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THE CHEMICAL HISTORY OF A CASE OF COMBINED ANTIMONIAL AND ARSENICAL POISONING.[1]

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THE coffin plate disclosed on opening the outer box of rough wood, bore the inscription, "Gustave H. M. J. Baum, died March 30th, 1892. Aged 26 years, 3 months, and 4 days." It was untarnished and affixed to a black cloth-covered casket. The condition, not only of the outer and that of the inner case, but also that of the lining of the latter and of the clothes about the body excluded the possibility of there having been any infiltration of liquid from the grave and rendered the examination of any soil from the cemetery superfluous.

The emaciated body of a medium sized man was identified by the physician who had attended him in life and verified his death and by the undertaker and his assistant who had prepared the body for burial.

Though three months had elapsed since the interment, it was possible on July 6th, 1892, to recognize the features, also an abrasion on the right shin. There was some mould about the face and body, the latter being disclosed when the clothing was removed. The features of the corpse bore a marked resemblance to a photograph of a man named Ludwig Brandt.

Both Baum and Brandt had been quondam acquaintances of a Dr. Henry Meyer. Insurance had been secured on the life of

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[1] Read at the May Meeting of the New York Section.

Baum in four companies, amounting in all to $8,500. Brandt had personated Baum in making application for these policies, had come to New York in company with Dr. Meyer, a woman posing sometimes as Mrs. Meyer, at other times as Mrs. Baum, and one Mueller.

After the death of Brandt the woman applied to the different insurance companies for the sums due, representing herself as his widow. Several of the companies paid in full, a total of $4,000.

Accompanied by Dr. Meyer she visited the offices of the Mutual Life Insurance Co., of New York. The interview aroused suspicions which were subsequently increased by the sudden disappearance from New York of the parties, their effects having been sold and no word being left of their destination.

At the instigation of Mr. Daniel Gillette, of the Mutual Life Insurance Company, detectives were sent in search of the parties with the view of unearthing any crime that might have been committed. Mr. H. G. Julian, acting in this capacity, had been able to secure a description of the supposed Baum, and found the body to agree not with him but with a photograph and description of Brandt.

Dr. L. W. Schultze, one of the coroners of the city, deemed this initial evidence of sufficient weight to order an autopsy and conducted it with his medical assistants. Dr. S. P. Minden, who identified the body, had attended the man for three weeks before his death, and gave a death certificate ascribing the demise to chronic dysentery. He had not noticed any unusual circumstances during this attendance. Had not Dr. Meyer borne an unenviable reputation, it is probable that no further notice would have been taken of the case; but because of his career extra caution was taken at the autopsy to determine, if possible, if the pathological condition agreed with the diagnosis of the physician.

The surface of the body was carefully scrutinized. There were no marks of hypodermic injections, however, nor any evidence of embalming by arterial or other injections. The undertaker declared that no attempt was made to embalm the body and that no embalming fluid was used upon it or injected into it. Three channels for the introduction of poison; *viz.*, imbibition from the soil, the use of embalming liquids, and the use of hypodermics were thus eliminated. Coroner's physician, Dr. O'Hare, and Prof. D. Hunter McAlpin, who at a subsequent time examined the viscera with Dr. O'Hare, could find no gross or microscropic pathological evidence of importance, so that full light as to the cause of death was not obtainable from the autopsy. At the autopsy Dr. S. P. Minden related the symptoms he noticed during his attendance on the patient. They did not develop any theory of death other than dysentery, but left the case still obscure. Later he kindly furnished copies of the prescriptions he had written. At the trial, testimony was given to show that some of these prescriptions had been filled but there was no evidence that the medicines had been administered. However, since remedies such as morphine, opium, copper arsenite, and bismuth subnitrate had been prescribed, it became necessary to consider them in any scheme of chemical analysis. The advisability of a chemical analysis was discussed and decided on as necessary to fully determine the cause of death. There was every probability that great skill had been used in the administration of any toxic agent or that some unusual poison had been employed.

Though due care was exercised at the autopsy to detect the odor of any volatile poison none was perceptible and there were no circumstances that in any way directed attention to that class of poisons. The analysis proper, therefore, was begun with the treatment of portions of the viscera for the alkaloids. For this purpose the stomach and its contents, one half of the intestine and its contents, and one-half of the liver, and some fluid which had exuded from it into the abdominal cavity at the time of the autopsy, were treated.

