As a matter of fact, they are often indicated, and it is seldom improper to resort to them.

The preparations of manganese have come into use of late years, having been recommended by Dr. Ringer and Dr. Murrell, of London (*Lancet*, January 6, 1883). One-grain pills of potassium permanganate may be administered, beginning with one pill three times a day, and increasing to two four times a day. The use of the drug should be begun three or four days before the time at which a menstruation should take place, and be continued, if the flow does not come on, until the time for the next period. It should be kept up also during the flow. Both sodium manganate and manganese binoxide are said to be equally effective, and it is stated that manganese acts as well with the plethoric as with the anæmic. Manganese has been tried extensively in this country, but the results have not, on the whole, justified the expectations with which its employment was begun.

There are several other drugs that have more or less repute in the treatment of amenorrhœa. Among them is apiol, which is said to act best in cases in which whatever flow there may be is ill-smelling. From eight to ten minims should be given daily during the week preceding the day for menstruation to begin, and fifteen minims on the morning of that day. Cimicifuga has been thought serviceable in cases of delayed or arrested menstruation. Senecio vulgaris has recently been recommended in cases unaccompanied by pelvic lesions. In the ovarian variety of amenorrhœa, "ovarine," a preparation made from the expressed juice of the fresh ovaries of healthy young animals, has been used with success. Aloes undoubtedly aids the action of the other so-called emmenagogues, and should be employed if there is constipation.

Electricity probably acts more directly as a provocative of menstruation than any other agent. Good effects may be produced by either the galvanic or the induced current, but the choice should not be a matter of mere caprice or convenience. Galvanism is more to be relied on for increasing the blood supply of the uterus, while faradization is useful to intensify and precipitate the hemorrhagic effort. To accomplish the latter purpose, the application ought to be made at a time when the degenerative changes in the endometrium have advanced to such a degree that heightened blood pressure, aided by muscular action, may operate at the greatest advantage in producing rupture of the capillaries. This condition can be judged to be present only when there are some symptoms of ovulation, or when the amenorrhœa is of such recent date that the time for a menstrual flow to fall due is accurately known. In the use of galvanism, it will generally be prudent to place both electrodes on the external surface, unless the current is quite weak and the sitting a short one; aiming, however, to pass the current directly through the uterus. When the faradic current is employed, on the other hand, one electrode should be applied within the vagina, or even within the canal of the cervix.

Milder measures than the use of electricity will often succeed, especially where there is not complete absence of the flow, but scantiness and lack of color of the discharge. Among these measures, refrigeration of that portion of the spinal region corresponding to the motor centre of the uterus is of great value. The skin over the junction of the dorsal with the lumbar vertebræ may be sprayed with ether, but not frozen, three or four times a day, for five or ten minutes at a time, or ice-water compresses may be applied. These means are supposed to exert their effect by depressing the activity of the vasomotor nerves. They are to be used only at the time when a menstrual flow is due. In the interim, an auxiliary measure of some value consists in the use of a very brief cold hip bath every night. *Frank P. Foster.*

AMERICAN CARLSBAD SPRINGS.—Washington County, Illinois.

Post-Office.—Nashville. Hotel Carlsbad.

These springs are located in Nashville, a well-built little city of three thousand inhabitants, fifty miles from St. Louis, Mo. Both the Louisville and Nashville and the Chester and Centralia railroads pass this point. The Carlsbad is a modern hotel with all the approved comforts and conveniences. It was erected in 1893, and is located within the city limits, in a natural park of twenty-three acres, with a lake for boating and fishing. It is well furnished throughout, heated with steam and lighted by electricity. The bath house has separate arrangements for ladies and gentlemen, with porcelain bathtubs and conveniences for steam, vapor, and shower baths. The environs of Nashville are very attractive, abounding in delightful drives, picturesque walks, etc.

The following analysis of the water was made by Dr. Ludeking, of St. Louis:

One United States Gallon Contains:

Solids.	Grains.
Sodium chloride	10.00
Calcium sulphate	65.80
Sodium sulphate	53.00
Magnesium sulphate	103.70
Sodium carbonate	27.40
Total	259.90

The water is evidently of the sulphated saline variety. An analysis by W. F. Hillebrand, acting chemist of the Interior Department at Washington, shows the sulphate of soda to be greatly in excess of the magnesium sulphate. According to Hillebrand's analysis, these waters are very similar to those of the Sprudel Mühlbrunn and Schlossbrunn Springs at Carlsbad. They possess potent cathartic and diuretic properties and are undoubtedly valuable for medicinal purposes. They have been found beneficial in most of the conditions for which Americans cross the ocean to visit Carlsbad, viz., chronic constipation, torpid states of the liver, rheumatism, renal and urinary disorders, and eczematous skin affections. *J. K. Crook.*

AMERICANUS MINERAL WELL.—(Formerly Michigan Congress Well.) Ingraham County, Michigan.

Post-Office.—Lansing.

Access.—By numerous railroads to the city of Lansing.

