SILVER SULPHATE.

By PHILIP BRAHAM, F.C.S.

THE silver sulphate was shown as brilliant transparent crystals of high refractive power. They were produced by pouring on a plate of pure silver strong sulphuric acid and adding a few drops of strong nitric acid. At first there was a slight action, bubbles of gas being liberated. In a day or two the whole of the sulphuric acid acquired a deep purple tint, probably due to the formation of some oxide of nitrogen. After a lapse of two to three weeks the purple tint sinks toward the silver and a slight brown tint can be seen on the surface. The layer above the silver being colorless, about this period long crystals form, which redissolve, and the liquid becomes colorless. In the course of a few days brilliant specks are seen, which develop into perfect crystals of a regular octahedral shape. The crystals shown had taken over six months in growing.

ARTIFICIAL INFLATION OF THE LUNGS.

DR. GADBURY, of Yazoo City, Miss., employs a very simple and inexpensive apparatus for artificial inflation of the lungs—a method of treatment which, however valuable, has been greatly restricted in practice on account of the bulk and expensiveness of Waldenburg's apparatus. It consists merely of a Richardson hand-ball and bulb atomizer, in which a mouth-piece has been inserted in place of the spray tubes. The method of its employment is as follows: the patient, having dilated his lungs to the fullest extent, immediately places the tube of the compressor between his lips, closes the nasal passages with one hand, and works the compressor rapidly with the other hand. A few squeezes pump an intermittent current of compressed air into the lungs; as soon as the distention becomes unpleasant, or the need of an expiratory movement is felt, the instrument is withdrawn, to be replaced and re-employed in the same manner a few moments subsequently, the operation being repeated four or five times in succession. In a healthy subject the operation is painless and may be prolonged for a minute or more, but to a person with diseased lungs it is at first disagreeable though not painful. The patient can at first force in but little air, but practice soon enables him to pump it in more freely and for a longer period each day. After frequent use it affords great comfort to those who suffer from a feeling of suffocation and have diminished capacity of the lungs. Dr. Gadbury gives brief histories of a number of cases in which the apparatus was employed with great benefit. He claims that the fresh air thus forced into the lungs expands unused capillary tubes and air-cells, displaces the residual air and noxious gases, excites cough and expectoration, removing morbid secretions at once, and obviating the necessity for expectorant medicines, oxygenates the blood, promotes absorption, relieves dyspnœa, gives impetus to the pulmonary circulation, reduces temperature in fever, and desiccates the fluids in the air passages. He expects beneficial effects from inflation by this method in croup, diphtheria, bronchitis, asthma, tuberculosis, whooping cough, asphyxia, chloroform poisoning, foreign bodies in the air passages, and many other obstructive lesions of the pulmonary organs. Vapors and gases may also be introduced into these organs by means of this method.

Dr. J. Solis Cohen writes that he has given this plan a trial during the past year. He has found that it cannot be employed safely in all cases in which Waldenburg's apparatus can be employed with advantage, but that it has a sufficiently wide range of utility. In patients liable to hæmoptysis or other hemorrhages, and in certain cardiac and visceral disorders, the intra-thoracic compression, if left to the patient, is apt to be too powerfully exercised, and thus to be absolutely detrimental. He believes that it is seldom safe to use compressed air with a pressure exceeding from one-sixtieth to one-thirtieth of an atmosphere. and quite delicate handling of the ball-compressor is requisite to keep within this limit, while the size of the compressor prevents access of air in large volume, or at constant pressure. He has found the Gadbury particularly useful as a mechanical expectorant.—*St. Louis Courier of Medicine.*

NEW STUDIES INTO THE NATURE OF DIPHTHERIA.

UNDER the direction of the National Board of Health certain experiments have been recently performed by Drs. H. C. Wood and H. F. Formad with the object of discovering the nature of the diphtheritic poison. These experiments were made for the most part upon rabbits, and were intended primarily to discover whether diphtheria could be induced in those or other lower animals. This particular point was quite well settled in the negative some time ago by Curtis and Satterthwaite, whose investigations were far more extended than those which are now presented. Drs. Wood and Formad have, however, given some valuable corroborative evidence, and have added other facts which are very suggestive and which really bring us somewhat nearer a true knowledge of the pathology of diphtheria.