Freshly rectified alcohol was placed on each separate part, 500, 600, and 800 cc. being used respectively. The organs were comminuted and the alcohol acidulated with tartaric acid. The jars remained in an ice chest until a thorough maceration was effected. The alcohol and washings with alcohol was filtered from the tissue and the undissolved substances, which latter were utilized for the detection of inorganic poisons, as were also such other residues from the extraction as could be utilized for this purpose.

The necessity for doing this is not generally recognized. Some of the salts of the metallic poisons are quite soluble in the menstrua employed in extracting the alkaloids and pass into solution with the latter. Previous cases had shown this, one which the writer examined as associate expert, involving the detection of morphine in an embalmed body, very markedly.[1]

In this latter instance, it was of paramount importance that the arsenic extracted in large quantities from the viscera should be separated from the trace of morphine that might coexist, and a prolonged series of extractions was resorted to to eliminate the possibility of mistaking the reactions of the one for the other. This procedure was also necessary to anticipate what was subsequently brought forward by the defence, *viz.*, a point raised by Otto.[2]

The production of arsines and other metallo-organic compounds must also not be lost sight of, for both in testing for organic and inorganic poisons, these exceptionally interesting compounds have been and are likely to be important objects of toxicological research. The fact that evidence of metallic poisons is obtainable from the extractions practised to separate the alkaloids must always be borne in mind, no matter whether the Stas, Erdmann-Uslar or Dragendorff method is employed, or some modification of them, as also when dialysis is resorted to.

Such a course is especially necessary in cases where, in order to recover the very minute quantity of alkaloid that may still remain in a stomach or intestine, the whole of either organ and its contents is submitted to processes for its recovery. Failure to detect an alkaloid may with these precautions in some cases be followed by the finding of an inorganic poison.

It is doubtful whether the method prescribed in many foreign countries, and followed in the laboratory of toxicology in Paris,[3] of comminuting each organ and then mixing together weighed portions of each and of submitting the composite mass to analysis is altogether a wise or safe proceeding. Our own experience is much against it.

[1] People vs. Robt. W. Buchanan, 1600.

[2] Otto: Ausmittelung der Gifte, *1884*, 117.

[3] Documents du Laboratoire de Toxicologie, Paris, *1891*, 23.

The chances of detecting any alkaloid are greatly reduced and the same can be said of metallic poisons. The unequal distribution of poisons through the viscera, and the retention of poisons in certain organs in preference to others, are two of many reasons why a mixture of a fourth of several, say, stomach, intestine, liver, brain, and kidneys, is inadvisable. Nor can there be any hard and fast rule laid down to apply to all cases in the search of poisons. The judgment of the expert must determine in some measure the method to be pursued, and he will naturally have in mind the facts which have been ascertained heretofore, and which have led to the establishment of rules of procedure.[1] No matter what course is followed, it will sometimes happen that important data in regard to the distribution or absorption of the poison detected are unobtainable which could have been secured had the nature of the poison been manifested in the symptoms or indicated by the history of the case. Where, therefore, prominent symptoms are developed, or the autopsy reveals the character of the poison, even if only to so slight an extent as to indicate whether organic or inorganic, narcotic or corrosive, it may best subserve the ends of justice to examine the contents of the stomach apart from the tissue, the gall-bladder and its contents separately from the liver. The fluids of the intestinal tract and the compacted fæces near the rectum separately from each other and the tissue. Much will depend in adopting a course as elaborate as this upon the time that has elapsed since death. A long interment would obliterate to a great degree the clearness of the picture of the distribution of the poison in the body, which we might expect to have developed.

While recent analytical results have tended to show that poisons rapidly diffuse in the body, either when injected post-mortem or imbibed by application to the skin, or though taken in life have afterwards permeated the tissues and reached other organs, we take issue with the claim advanced by the defense in this trial, that toxicology is utterly unable to-day to decide whether a poison extracted from the body has or has not been administered before death.