Under the name of Michigan Congress Water the product of this well has been in use for many years past. The following analysis was made, we believe, by Dr. Jennings, of Detroit:

One United States Gallon Contains:

Solids.	Grains.
Sodium phosphate	25.04
Sodium chloride	183.84
Sodium bicarbonate	93.40
Magnesium bicarbonate	67.13
Iron bicarbonate	3.06
Lithium carbonate	0.08
Calcium carbonate	85.90
Potassium sulphate	12.45
Silica	33.00
Alumina	Traces.
Sodium iodide	Traces.
Calcium phosphate	Traces.
Total	503.90
Carbonic acid, 190.29 (grains?).	

This water bears considerable resemblance to that of some of the Saratoga Springs. It retains a uniform temperature of 53° F. the year round. The water is highly recommended in cases of acid dyspepsia, the headaches following alcoholic excesses, etc. It has also been used with good results in lumbago, gout, and various urinary and renal disorders. The water is used commercially. *J. K. Crook.*

AMMONIA AND AMMONIUM SALTS.—1. General Medicinal Properties of Ammonium Compounds.—Ammonium compounds, as a class, are irritant, locally, to a degree greater than that shown by the corresponding compounds of sodium, but less than in the case of compounds of potassium. They tend to be of high diffusion power, and are therefore, when swallowed, quickly absorbed, and hence are free from the purgative tendency of the low diffusion salts of potassium, sodium, and magnesium. Constitutionally they tend to increase the force and frequency of the heart's action and to determine a rise of arterial tension; to excite the respiratory centre in the medulla oblongata, causing fuller and more frequent respirations, and to enhance reflex irritability of the motor tract of the spinal cord—an enhancement leading in poisonous dosage in animals to tetanoid convulsions. General nutrition is not seriously affected by therapeutic doses. In long-continued excessive dosage the heart becomes enfeebled and the quality of the blood deteriorates, with marked impairment of the power of the hæmoglobin to fix oxygen. An important difference between the alkaline ammonium compounds and the corresponding potassium, sodium, and lithium preparations is, that whereas the latter carry their alkalinity through the system generally and into the urine, no such effect follows the ingestion of the ammonium compounds. On the contrary, the acidity of the urine tends rather to be enhanced under ammonic medication. The explanation of this peculiarity among ammonium compounds is an assumed oxidation of the elements of the ammonium radicle, leading to the formation of nitric acid as one of the products. By virtue of the properties described, ammonium compounds furnish important medicines for restoring or sustaining flagging heart or lung action; for relieving dyspnœa, and for opposing the action of motor-paralyzing poisons.

2. The Ammonium Compounds Used in Medicine.—These are ammonia, and the following ammonium salts: acid carbonate, acetate, chloride, bromide, iodide, benzoate, and valerianate. In the present article will be discussed the first three only; for the others see respectively *Chlorides*, *Bromides*, *Iodides*, *Benzoic Acid*, *Valerianic Acid*. The nitrate is also official, but for pharmaceutical purposes only.

Ammonia, NH_3.—Ammonia is used in medicine only in aqueous or alcoholic solution, as afforded by the following official preparations of the U. S. P.: *Aqua Ammoniæ Fortior*, Stronger Ammonia Water. This is an aqueous solution of ammonia, containing twenty-eight per cent., by weight, of the gas. It presents itself as a "colorless, transparent liquid, having an excessively pungent odor, a very acrid and alkaline taste, and a strongly alkaline reaction. Specific gravity, 0.901 at 15° C. (59° F.)" (U. S. P.). It is completely volatilized by the heat of a water bath. On bringing a glass rod, dipped into hydrochloric acid, near the liquid, dense, white fumes are evolved. From the volatility of its contained ammonia this preparation is directed to be kept in "strong glass-stoppered bottles, not completely filled, in a cool place." *Aqua Ammoniæ*, Ammonia Water: "An aqueous solution of ammonia, containing ten per cent., by weight, of the gas." This weaker solution has the properties of the stronger, only not to so intense a degree. Its specific gravity is 0.960, at 15° C. (59° F.). It also should be kept cool, in glass-stoppered bottles, but the precaution to avoid filling the bottles completely is not here necessary. *Spiritus Ammoniæ*, Spirit of Ammonia: "An alcoholic solution of ammonia, containing ten per cent., by weight, of the gas." This solution is prepared by subjecting stronger water of ammonia, in a still, to a gentle heat, and conducting the ammonia gas thereby volatilized to a receiver containing freshly distilled alcohol. The product is assayed and brought to standard strength by the addition of alcohol. Spirit of ammonia is a "colorless liquid, having a strong odor of ammonia, and a specific gravity of about 0.810 at 15° C. (59° F.)" (U. S. P.). It should be kept in glass-stoppered bottles, in a cool place. *Spiritus Ammoniæ Aromaticus*, Aromatic Spirit of Ammonia: This is a composite preparation, containing, in 1,000 c.c., ammonium carbonate, 34 gm.; ammonia water, 90 c.c.; oil of lemon, 10 c.c.; oil of lavender flowers and oil of nutmeg, each, 1 c.c.; alcohol, 700 c.c.; and the rest distilled water. It is a "nearly colorless liquid when freshly prepared, but gradually acquiring a somewhat darker tint. It has a pungent ammoniacal odor and taste. Specific gravity, about 0.905 at 15° C. (59° F.)" (U. S. P.). This spirit, like the other ammonia solutions, should be kept glass-stoppered, in a cool place. But in spite of this precaution, the fact obtains generally with ammoniacal solutions that they lose strength upon keeping, so that a sample a year or more old may be almost wholly without ammoniacal odor. Ammoniacal solutions are incompatible with acids, acidulous salts, and many salts of the metals and earths; ammonia, however, does not decompose calcic salts, nor, except partially, magnesic.