The first series of experiments was made by inoculating bits of fresh diphtheritic membrane in the mouth and thigh of thirty-two animals, eighteen being rabbits, the remainder cats, dogs, and a goat. Six of these animals, all being rabbits, died within about two weeks or less from the time of inoculation. *Post-mortem* examination discovered evidences of tuberculosis in every instance. In only one case was there any tracheal false membrane, and in this the deposit may have been due simply to a catarrhal inflammation. Micrococci were found in the blood. In no case did inoculation by the mouth cause any local or general symptoms, a fact which corresponds with the observation of Curtis and Satterthwaite, that inoculations in the cornea were entirely ineffective. The inoculations in the thigh seemed to result in the development of small, cheesy lumps. These either became absorbed, or they infected the system and caused death by tuberculosis. The rabbits, then, it is concluded, may either die very soon after inoculation of diphtheritic membrane, by absorption of a non-specific septic poison, or they may die a week or two later from a tuberculosis due to absorption of cheesy products. Most of the animals experimented on by Curtis and Satterthwaite died from the former cause, perhaps because they used larger pieces of membrane and inoculated more deeply.

It was shown by subsequent experiments that the tuberculosis was not due to anything specific in the membrane, for that disease followed the inoculation of bits of wood, glass, and wire.

So far not much more had been discovered than was already known.

The next series of experiments was made to determine the accuracy of Trendelenburg's assertion that the introduction of pseudo-membrane into the trachea produces diphtheria. Dried diphtheritic membrane was introduced into the trachea of four rabbits. One of these died in five days. The *post-mortem* showed a delicate pseudo-membrane in the trachea. It was 1 mm. thick in some parts, was infested with micrococci, and showed the usual structure of natural and traumatic pseudo-membrane. The internal organs were tuberculous, but there were no bacteria in the blood. The experiments, as far as they went, confirm the statements of Trendelenburg, but they indicate very little.

A study was then made of the effects of ammonia in producing pseudo-membranous trachitis. This substance was injected into the trachea of four rabbits, a cat, and a dog. All the animals except the dog died. death generally coming on in two or three days. False membrane was observed in the trachea of all six animals, and tubercles were also uniformly present in the internal organs. Furthermore, contrary to the statements of Oertel, bacteria and micrococci were in every instance found in the traumatic false membranes. The experiments seemed to show that diphtheritic membrane placed in the trachea will produce a fatal pseudo-membranous trachitis, although the same membrane inoculated in the thigh will not cause death, except indirectly, by exciting caseous foci and a resulting tuberculosis. This point, as stated by the experimenters, needs a further study.

A fifth set of experiments showed that other foreign bodies, such as slough, inflammatory products, and pus, will also produce a pseudo-membranous trachitis. So that the conclusion is almost certain that such trachitis is not a specific process, but is only an intense inflammation such as any highly irritant body may excite.

As a general conclusion, then, it is stated that the contagious material of diphtheria is really of the nature of a septic poison which is also locally very irritant to the mucous membranes; so that when brought in contact with the fauces and nose it produces an intense croupous inflammation simply by its local action and without any absorption. But further, though it may sometimes thus act locally and directly, it may also bring on the angina by being first absorbed, then acting locally by being carried in the blood to the mucous membrane of the throat. Under this theory, again, it is possible that the poison may cause a purely local angina, no absorption occurring; or, on the other hand, a simple local non-specific trachitis may end in adynamic diphtheria in consequence of absorption of septic material.

In regard to the relation of bacteria to the disease, it is stated that it seems altogether improbable that they have any connection with it whatever. There is, however, the possibility that the bacteria may act upon the exudations of the trachea as the yeast plant acts upon sugar, and cause the production of a septic poison which differs from that of ordinary putrefaction, and bears such relations to the system as, when absorbed, to cause the systemic symptoms of diphtheria.