Though weighable quantities of copper were obtained from the

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[1] Dragendorff Ermittelung von Giften. 4. *1884*.

liver and brain in the case now before us, only traces were found in other organs and in some none at all. Such facts are inexplicable on the basis of post-mortem diffusion. It is therefore of great moment to determine more closely not only the localization of a poison but how intimately it is combined with the tissue. A simple permeation may have taken place, or a definite union or fixation, and such union would often be indicative of vital processes. The employment of suitable solvents will thus lead us to a diagnosis between such true chemical compounds and mere loose impregnations. Tissues are found by the dyer to absorb only certain dyes though they may be transiently stained with others. When in contact with poisons, certain living tissues "dye in the wool."

The alcoholic extracts of stomach, intestines, and liver, were evaporated each by itself and each residue thus obtained treated with strong alcohol and filtered. The new alcoholic extracts now of small volume were again evaporated and their aqueous solutions while still acid treated successively with petroleum ether, benzene, and amyl alcohol. All of these liquids had been especially rectified. After the last amyl alcohol extraction was effected several fresh shakings with petroleum ether were resorted to to remove amyl alcohol from the watery liquid. The aqueous solution was then made alkaline by ammonium hydroxide, and the extractions with petroleum ether and benzene conducted as before. The solution was then acidified, hot amyl alcohol added and emulsified, then enough ammonium hydroxide added to render the solution alkaline. This procedure was repeated often enough to make sure of the extraction of any morphin. Six residues were thus obtained from each of the three viscera. It was a noticeable feature of this case compared to two other investigations made just previously that the residues were of less quantity than in either of the other cases, and that many were indeed so insignificant as to be incapable of purification. Residues I, II and IV were very slight or inappreciable.

Of course, residues VI, from the alkaline liquid extracted by amyl alcohol were submitted to the closest scrutiny. Not only had morphin been prescribed, but it was desirable to ascertain if the ptomaines present might either give or mask the morphin reactions. After suitable purification they were tested. The morphin reactions were not obtainable, some of the ptomain reactions were pronounced. Minute quantities of morphin solution added to portions of the residues could be detected by appropriate tests. The physiological test of morphin applied to a frog was not obtained. Neither morphin nor other poisonous alkaloid could be identified in any of the residues.

The inorganic poisons claimed attention next. Small quantities of copper arsenite had been prescribed; bismuth also as subnitrate. These metals might therefore be present.

The comminuted tissues, subsequently residues from parts treated for organic poisons, were disintegrated by hydrochloric acid and potassium chlorate. Fresenius and von Babo's method was applied to the stomach first and the results obtained showed the necessity of using the same process with the other organs. A copious precipitate formed the moment hydrogen sulphide was conducted into the faintly acid liquid which had been previously deprived of chlorine by bubbling carbon dioxide through it. The color of the precipitates thus obtained varied with the different organs, but was evidently metallic and not of organic nature. The precaution was taken in the analysis of each separate organ to subject the liquid after saturating it with hydrogen sulphide to warmth and long standing to effect a complete precipitation of the metals.

The precipitates were collected, redissolved in small quantities of hydrochloric acid and potassium chlorate and reprecipitated with previous precautions.

The purified sulphides were washed free of chlorides by dilute hydrogen sulphide water and a separation of the different metals attempted.

It will shorten the story considerably to state that mercury, lead, bismuth, and tin were not detectable in any organ. That zinc was tested for carefully in the filtrate from the hydrogen sulphide and not found.

That antimony and arsenic and in some organs these and copper were separated and identified.

Ammonium sulphide was found to dissolve the washed precipitate entirely or to leave only a small amount of copper sulphide. This solution was evaporated and oxidized by nitric acid. Then fused with sodium carbonate and sodium nitrate. When copper was present a dark mass separated. In other cases a white powder was suspended in a clear liquid and all became a white solid on cooling.

At this juncture one of the greatest obstacles was met.

Otto[1] would have us believe that the separation of antimony from arsenic by Meyer's method is as facile and as complete as the destruction of organic matter. He enters into a discussion concerning the methods of manipulation and gives a device for still further preventing dissolved antimony from producing a mirror in the Marsh test by conducting the gases evolved over caustic alkali, a very objectionable process as we shall see later, and comes to the conclusion that the method is reliable.