Ammonia is a powerful alkali, and in gaseous form is intolerably pungent, its fumes, if strong, exciting vigorous spasm of the larynx. In strong solution, it is intensely irritant. Either of the official ammonia waters, or the simple spirit will, if of standard strength, excite severe irritation upon incautious inhalation of the fumes, and, if applied to the skin upon cloths so covered as to prevent evaporation, will very speedily cause burning pain and redness, and, after a few minutes, blistering. Prolonged application may lead to ulcerative inflammation or gangrene. Internally, in proper dilution, ammoniacal solutions are locally alkaline so far as the contents of the stomach and bowels are concerned. Also, because of the pungency and volatility of ammonia, they tend to allay nausea and to expel flatus. Ammonia, being of high diffusion power, is readily absorbed, whether taken by swallowing or by inhalation, and then quickly but evanescently exerts the peculiar effects of the ammonium compounds upon the heart, respiration, and motor tract of the cord, as already set forth. Undiluted, the three first-named pharmacopœial solutions of ammonia are so irritant as practically to be corrosive to the mucous membrane of the stomach and bowels. Large doses are, therefore, violently poisonous, capable of causing speedy death, with all the usual symptoms of corrosive irritation. In some cases death results in so short a time as a very few minutes, probably from suffocation through rapidly developed œdema of the glottis. So small a quantity as about a teaspoonful and a half of a strong solution of ammonia, swallowed undiluted, has killed. Dangerous, and even fatal, poisoning has also resulted from inhalation of strong ammoniacal fumes.

The therapeutical uses of ammoniacal solutions are local and general. Locally, according to strength of application, ammonia may be made to serve as a vesicant or rubefacient. To blister, a pledget of lint, steeped in a strong solution, is covered with a watch-glass or wooden pill box to prevent evaporation, and then directly applied. In such way the stronger water of the Pharmacopœia has been used, but this solution is unnecessarily and, unless very carefully manipulated, dangerously strong. If employed, the application should be held in contact with the skin for only three or four minutes, or until the part is well reddened, and should then be removed and a hot poultice applied until the blister rises. It is safer to dilute the stronger water with one-half its volume of additional water. Ammonia is rarely selected as a blistering agent, unless the need for the blister is urgent, when the quickness with which ammonia acts makes it preferable to cantharides. For rubefacient purposes a dash of the stronger water is a very common addition to composite liniments, and there is official in the U. S. P. *Linimentum Ammoniæ*, Ammonia Liniment, or, as it is commonly called, *volatile liniment*. This preparation is made by mixing seven volumes of ammonia water (not the stronger water) with twelve of cotton-seed oil and one of alcohol. An ammonia soap results, which partly dissolves and partly remains emulsified in the fluid, forming a white viscid mixture. The preparation is saponaceous, yet possesses mildly the irritant qualities of ammonia, and makes a capital liniment for rubefaction. Still a third local purpose of ammonia is to relieve the pain or itching of bites of insects. For this purpose a drop or two of the weaker water, clear or diluted, may be applied to the part. Internally, ammonia may be used, first, to correct the gastric malaise that attends a fit of acid indigestion, or to allay nausea from any cause. For such purpose the aromatic spirit is specially devised, to be given in doses of from one-half

to one teaspoonful, diluted with three or four volumes of water. Secondly, ammonia may be given for the constitutional effects of reviving the heart in faintness, of supporting it in chronic conditions threatening heart failure, of stimulating flagging respiration, as in dyspnœa from lung disease, or respiratory failure in poisoning by paralyzing agents, of allaying mild spasmodic seizures, and of opposing generally the action of narcotics and paralyzers. For all internal medication the stronger water is entirely too strong, and the weaker water or the spirits are to be preferred. Of the water or of the simple spirit from ten to thirty drops may be administered at a dose, largely diluted. If swallowing be impossible, as in case of unconsciousness from a faint, the effects of ammonia may be obtained by inhalation, but great caution is necessary lest dangerous, or even fatal, irritation of the air passages be set up by too strong inhalation during complete or semi-unconsciousness. None of the pharmacopœial ammoniacal solutions should be applied close to the nostrils.