These views in regard to the nature of the diphtheria poison have a good deal of the hypothetical about them, and are, indeed, only put forward tentatively by their authors. The experiments of Dr. Wood and Dr. Formad are very instructive, but perhaps in no direction more than in showing where further investigation is needed. It is to be hoped that the National Board of Health, whose bulletins have heretofore been somewhat meager in scientific matter, will see that the present work is continued.—*Medical Record.*

BAD ODOR FROM THE FEET.

GEORGE THIN, M.D., in an article on the above subject, published in the *British Medical Journal*, says:

Profuse sweating of the palms and soles is not uncommon, but, in order to produce the specific odor to which I refer, something more than mere profuse sweating is required. The excessive perspiration, when confined by stockings and boots, macerates the epidermis, and, if the person stand or walk much, the skin of the heels becomes tender. This tenderness is accompanied by redness, slight blistering, or, more decided, localized eczema. In damp, relaxing weather, perspiration is increased; and we have thus two causes of aggravation, each potent, but, both together, very powerful —moist warm weather and prolonged pressure by walking or standing.

It has been pointed out by Hebra that the evil smell is not in the sweat itself, but in the coverings of the feet, a fact which it is easy to verify.

The patient who has afforded me the opportunity of investigating the cause of the smell is a young woman, aged twenty-two, who has suffered from evil-smelling feet, with soreness of the heels, for several years. Her hands are usually moist, or even wet, but are always odorless. The smell from the feet is not constant, disappearing in dry, bracing weather, and reappearing when the weather is moist and depressing.

The experiment I made was to subject the soles of the stockings and boots to the action of an antiseptic solution. The success was complete, the odor being entirely banished. The antiseptic precautions having been soon neglected, the smell returned, and I took the opportunity of investigating its cause more minutely.

The sole of the stocking, a few hours after it was put on, was found to be quite wet; and a stocking, if worn for a whole day, was so extremely offensive that, when held close to the nostrils, its overpowering fetor was comparable to that of putrid blood. The inside of the boot was equally wet and offensive; but at the very time that the stocking and boot smelt so strongly, the heel itself, exuding moisture profusely, had no disagreeble odor. The sole of the heel was reddened and tender, and macerated around the edge, like a washerwoman's palm.

The reaction of the moisture in the stocking and in the sole of the boot was alkaline, that of the moisture exuding from the skin of the sole of the heel faintly alkaline, while that of the perspiration of other parts of the body was acid.

The fluid from the sole of the heel was thus shown to be not pure sweat, the faintly alkaline reaction being doubtless due to the serous discharge accompanying the eczema set up by the local hyperidrosis.

The fluid in the sole of the stocking was found to be teeming with bacteria forms, the nature and development of which I have carefully investigated. These investigations have produced results of some scientific interest, which I have communicated to the Royal Society. The rapid development of bacteria in the fluid which exudes from the soles is doubtless favored by the alkaline reaction produced by the mixture of serous exudation with the sweat.

The treatment instituted in this case is as simple as it has been effective. The stockings are changed twice daily, and the stocking-feet are placed some hours in a jar containing a saturated solution of boracic acid. They are then dried, and are fit for wear again if it be desired. The boracic acid effectually destroys the smell. But to kill the bacteria in the stocking is not enough. The leather in the bottom of the boot is wet and sodden, and smells as vilely as the stocking. This difficulty is got over by the use of cork soles. I directed my patient to get half a dozen, which she finds sufficient. A pair must only be worn one day unchanged; at night they are placed in the boracic jar, and are put aside the next day to dry. If these directions be accurately carried out the evil smell is perfectly destroyed.

The boracic acid solution is an excellent application to the painful skin in these cases. When the tender skin of the soles is washed with it, a sensation of coolness succeeds the feeling of heat and tension, which are the usual accompaniments of the eczematous condition associated with the smell, and the skin becomes harder and loses its abnormal redness.

The bacteric fluid would seem to act as a direct irritant to the skin. My patient assures me that, if she wears stockings which have been dried without being disinfected, irritation is speedily felt; and that the cork soles, if worn a second day without having been purified, act in a similar way.

ON THE MICROSCOPIC CRYSTALS CONTAINED IN PLANTS.

By W. K. HIGLEY.