Notwithstanding all this, the history of this analysis shows first, that when very small quantities of antimony are present they would escape notice when the fused mass is dissolved in water and possesses an *alkaline* reaction as required ; secondly, that where much antimony is present it is advisable to resubject the insoluble residue to a second fusion to remove possible traces of arsenic.

The finding of antimony and arsenic in the first organ analyzed, naturally put us on our guard in the testing of others.

Where much antimony was found, there was of course an insoluble white residue, but the brain and muscle contained so little that only the most painstaking work enabled us to detect the antimony and separate it from the arsenic. Since some antimony remains in the Marsh apparatus, the whole not passing out as hydrogen antimonide undiscovered pyroantimoniate may go into solution when the fused mass is dissolved in water and either produce a mirror with arsenic or remain in the generator.[2]

The fact that all the antimony is not converted into gas in the Marsh process renders the use of Hofmann's silver nitrate method unserviceable for the quantitative separation and estimation of antimony and arsenic in toxicological analysis.

While all things considered Meyer's method seems the best

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[1] Otto, op. cit., 164.

[2] Dragendorff Ermittellung der Giften, Dritte Auflage, 406, *1888*

available, the experiences of this case justify us in cautioning against a too implicit reliance upon it.

The finding of antimony in the stomach was followed by detecting arsenic also. The other organs also revealed the presence of each.

In three viscera, copper was noticeable. The liver yielded 0.0056 gram, the brain and muscle, traces.

The entire quantity of copper extracted from the liver was converted by a small portion of the arsenic obtained from the same organ into copper arsenite and presented as an exhibit along with other portions of the arsenic, there being a great excess of the latter. The absence of copper from the stomach and intestines and its disproportion to the arsenic in the liver and the quantity of each poison found seemed sufficient proof to decide in the negative the question of the copper arsenite prescribed being the source of the arsenic found. Since the copper when found had passed together with antimony and arsenic into the ammonium sulphide solution, then to the fusion, it remained undissolved with the pyroantimoniate and had to be separated from the antimony. This operation followed the incineration of the filters and their contents of sodium pyroantimoniate, in either very small crucibles or porcelain dishes and the fusion of the residues with potassium cyanide. In the case of the intestine the filter was not very small since a considerable amount of sodium pyroantimoniate had been separated. The contents of the filter were removed to a capsule and the filter incinerated. A slight amount of char was left. A drop or two of nitric acid was put on this and heat applied to expel all acid. Whether this was not effectual or some trace of sodium nitrate remained undecomposed is uncertain, but sufficient was left to cause a sharp explosion when the fusion with potassium cyanide was quite well under way, projecting most of the unfused mass out of the dish. While the presence of antimony in large quantity in the intestinal tract was still clearly demonstrated from the residue left in the dish, a quantitative determination of the whole was out of the question. Otto alludes to the possibility of such an explosion in connection with Fresenius and von Babo's method of obtaining arsenic by reduction with potassium cyanide and sodium carbonate, and very naively says "Mir ist bei sorgfaeltigem Arbeiten nie Derartiges vorgekommen."

Although great care was exercised, the accident did happen in the above instance and though the filter ash of the antimonial precipitates from other viscera were in one or two cases similarly treated without the slightest trouble, we caution against the use of nitric acid or an insufficient washing of the pyroantimoniate.

Antimony was weighed either as metal in powder or on platinum, as sulphide or as tetroxide, Sb_2O_4.

Arsenic was weighed either as mirror obtained by the Marsh test or as sulphide. Two mirrors of arsenic were estimated baroscopically.

Organ.	Weight in grams.	Antimony weighed as grams.		Antimony calculated to grams.	Antimony calculated as tartar emetic.
Stomach and contents....	130	Sb	0.0307	0.03070	0.08404
Intestines and contents	898 47	Sb Sb_2S_3	0.0042 0.0072	0.00936	0.02562
Liver, spleen, and fluid from abdomen.	988 ?	Sb_2O_4	0.1442	0.11423	0.31314
Heart	224	Sb_2O_4	0.0028	0.00221	0.00605
Kidneys	315	......	.....	......	....
Brain.....................	820	Sb_2O_4	0.0003	0.000237	0.00065
Muscle	227	Sb_2O_4	0.0004	0.000317	0.00086
				0.157054	0.43036

equivalent to 6.64 grains.