Acid Ammonium Carbonate, NH_4HCO_3.—Upon subliming a mixture of chalk and ammonium chloride or sulphate, double decomposition ensues, and a sublimate is obtained which consists of acid ammonium carbonate and ammonium carbamate, represented by the symbol, $NH_4HCO_3.NH_4NH_2CO_2$. This composite salt is official under the title *Ammonii Carbonas*, Ammonium Carbonate. It occurs as "white, hard, translucent, striated masses, having a strongly ammoniacal odor without empyreuma, and a sharp, saline taste. On exposure to the air, the salt loses both ammonia and carbonic acid, becoming opaque, and is finally converted into friable, porous lumps, or a white powder. Slowly but completely soluble in about five parts of water at 15° C. (59° F.); decomposed by hot water with the elimination of carbonic acid and ammonia. By prolonged boiling with water the salt is completely dissipated. Alcohol dissolves the carbamate [$NH_4NH_2CO_2$], and leaves the acid carbonate (ammonium bicarbonate). When heated, the salt is completely volatilized, without charring. The aqueous solution possesses a strongly alkaline reaction, and effervesces with acids" (U. S. P.). This salt must be kept in well-stoppered bottles in a cool place.

Ammonium carbonate behaves, physiologically, like ammonia itself, but is a little less rapid and evanescent in operation. In concentrated solution it is locally irritant, and taken internally, dangerously poisonous. The salt is used for the constitutional stimulant and sustaining effects of ammonia, and is often for such purpose preferred to solutions of ammonia because of the slightly longer duration of the action. It is given internally in frequently repeated doses of from 0.30 to 0.60 gm. (gr. v.–x.) in aqueous solution, with the acrimony disguised by gum arabic or sugar, or some agreeably flavored aromatic addition. Large single doses should be avoided, since they easily over-irritate the stomach and may excite vomiting. Ammonium carbonate is also much used to get an ammoniacal effect by inhalation. For this purpose it is coarsely bruised, treated with half its bulk of strong water of ammonia, and flavored with a little oil of lavender or bergamot, such mixture constituting what is known as *smelling salts*.

Ammonium Acetate, $NH_4C_2H_3O_2$.—This salt is used only in the aqueous solution in which it results from the procedure of neutralizing with ammonium carbonate the diluted acetic acid of the Pharmacopœia. Such solution, commonly called *spirit of mindererus*, is official as *Liquor Ammonii Acetatis*, Solution of Ammonium Acetate. It is "a clear, colorless liquid, free from empyreuma, of a mildly saline, acidulous taste, and an acid reaction" (U. S. P.). The solution contains about seven per cent. of the salt. It should be made freshly for use, since like other solutions of alkaline salts of the common organic acids it tends to spontaneous decomposition on keeping. Ammonium acetate is a bland, mawkish salt, which upon absorption may prove feebly diaphoretic or diuretic, according to circumstances, and may to a slight degree exert the characteristic effects of the ammonium compounds generally. It is used to allay headache, especially the headache of pyrexia, to quiet an uneasy stomach, or to promote gentle diaphoresis or diuresis in fever; but it is at best a feeble medicine. One or two tablespoonfuls may be given at a dose, clear or diluted, sweetened and aromatized. If diluted, carbonic acid water makes an excellent addition.

Ammonium Nitrate, NH_4NO_3.—The salt is official in the U. S. P. as *Ammonii Nitras*, Ammonium Nitrate. It is not used in medicine, but inasmuch as one of its pharmaceutical uses may need to be availed of by the physician himself—namely, the making from it of nitrogen monoxide gas—the pharmacopœial description and also tests for purity are here appended: "Colorless crystals, generally in the form of long, thin, rhombic prisms, or in fused masses, without odor, having a sharp, bitter taste, and somewhat deliquescent. Soluble, at 15° C. (59° F.), in 0.5 part of water, and in 20 parts of alcohol; very soluble in boiling water, and in 3 parts of boiling alcohol. When gradually heated, it melts at 165° to 166° C. (329° to 330.8° F.); at a temperature between 230° and 250° C. (446°–482° F.) it is decomposed into nitrogen monoxide gas and water, leaving no residue. The aqueous solution of the salt is neutral to litmus paper, and, when gently heated with potassium or sodium hydrate T. S., it evolves the odor of ammonia. On heating the salt with sulphuric acid, it emits nitrous vapors. A ten-per-cent. aqueous solution of the salt, when acidulated with nitric acid, should not be affected by silver nitrate T. S. (absence of *chloride*), nor by barium chloride T. S. (absence of *sulphate*)" (U. S. P.).

Edward Curtis.

AMMONIA, TOXICOLOGY OF.—Ammonia is met with in commerce in a number of forms.

First, as anhydrous ammonia condensed in large steel cylinders for use in ice machines. In these the ammonia is under a pressure of several hundred pounds and is in a liquid condition. When the pressure is removed, the liquid assumes a gaseous form and issues from the opening as a colorless, irrespirable gas intensely corrosive to organic tissues.

A number of fatal accidents have happened from the action of this gas, either through the bursting of the cylinder when it has been highly heated, or through imperfect connection with the refrigerating machine.