IT has been the custom to call all crystals that occur in plants, whether in the cell contents, the cell-wall, or even the non-microscopic crystals that are found in the outer portions of plants, by the common name "raphides," no matter what the form may be. And while giving this general name to their form, a much more general chemical composition was given, viz.: oxalate of lime; and for a long time they were all supposed to have had this composition, and even up to the present day many writers have considered them thus. The decision of some seems to have been based on the analysis of the inorganic matter of one crystal-bearing plant, which proved to have the above composition, and in drawing their conclusions they considered that all crystals of apparently the same crystalline form, were of the same composition. But it is difficult to tell, at all times, the exact crystalline form, as different forms sometimes resemble each other very much. And as the form may vary, so may the chemical composition. Crystals of some form seem to be nearly or quite universal; on close examination they may be found in some part or parts of the majority of plants. In some plants they are only found in a certain position and of one form, while in others they may occupy several localities of the plant, and have as many forms. But the position and form often vary so much that it has been recommended by some authorities that they be made a family, and in some cases a generic distinction in the study of systematic botany.

Prof. Geo. Gulliver, while making dissections under the microscope for the purpose of comparing the relations between the structure of plants and animals, made note of every case, in the examination of plants where raphides or other crystals occurred, and he says: "It was not before a large accumulation of my notes had been examined that crystals were thought of in this point of view; for they had not even been particularly looked after, and were merely noted whenever seen, long before their significance as characters were suspected. But when every one of these notes on raphides had been picked out, it was very unexpectedly discovered that the plants in which they occurred would sometimes come under certain orderly arrangements. Thus not a single species belonging to the order Onagraceæ or Galiaceæ was without a note of raphides, while in no single instance were these acicular crystals noted in the next allied orders." A converse example is then given. He then proves by more extended experiments that raphis-bearing is essential throughout the lives of certain species. By this and other experiments that I might mention. it is shown that the form and position of microscopical crystals in plants may be used as a distinctive character between orders especially, and perhaps, to a certain extent, between genera and species (?). Plant crystals as a character would only be of benefit to the botanist who had at hand a microscope that magnified at least a hundred and twenty-five diameters. Hence the objection to making them a means of identifying plants in our works on systematic botany.

As to the history of crystals, Lindley states that they were first seen by Rafn, who found them in the milky juice of some species of the family Euphorbiaceæ, and that they were afterward seen by Jurine in the leaves of *Leucoium vernum* and elsewhere.

Edwin Lankester, M.D., writing on raphides, credits Malpighi with the discovery of crystals in plants, who found them in a species of Opuntia, and he says, further, that they were afterward described by Rafn as occurring in the milky juice (latex) of some plants belonging to the family Euphorbiaceæ, and that Jurine soon after found them in the leaves of *Leucoium vernum* as stated by Lindley.

Raspail seems to have been the first person who studied crystals with their chemistry in view, at least he was probably the first to demonstrate that some of the crystals were composed of calcic oxalate.

John Quekett, in a paper written in or about the year 1852, also gives the credit of the discovery to Malpighi, and says that they were subsequently described by Jurine and Raspail, as stated above.

Prof. Gulliver says that the raphides so early mentioned by Rafn in the Euphorbiaceæ were only the starch-rods which he (Gulliver) described as having found in the latex of the British Spurges.

Crystals should be divided into (at least) three classes, and these seem to cover all the ground that was formerly covered by the name "Raphides." They are as follows:

1. Raphides.
2. Sphæraphides.
3. Crystal prisms.

1. *Raphides.*—The term raphid is from the Greek *raphis*, a needle, and was formerly applied by De Candolle to crystals resembling a needle in form.

Professor Gulliver gives the following definition of the term:

"These are slender needle like crystals with rounded, smooth shafts, vanishing at each end to a point, from about ten to fifty or more lying parallel together so as to form a bundle, which partially fills a cell or intercellular space."

I have never been able to find over thirty in one cell, and generally from five to twenty-five. The cells which contain them are generally elongate, or quite oval. To obtain these crystals in a bundle and still have a thin section fit for microscopical work, a steady hand and great care are required, as they are easily disturbed, when they will be seen scattered in every direction. Often on slight pressure they