Organ.	Weight in grams.	Arsenic weighed as grams.		Arsenic calculated to As.	Arsenic calculated to As_2O_3.
Stomach and contents....	130	As_2S_3	0.0063	0.00384	0.00507
Intestines and contents .	898 47	As_2S_3	0.1888	0.11512	0.15196
Liver, spleen, and fluid from abdomen .	988 ?	As_2S_3	0.1134	0.06914	0.09127
Heart	224	As	0.0003	0.00030	0.000396
Kidneys	315	As	0.0580	0.05800	0.07656
Brain.....................	820	As	0.0002 estimated.	0.00020	0.000264
Muscle	227	As	0.0001 estimated.	0.00010	0.000132
				0.24670	0.325652

equivalent to 5.02 grains.

It was deemed important to produce evidence before the jury to confirm the statement that both antimony and arsenic existed in the viscera of the body exhumed. To this end the antimonial and arsenical compounds isolated from the several viscera were brought into weighable form. After weighing, these compounds were submitted to special tests, the results of which in many instances were reserved as *corpora delicti.* These consisted in the case of

The Stomach of antimony as metal from the cyanide fusion; antimony on platinum and on tin; the oxide and the sulphide.

Bunsen tests, metal, sulphide, and reaction of oxide with silver nitrate and ammonia.

The arsenic was shown as a mirror obtained by Fresenius and von Babo's method. (No antimony could be detected in the fused mass of cyanide.) Arsenious sulphide and silver arsenate were also presented as exhibits.

The Intestine. Antimony was shown as metal on platinum and as sulphide; arsenic as Marsh test mirror and oxide; also the resulting mirror of a Marsh test using electyolysis; further, a Reinsch deposit on copper and a sublimate of arsenious oxide therefrom; silver arsenite, copper arsenite, arsenious sulphide, silver arsenate, magnesium ammonium arsenate and Bettendorff's test with stannous chloride.

The Liver, Spleen, and Fluid.—Antimony was shown by Marsh test, metal, silver antimonide and oxide; deposit from hydrogen antimonide on potassium hydroxide; antimonious sulphide, antimonic oxide, antimonious oxychloride, the metal on platinum and on tin; Bunsen's flame tests, metal and sulphide; Reinsch's test, metal and sublimate.

Arsenic, by Marsh test, elementary and oxide; deposit made from passing hydrogen arsenide over potassium hydroxide; silver and copper arsenates.

The Heart and Blood.—Antimony was shown as metal and sulphide; arsenic, as Marsh mirror.

The Brain.—Antimony was shown as sulphide; arsenic, as Marsh mirror.

The Muscle.—Antimony was shown as sulphide; arsenic, as Marsh mirror.

The Marsh test was conducted with the usual precautions and using zinc, slightly platinized, and sulphuric acids of varying strengths.

The apparatus was modeled after that proposed by Prof. R. Ogden Doremus, in 1859, and used in the trial of The People vs. James Stephens, since which date no other case of criminal poisoning by arsenic has been tried in New York City, until the one now under consideration. At a subsequent date, 1878, the same observer, made another change during an investigation of a case where attempt to poison by antimony was charged, *viz.*, The People of the State of New Jersey vs. Rev. Geo. B. Vosburgh. Dragendorff's statement of the decomposability of hydrogen antimonide by stick potassium hydroxide was then verified, but his other statement that hydrogen arsenide does not undergo change was then disproved. This observation has been corroborated by Johnson and Chittenden[1] and in this case.

Dragendorff,[2] in his fourth edition which has just come to hand, modifies his statement concerning the decomposability of hydrogen arsenide by stick potassium hydroxide and refers to work done by Kühn and Säger in this connection. The quotation in the footnote shows that they were anticipated in this matter by R. Ogden Doremus.

Repeated experiments with various kinds of stick sodium and potassium hydroxides have been made since 1878, and though the darkening by arsenic is not as pronounced as with antimony, there is abundant evidence of it. The stains fade more readily. To avoid the loss of arsenic therefore, it has been customary with us to use fragments of pure caustic lime as a drying agent. These at least show no outward sign of a decomposition of either hydrogen antimonide or arsenide.