Second, as a clear, colorless solution containing twenty-eight per cent., by weight, of the gas dissolved in water, the *Aqua Ammonia Fortior* of the pharmacist. This solution, exposed to the air, loses strength rapidly through volatilization of the gas, and rapidly deteriorates, especially in a warm atmosphere. If kept in a bottle with an ordinary cork, it gradually corrodes and softens the tissues of the cork, turning it dark and so destroying it that, after a time, it falls readily to pieces. The gas arising from the solution is pungent and irrespirable.

Third, a solution containing ten per cent., by weight, of the gas dissolved in water—the *Aqua Ammoniæ* of the pharmacist. This solution is made from the *Aqua Ammonia Fortior* by dilution with water. This is like the preceding solution, though less corrosive.

Fourth, a solution of varying strength containing a number of impurities sold under the name of Household Ammonia.

Poisoning from gaseous ammonia is always the result of accident, and such cases occur only in plants where the gas is stored or where it is used in quantity for refrigerating purposes. Poisoning by inhalation of the gas arising from its water solution has also been known as the result of accident. Such a case occurred in the writer's laboratory, where a carboy containing about ninety-five pounds of the saturated solution cracked so that the entire contents were soon spread over the laboratory floor. The young man in the laboratory at the time was just able to reach the door in a condition of suffocation. He complained of feeling drowsy and weak, and of soreness in the bronchial tubes as in a case of bronchitis. On the second day he complained of a sense of heaviness in the lungs and pain in drawing a deep breath. On the third day his condition was much improved, and in a few days he entirely recovered.

In another case a bottle of strong ammonia water held to the nose caused at once copious bleeding, followed by inflammation.

When the gas is inhaled there is generally a sense of suffocation and giddiness, followed at times by vomiting. The face is pale, and the pulse is faint and accelerated. In some instances the mucous membrane of the mouth becomes detached in the form of white shreds, leaving the surface beneath intensely reddened and very sore. The sense of taste is seriously impaired for some time, and the contact of solids with such eroded surfaces is intensely painful. The chronic effects of the inhalation of the gas are said to be inflammation of the eyes and a diseased condition of the skin. There is also a general lowering of the tone of the system with pronounced anæmia.

When applied to the surface of the skin, a strong solution of ammonia causes an intense smarting sensation, and the skin may become rough and excoriated through the corrosive action of the solution.

When a solution of ammonia is swallowed, the symptoms depend largely on the degree of concentration of the solution. When it is concentrated, there is instantly a strong smarting pain in the mouth and throat, which extends very soon to the stomach and bowels. The abdomen becomes distended, and the slightest touch increases the pain. There is vomiting of stringy matter having the odor of ammonia and sometimes containing blood. The face is pale, the expression anxious, the inspiration hurried and painful. The pulse is feeble and rapid. The body is covered with a cold perspiration. The interior of the mouth is white or bright red, more or less covered with shreds of mucous membrane, and the parts are greatly swollen. There is loss of voice and there is also difficulty in swallowing. The thirst is intense and the mouth feels dry and parched. The flow of saliva is greatly increased, in one case reaching the amount of three litres in twenty-four hours. The urine is scanty, slightly acid or even alkaline in reaction, and it may contain albumin and casts. The bowels are sometimes constipated and sometimes the reverse, the liquid dejecta at times containing much blood. If the patient dies from the immediate action of the poison, it is usually from suffocation on account of the swelling of the glottis. Some have died in a condition of coma and some in convulsions. Death is generally from suffocation.

In a few cases in which recovery has taken place from the immediate effect of the poison, death has ensued after some weeks or months from starvation, owing to the destruction of a considerable portion of the glands of the stomach or to constriction of either its cardiac or its pyloric opening or of the œsophagus.

The treatment consists in the administration of solutions of weak acids like vinegar or lemon juice to neutralize the action of the alkali, and in the use of mucilaginous or oily drinks to cover the corroded surfaces. Often the inflammation of the respiratory passages is successfully combated by keeping the patient in an atmosphere saturated with moisture. If there is impending suffocation, tracheotomy must be resorted to, if the condition of the patient will allow it. Preparations of opium may also be made use of to control the intense pain.

The amount of this poison which will cause death varies greatly. Recovery has taken place from so great a dose as an ounce of the concentrated liquid, and death has ensued from as little as two drachms.

Death sometimes takes place within a few minutes, but generally it is delayed for from eight to forty-eight hours. Death from the secondary effects of the corrosive has resulted after many months.

In cases in which death has resulted within a short time, the post-mortem examination shows a condition of intense inflammation, which extends from the lips to the stomach, but seldom beyond. The interior of the mouth is white or red and the epithelial layer largely loosened or detached. The tongue is swollen and the epiglottis much enlarged. The bronchial tubes are reddened, and their minute ramifications show the effect of the corrosive. Sometimes a diphtheritic condition exists or the tubules are filled with a tenacious mucus. The heart is partly empty, the blood bright red, and, for the most part, fluid. The œsophagus is blanched or intensely red. The stomach is either white or bright red, its lining membrane loosened and in shreds. The stomach contents are more or less bloody. If the patient recovers from the immediate effects, and death ensues a considerable time after the corrosive was taken, the œsophagus and stomach show scars of greater or less extent, and there may be more or less constriction of the œsophagus and of the cardiac or pyloric openings of the stomach.

