74}O_7 + HO$, while Professor Wöhler represents it as $C_{40}H_{70}O_7 + HO$.

Resino-bezoardic concretions were first examined by Fourcroy and Vauquelin. Their account is very slight and imperfect, but is accompanied by a very accurate drawing of a fragment of one of them. Fourcroy states, without mentioning his authority, that they are taken from some unknown species of Asiatic or African animals, and believes them to be formed from the resinous juices of the plants on which these animals fed.

In the College Catalogue I have described them as being the true *Occidental Bezoar*. Subsequent consideration how-

* *Ann. der Chem. und Pharm.*, xxxix. 242.

† Pogendorff's *Ann. der Phys. und Chem.*, liv. 259.

ever inclines me to believe that the true Occidental Bezoar consisted of diphosphate of lime, and that these concretions, which Kæmpfer states were termed in Persia *Lapis Bezoar Occidentalis*, on account of their similarity to the concretions brought from South America, were so called from their exterior possessing the same smooth polished exterior as the diphosphate of lime concretions. The concretions described by Kæmpfer under the name of *Coagulum Resinosum Bezoarticum*, are evidently identical with resino-bezoardic acid calculi; for he says that the Swedish ambassador, on his departure from Ispahan, purchased some specimens, which, when thrown upon burning coals, melted and gave out an aromatic odour like that of colophony or olibanum. In the work of Clusius there is a figure of the occidental bezoar which is quite characteristic of this calculus, and Monardes asserts that they were taken from the wild goats of Persia. It is not however probable that any particular species of concretion was confined exclusively to the animals of one or the other hemisphere, since the resinous and bitter juices from which the concretions are formed exist in the plants of both divisions of the globe.

[To be continued.]

XXXVI. *On the Winter Storms of the United States.*
By Lieut.-Colonel SABINE.

To the Editors of the Philosophical Magazine and Journal.

GENTLEMEN,

YOUR meteorological readers, and especially those who take an interest in the law of storms, will, I am sure, be glad to have their attention drawn to a second memoir by Professor Loomis of New York, on the phænomena of the great storms which are experienced in the United States during the winter months. In this memoir (Art. IV. of vol. ix. of the Transactions of the American Philosophical Society) two storms are investigated, one of which occurred about the 3rd of February, 1842, and the other about the 15th of the same month of the same year. The method of investigation is the same which Professor Loomis adopted in his account of the great storm of December 20th, 1836, viz. the assemblage in one view of the atmospherical circumstances simultaneously observed over the whole extent of the United States, both during the continuance of the storm and for one or two preceding days. It is by this path that we may confidently hope to attain to a knowledge of the causes which produce these great atmospherical derangements; and, thanks to the spirit