A small Erlenmeyer flask, well cooled and having granulated zinc within, had acid and when purged of air acid and suspected liquid fed into it from a stop-cock funnel. The escaping gas was dried by a layer of quick-lime between cotton plugs, and then conducted through several inches of hard glass tubing coiled in a spiral, surrounded by a hood and heated by a strong Bunsen flame. The escaping gas was conducted into a solution of silver nitrate.

A complete decomposition of the hydrogen arsenide occurs, no mirror appearing on a second coil, which may be added for precaution. Some of the Marsh tests were conducted with the view of weighing the mirrors, which was done except with the brain

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[1] Dragendorff, *op. cit.*, 406; Otto, *op. cit.*, 198; Fresenius' System of Quantitative Chemical Analysis; Am. Ed. 1881, p. 782. "Otto and also Dragendorff recommend to pass the gas first over fragments of caustic potassa. We find, however, in accordance with Doremus, that arsenic is arrested by caustic alkali. S. W. J. and R. H. C."

[2] Dragendorff Ermittelung von Giften, vierte Auflage, 386 and 410.

and muscle, where they are so small as to render their retention as exhibits of greater importance than the ascertaining of their weight.

In other cases the Marsh test was used as a proof of the assertion that antimony and arsenic had been isolated. This last was particularly the case in the liver tissue, from which considerable quantities of each poison had been separated. A potassium hydroxide tube was therefore inserted instead of the quicklime, and well-defined black deposits obtained not only on the hydroxide but by the heated coil with antimony and arsenic, the antimonial deposit formed by the action of heat being on the side towards the generator, that of the arsenic beyond the heated spiral.

The arsenical deposit on the hydroxide is therefore of special interest.

Wormley[1] and others lay stress on the fact that the arsenical mirror forms beyond the heated portion of glass.

While conducting a Marsh test by the electrolytic evolution of hydrogen a gradual weakening of the current caused a gradually diminishing flow of gas.

A mirror of the character of those of arsenic formed on each side of the heated spiral. That these were both arsenical was proved by their being soluble in sodium hypochlorite solution, as well as from the extreme care taken to separate antimony from arsenic before employing the latter in the Marsh test.

Antimonious oxide occurs not only as valentinite but as prisms in exetele and as octahedra in senarmontite. The latter resembles ordinary arsenious oxide, a beautiful example of isodimorphism.

Just beyond the hotest part of a spiral employed in making a Marsh test for antimony we observed a crystalline deposit. The crystals were transparent octahedra, did not sublime when the tube was heated, and became red when acted on by hydrochloric acid and then ammonium sulphide. We have therefore apparently an instance of antimonious oxide depositing in the usual octahedral form of arsenious oxide.

Where admissable on account of quantity of arsenic or antimony at our disposal, the gases generated in the Marsh test were

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[1] Micro-chemistry of poisons, 229, *1885*.

conducted through a silver nitrate solution before heating the spirals.

Though a darkening of the liquid was obtained in each instance, no arsenical reaction could be obtained from the liquid where the suspected antimonial solution was being added to the generator, nor antimony from the black deposit, where a supposably arsenical solution was under test. Antimony and arsenic revealed themselves however in the deposits in the former and in the liquid in the latter, a further evidence that a thorough separation of the two poisons had been effected in the analysis.

The statement is made that selenium hydride yields a black stain to glass at the heated portion, the stain remaining black as long as the glass is hot, but becoming invisible or white in character when the glass cools. We have verified this by experiments made with sulphuric acid containing selenium, a kind of acid not difficult to secure nowadays. Indeed, much sulphuric acid sold as chemically pure should be rejected for toxicological work solely on this ground. This dark stain on the glass is quite distinct from the one alluded to by Wormley[1] as due to arsenic in the glass or to the reddish-brown deposit given by selenium hydride when this gas is tested by the Marsh-Berzelius method. In connection with special tests, we desire to draw attention to the great delicacy of the flame tests when conducted by the methods suggested by Bunsen. We have had occasion to use them in a number of toxicological cases with marked success. In the Vosburgh case many of the exhibits shown were obtained with very small quantities of antimony by these means. Specimens of both antimonial and arsenical reactions were obtained in this investigation and formed part of the exhibit. As a rapid method of bedside testing, these reactions are most excellent. A small sliver of mica is a good substitute for asbestos fiber, and the suspected material can be readily introduced into a small reduction flame of either a Bunsen burner or alcohol lamp, while the oxide tests may be secured with the aid of a candle flame. A bit of china is a good substitute for a capsule, and may be used to catch the deposits by either crushing down the flame or holding it a little distance above it. The deposits may then be tested with suitable reagents.