If life has been prolonged for some time, or if decomposition has begun, it is useless to attempt to detect the ammonia that may have caused the death, for either it has been eliminated during life, or its presence, after putrefaction sets in, may be accounted for by the decomposition of nitrogenous compounds of the body. The materials vomited, or the stomach contents, or the stomach itself in case death follows soon after the ingestion of the corrosive, may be found to contain sufficient ammonia to respond to characteristic tests. For this purpose the material is distilled first alone and afterward with the addition of an alkali like lime or magnesia, and the distillates are then separately collected and are subjected to the several tests for ammonia.

These tests are as follows:

If a portion of the distillate be added to a small amount of Nessler's solution (prepared by adding to a solution of corrosive sublimate, containing 40 gm. to 300 c.c. of water, a strong solution of potassic iodide until a permanent precipitate begins to form, and then adding to this solution 600 c.c. of a solution containing 160 gm. of potassic hydrate), a yellow or brown color or a brown precipitate is produced.

A portion of the distillate added to a few drops of a solution of mercuric chloride gives a white precipitate.

A portion of the distillate added to a few drops of a mercurous nitrate solution gives a black precipitate.

To a portion of the distillate, made neutral by the addition of dilute hydrochloric acid if alkaline, add a little alcoholic solution of picric acid. In the presence of ammonia compounds yellow crystals of ammonium picrate are formed on standing.

To a portion of the distillate acidified with hydrochloric acid add platinic chloride solution and evaporate to small bulk at a gentle heat. When ammonium compounds are present, yellow crystals of ammonioplatinic chloride are formed, insoluble in alcohol, and but little soluble in dilute mineral acids and free alkalies.

In the form of ammonioplatinic chloride the quantity of ammonia present may be weighed and calculated. To this end the precipitated double chloride is filtered on to a tared filter and washed with strong alcohol until free from acid. After this the filter with its precipitate is dried at 100° C. and weighed. The ammonium salt contains 7.62 per cent. of its weight of ammonia as NH_3.

Herbert M. Hill.

AMMONIACUM.—Ammoniac, "Gum Ammoniac"—"A gum resin obtained from *Dorema Ammoniacum* Don (fam. *Umbelliferæ*)" (U. S. P.). This is a large, weird-looking umbelliferous plant, growing abundantly in the wastes of Persia and Beloochistan. It has a fleshy, turnip-shaped, perennial root, nearly 30 cm. (one foot) in length, which is itself an article of commerce in the East, and known as "Bombay sumbul." The flowering stem does not appear until the plant is five or more years old; it is thick and coarse, 2 metres or more (over six feet) in height. There are a few large compound leaves at its base, but above it is leafless. It terminates in a large, close panicle, along the branches of which the minute flowers are clustered in small globular heads.

The plant is filled with an abundance of milky juice, contained in both stem and roots, which exudes either spontaneously or from punctures made by a beetle which feeds upon it. The sap, as it escapes, hardens and dries upon the stem, and flows or drops to the ground. It is collected in July and August, partly from the stems, partly from the ground, by Persian peasants, and exported to India, and from there to Europe.

Ammoniac consists of these hardened drops, or "tears," as they are technically called. In the best qualities they are separate, or only loosely stuck together in porous masses; in inferior grades they are embedded in a dark-brown resinous matrix. Fine specimens consist of rounded pieces from 1 mm. to 1 or 2 cm. (one twenty-fifth to three-quarters of an inch) in diameter. They are brownish cream-colored externally, darkening to cinnamon brown with age, creamy white, or pure white within. They break with a conchoidal fracture, disclosing a waxy, but shining surface. The odor is peculiar, rather disagreeable, but faint, excepting in masses or upon warming; the taste is bitter and rather acrid. Inferior specimens are those having a large proportion of the darker, homogeneous resins and extraneous substances, such as dirt, sticks, chaff, etc. It is a difficult drug to powder, unless very cold or very dry. When heated it softens, but does not melt. Alcohol dissolves about three-fourths of it. Water disintegrates it, and forms with it a milky emulsion.

Ammoniac consists of about seventy per cent. of resin, fifteen to eighteen per cent. of soluble gum, and the rest of insoluble gum, water, and a trace of essential oil. The latter, according to Flückiger, does not contain sulphur, and, therefore, is not similar to the oil of asafœtida.

Ammoniac is stimulant, expectorant, and antispasmodic, but is scarcely used now internally. The dose is stated to be 0.5 to 2 gm. (gr. viij.–xxx.) three or more times a day. An emulsion would be an eligible form, although a tincture would probably contain all that is active in it. The only official preparation is Ammoniac Plaster (*Emplastrum Ammoniaci*, U. S. P.), made by softening the ammoniac in diluted acetic acid, and evaporating to a suitable extent. It is a stimulating and rubefacient, sometimes blistering application, useful as a mild counter-irritant.