[1] Wormley, *op. cit.*, 319 and 290.

As an adjunct to the Marsh test for arsenic, when a good-sized mirror had been obtained from a portion of the arsenic, extracted from the intestine, the hydrogen apparatus was removed and dry oxygen obtained by electrolysis was slowly passed in the reverse direction to the hydrogen current. The mirror was then gently heated at the side nearest the coil and the current of oxygen drifted the arsenious oxide formed through the first cold portion beyond where beautiful octahaedral crystals were formed.

Although the work thus outlined had been conducted with the assistance of Prof. John A. Mandel, who is jointly entitled to any credit belonging thereto, yet to anticipate certain legal quibbles, the District Attorney, Mr. De Lancey Nicoll deemed it expedient to submit a portion of the viscera for analysis to some one entirely unfamiliar with the history of the case. Prof. R. H. Chittenden was therefore requested to make an independent analysis of the kidneys, which resulted in his finding both antimony and arsenic. The former was in unweighable quantities. The arsenical mirrors obtained from the 315 grams of the kidneys weighed 0.0058 grams.[1] Prof. Chittenden then came to New York and together we analyzed the heart, finding antimony and arsenic as previously stated. The results of his analyses of the kidneys made a separate exhibit which he presented before the jury in his direct examination as a witness.

The defense did not dispute the finding of arsenic and antimony but attempted to show the impossibility of determining whether these poisons had not been introduced by some means after death. The medical history of the case, the condition of the body at the autopsy, the results of the pathological examination, and finally those of the chemical analysis were deemed sufficiently conclusive to the minds of the experts for the prosecution, to make special tests to elucidate this claim uncalled for. No testimony was produced by the defense to show that anyone had so introduced the poisons or had a motive to do so.

During the summing up by the defense, one of the jurors suddenly became insane. It was a recurrence of mental aberration

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[1] The entire record of the case will be published under the direction of Assistant District Attorney John E. McIntyre.

which was totally unexpected. He had denied ever having had any mental disease when catechised previous to his acceptance as a juror. A second trial was therefore necessary. It resulted in a verdict of imprisonment for life.

The wife of the prisoner was held in custody for many months, but was finally released on her own recognizance. She had presented herself at the insurance offices dressed in appropriate mourning and claiming to be the widow of "Baum." Several of the companies made payments which she accepted.

It is a noteworthy circumstance that the history of antimonial poisoning is so frequently connected with the destruction of lives heavily insured. Taylor,[1] in a monograph, gives some remarkable cases. In some of these a second poison was administered. Though there have been cases where arsenic has been found along with antimony its presence has been due to the impure nature of the antimony. We have not been able to find the record of any case of chronic antimonial poisoning followed by the use of arsenic as a toxic agent.

BELLEVUE HOSPITAL MEDICAL COLLEGE,
May 10, 1895.

[CONTRIBUTIONS FROM THE JOHN HARRISON LABORATORY OF CHEMISTRY, NO. 4.]

ACTION OF HYDROCHLORIC ACID GAS UPON SALTS OF THE ELEMENTS OF GROUP V OF THE PERIODIC SYSTEM.

BY EDGAR F. SMITH AND JOS. G. HIBBS.

Received May 3, 1895.

IN a former number of this Journal (*Vol. XI, 578*) we took occasion to call attention to the rather interesting behavior of sodium vanadate, when gently heated in an atmosphere of hydrochloric acid gas. The results obtained by us proved that vanadic acid is entirely expelled from its salt by this means. This behavior naturally suggested a line of investigation, which we hoped to begin at once, but it was not until very recently that we were able to resume the study. The idea as to whether the salts of the acids of other elements of Group V of the Periodic System were similarly transposed by hydrochloric acid gas, or by the gaseous haloid acids in general, constantly obtruded itself.

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[1] On Poisoning by Tartarized Antimony. A. S. Taylor, M.D., F.R.S., Guy's Hospital Reports, Third Series, **3**, 369, *1857*.