One other species of *Dorema*, according to the "Pharmacographia," yieids ammoniac. Bentham and Hooker include only two species in the genus. The ammoniac of Dioscorides and Pliny, and other ancient writers, was obtained in Africa, and is a different article, namely, a gum resin obtained from *Ferula Tingitana* Linn. It is rarely found in European markets. *W. P. Bolles.*

AMMONOL.—A proprietary remedy stated to be ammonium phenylacetamide and recommended as antipyretic, analgesic, and antiseptic. Dose, gr. v.–xx.

Ammonol Salicylate.—A salicylic acid compound of ammonol, claimed to be especially useful in the headache of nervous and anæmic patients, and given in eight-grain doses. Both ammonol and its salicylate are white powders which lose ammonia on exposure to air.
W. A. Bastedo.

AMNESIA. See *Aphasia*.

AMNION.—The amnion is one of the fœtal appendages, being a thin membrane which is derived from the extra-embryonic portion of the somatopleure, and forms the innermost of the envelopes surrounding the fœtus. It occurs only in mammalia, birds, and reptiles (the amniota), and is absent in the amphibia and fishes (the anamniota). Among the invertebrates an amnion is developed by the embryos of many insects. The vertebrate animals which exhibit an amnion are also characterized by the possession of the allantois, another fœtal appendage. These two structures, the amnion and allantois, though associated together in existing species, are distinct in their histological origin and development.

The amnion is a thin, delicate membrane or sac which is situated next to the embryo, separated from it by a space or accumulation of fluid; outside the amnion are the chorion and allantois, and outside these (in mammals) the uterine walls. At an early period the amnion is a separate sac, distinct from the chorion, but later it comes into contact with and is loosely attached to the chorion. In the fully developed human afterbirth the amnion is a well-marked, thin, pellucid membrane lining the inner surface of the placenta and fœtal membranes, from which it can be easily stripped off. At the insertion of the umbilical cord into the placenta the amnion merges into the integument of the cord, which differs somewhat in character from the remainder of the amnion. At the junction of the cord with the abdominal wall, the superficial layers of the cord become continuous with the skin of the fœtus. Hence the amnion is a structure continuous (through the integument of the cord) with the skin, and in the main it is genetically as well as structurally homologous to the skin. The amnion possesses two layers: the superficial layer (that directed toward the fœtus) is of epiblastic origin and epithelial nature, and is the precise homologue of the epidermis; the deeper layer is a connective-tissue stratum of mesoblastic (somatopleural) origin, and corresponds in the main to the cutis vera. Within the amnion is a cavity, the amniotic cavity, which is filled with a fluid (the amniotic fluid), in which the fœtus is immersed.

A distinction is sometimes made between the true amnion and the false amnion. The true amnion is the amnion proper, the innermost of the fœtal envelopes. The false amnion, or "membrana serosa," consists of that portion of the extra-embryonic somatopleure which enters into the formation of the chorion; the chorion is formed by the fusion of the false amnion and the allantois.

Development of the Amnion.—The ontogenetic development of the amnion in all reptiles and birds (which together are often called the sauropsida) appears to take place by substantially the same process, which is well exemplified in the classical case of the chick. In the mammalia, however, there are several important differences and variations in the mode of amnion formation, though in many of the mammals the process is similar to that in the sauropsida.

The development of the amnion is in some cases associated and complicated with that of another membrane, the proamnion; this is a fold of epiblast and hypoblast which covers the anterior portion of the embryo, and is usually a transient structure. It differs from the amnion in consisting of ectoderm and entoderm without intervening mesoderm or cœlom, while the amnion is formed from the somatopleure. It is considered in a separate article.

Preliminary to considering the development of the amnion, it will be convenient to recall some of the features of the early embryo. At a certain early period the embryo exhibits three layers, the epiblast (ectoderm), mesoblast (mesoderm), and hypoblast (entoderm), from without inward. Outside the epiblast there is also another layer, known chiefly under the German term *Deckschicht*, or Rauber's layer, probably to be regarded as a portion of the epiblast. In many cases this outer layer early disappears and may be disregarded; but in numerous species the *Deckschicht* plays a very important part in the formation of the amnion. The mesoblast early splits into two layers, the cleft beginning near the longitudinal axis of the embryo and extending laterally outward. The outer layer thus formed is called the somatic layer of the mesoblast, and it with the epiblast are together termed the somatopleure. The inner layer is the splanchnic layer of the mesoblast, and with the hypoblast forms the splanchnopleure. The cleft or space between the two layers of the mesoblast is called the cœlom or pleuroperitoneal cavity. The layer of cells lining the cœlom has been termed (Minot) the mesothelium, while the rest of the mesoblastic tissue has been called the mesenchyma.

Amnion Formation in Reptiles and Birds.—The development of the amnion appears to take place in substantially the same manner in all birds and reptiles, practically as exemplified in the chick.

In the chick, as typical of the sauropsida, the formation of the amnion begins with the growth of a crescentic fold of the somatopleure upward in front and at the sides of the cephalic extremity of the embryo, which becomes sharply flexed on the body of the embryo. This fold grows up over the head as a sort of hood, and gradually extends backward. Later a similar but smaller somatopleural fold grows up over and envelops the posterior end of the embryo.

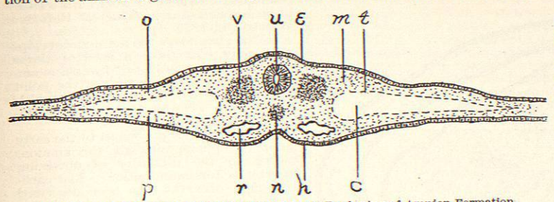

Fig. 94.—Early Development of Embryo, Prior to Beginning of Amnion Formation.

The fœtal body at the same time sinks downward and lateral folds grow up at its sides. As the cephalic somatopleural fold grows backward, the posterior fold forward, and the lateral folds upward and inward, the margins of these folds finally come to meet in a line over the dorsum of the embryo. The edges of the folds then grow together: first the epiblastic cells unite, then by the extension of the mesoblast and the cœlom complete union is effected, and two complete and separate membranes are formed over the dorsum of the embryo. The inner of these is the amnion; the outer (the "false amnion" or membrana serosa) enters into the formation of the chorion, and comes into vascular connection with the embryo by means of the allantois. This process is gone through during about the second, third, and fourth days of incubation, and is illustrated by the accompanying figures (Figs. 94 to 98). Later, the amniotic cavity extends underneath the embryo, so that the fœtal body comes to be completely enveloped in the amniotic membrane.

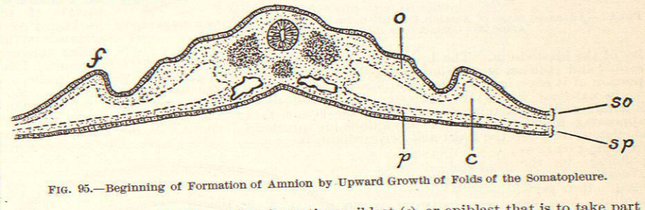

Fig. 95.—Beginning of Formation of Amnion by Upward Growth of Folds of the Somatopleure.

In the ova of *insects* an epiblastic membrane, corresponding closely to and probably analogous with the amnion of the vertebrate amniota, develops so as to envelop more or less of the embryo and enclose a small cavity. This membrane is formed by the growing up and coalescence of folds in a manner strikingly similar to that exhibited by the chick.

Amnion Formation in Mammalia.—There is considerable variety and diversity in the details and the general features of the process of amnion formation in the different varieties of mammalia. In many mammals the process is, in the main, similar to that exhibited by the sauropsida, though with differences in the details; but in other species there is a wide departure from the type presented in the chick. The process is not even uniform within the same orders of mammals, but great differences may occur between allied genera. While the embryology of many species has been worked out, it will still require extensive researches among different varieties of mammals to determine all the forms of amnion development. A few of these forms are briefly described below.

In the *rabbit* the amnion is derived from a somatopleural fold like that in the chick, which begins, however, only at the caudal extremity and gradually grows forward over the embryo (Fig. 99). The anterior end of the embryo becomes covered by a large proamnion, but by the forward growth of the posterior amniotic fold the proamnion is ultimately obliterated and replaced by the true amnion.

In the *opossum* a similar caudal amnion fold grows up at first, but this disappears and is replaced by proamnion, which ultimately covers the entire embryo.

In the *hedgehog*, according to A. A. W. Hubrecht ("Die Phylogenese des Amnions und die Bedeutung des Trophoblasts," Amsterdam, 1895), the *Deckschicht* (or "trophoblast") plays an important part in the formation of the amnion. A space (*a*, Fig. 100) early appears between the formative epiblast (*e*), or epiblast that is to take part in the formation of the embryo, and the overlying portion of the *Deckschicht* (*b*); this space is to develop into the amniotic cavity. From the inner surface of this overlying portion of the *Deckschicht* (*b*) a layer then splits off, beginning at the margin of the formative epiblast, and the cœlom and somatic layer of the mesoblast at the same time grow into the cleft thus formed. By the complete splitting off of this inner layer (*n*, Fig. 101) from the *Deckschicht* the amnion is formed, the *Deckschicht* remaining to take part in the formation of the chorion.

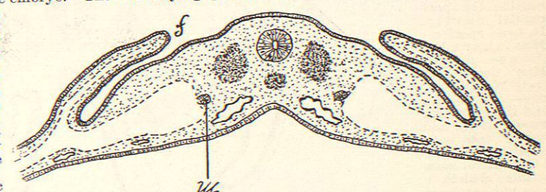

Fig. 96.—Amnion Formation Further Advanced.

Hubrecht also describes modifications of this process of amnion formation in other animals.

In many of the *rodents* (but not all) a peculiar process occurs, known as the "inversion of the germ layers," in which the *Deckschicht* plays an important part. A proliferation of cells takes place at one point of the *Deckschicht*, forming a cellular mass known as the *Träger*,