Wilson: "The Cell in Development and Inheritance," second edition; M. Verworn: "General Physiology," translated by Lee; C. B. Davenport, "Experimental Morphology"; Y. Delage: "La structure du protoplasma et les théories sur l'hérédité et les grands problèmes de la biologie générale"; C. L. Morgan: "Animal Life and Intelligence." For philosophical discussion see H. Spencer: "Principles of Biology," second edition, 1900; W. K. Brooks: "The Foundations of Zoology"; K. Pearson: "The Grammar of Science," second edition, pp. 328–332.

Additions to the science are recorded annually in L'Année Biologique, edited by Delage, Paris, since 1895; and in "Ergebnisse der Anatomie und Entwickelungsgeschichte," edited by Merkel and Bonnet, Wiesbaden, since 1891.

BIOPLASSON—a term introduced by Elsberg for the protoplasm. In consequence of the observation of the intercellular bridges by which the protoplasm of adjacent cells is in many tissues connected, Heitzmann has denied the existence of cells and has asserted that the body consists of a network of protoplasm. Elsberg adopted this strange theory and introduced bioplasson for protoplasm, a term which it is necessary to note only because it is used by a small circle of American writers. Heitzmann's theory has also been advocated by Adam Sedgwick, who has attempted accordingly to revolutionize all morphological conceptions. That Heitzmann's theory is erroneous, on account of its evident exaggeration, hardly needs demonstration. That fine protoplasmatic bands connect the adjacent cells of certain tissues, both in plants and animals, is now well established; but this does not in any way invalidate the cell doctrine. Even if it were true, which it is not, that, as Heitzmann apparently claims, all tissues consist of a network, this would not do away with cells as the unit of organization. The fatal objection to Heitzmann's view, however, is the fact that the union of cells is secondary, for during the segmentation of the ovum the cells are completely separated, and the connection between them does not exist until considerably later in the course of development. What Heitzmann considers as primary is therefore secondary; his theory has been almost unanimously rejected by histologists.

Charles S. Minot.

LITERATURE.

Elsberg: Notice of the Bioplasson Doctrine. Trans. Amer. Med. Assn., 1875.
Heitzmann: Microscopical Morphology, 8vo, New York, 1883. (Presents Heitzmann's theories *in extenso*, but displays a strange disregard of contemporary research.)
Sedgwick, Adam: On the Inadequacy of the Cellular Theory of Development, etc. Quart. Journ. Microsc. Sci., xxxvii., p. 87, 1894.

BIRCH.—The common name of the genus *Betula* (fam. *Betulaceæ*), of some thirty-five species, several of which are strongly aromatic. Unless otherwise specified, the *B. lenta* L., Sweet Birch or Cherry Birch (incorrectly "Black Birch") is to be understood. This is an abundant shrub or small tree in Eastern North America. Its bark is an important article of commerce, and has long been used medicinally as well as for flavoring. It contains a volatile oil identical with that of wintergreen, which see.

The wood of several species is used as a source of medicinal tar, which, like that of beechwood, is rich in guaiacol.

Henry H. Rusby.

BIRCHDALE SPRINGS.—Merrimac County, New Hampshire.

POST-OFFICE.—Concord. Hotel.

These springs are located about four miles from the state house. The springs are four in number, known as the "Concord," "Merrimac," "Granite," and "Penacook." The following analysis of the Concord was made in 1873 by Prof. Charles F. Chandler, of New York:

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Sodium bicarbonate	.19
Calcium bicarbonate	2.09
Magnesium bicarbonate	.84
Iron bicarbonate	.37
Sodium chloride	.38
Sodium sulphate	.26
Potassium sulphate	.07
Sodium phosphate	.01
Silica	.92
Alumina	.12
Organic matter	.67
Total	5.92

We have been unable to obtain information relating to the present status of these springs. They were formerly used both commercially and as a resort.

James K. Crook.

BIRTHS, STATISTICS OF. See *Vital Statistics*.

BISKRA—a place of growing importance—is situated on the outskirts of the Algerian Sahara, at an elevation of about three hundred and sixty feet above sea level, in Lat. 35° 27′ N., and Long. 5° 22′ E. It consists of a union of several villages containing in all eight thousand inhabitants. It lies among plantations of date palms and evergreen trees, with gardens and squares containing tropical plants such as the yucca, the false pepper plant, the fragrant gum trees and palms. Nearby are mountains capped with snow for the greater part of the year, and to the south the limitless expanse of the desert. Biskra is reached by steamer from Marseilles to Algiers in twenty-six hours, and by rail from the latter place in two days. One can break the journey at Constantine, which is about half-way. There are good hotel accommodations, and one can find endless diversion in the Oriental life and scenes of the various tribes which collect here—the shepherd Arab, the Nomads, the Moor, and the African. There are also to be found numerous remains of Roman occupation. The water supply is derived from wells, one of which, in the great mosque, is said never to be dry. According to Weber and Foster (Albutt's "System of Medicine," 1896), the water contains too much salt for drinking and for certain cooking purposes.

The climate partakes of that of the desert, being warm, dry, equable, sunny, and rather bracing. "It is much drier and sunnier than the neighborhood of Algiers itself; but it is subject to violent winds which for days together may prevent outdoor exercise" (Weber and Foster). The season extends from October to April, and the temperature for these months, for the years 1887 to 1891, is given by Hurabielle ("Biskra," Paris, 1899) as follows:

	Maximum.	Minimum.	Mean.
October	81.2° F.	58.6° F.	70.0° F.
November	69.0	48.0	57.9
December	60.5	42.0	50.8
January	58.6	39.7	48.8
February	62.0	42.0	52.6
March	77.5	48.4	59.3
April	77.7	54.0	66.0

The following comparison is made with the temperature of Nice:

	Maximum.	Minimum.	Mean.	Rainfall.
Nice	67.7° F.	36.8° F.	52.0° F.	3.9 inches.
Biskra	60.5	47.6	58.4	0.6 inch.

The rainfall is almost *nil*, and the relative humidity must be very small. We have then at Biskra, during the winter season, or from October to April inclusive, a dry pure atmosphere, a mild and very equable temperature, practically no rain, and almost constant sunshine. "For six months," says Murray, "the climate is delicious. In the whole of Algeria one does not find a more agreeable temperature, a clearer sky, or more beautiful vegetation." The most considerable drawbacks are the high winds from the south and west, which are frequent. One is, however, partially protected from them in the interior of the oasis by the forest of date palms, which covers an area of twelve thousand square metres.

The diseases which are relieved by a residence in this climate are certain cases of pulmonary tuberculosis, albuminuria, rheumatism, neurasthenia, climacteric disturbances, etc. There is no evidence that malaria exists at Biskra.

The writer would acknowledge his indebtedness in the preparation of this sketch to J. Madison Taylor's article "Biskra," in the *Climatologist* for 1891; to "Au pays du bleu," Biskra, par L'Abbé Jean Hurabielle, Paris, 1899; and to the article upon "Climate in the Treatment of Disease" in Albutt's "System of Medicine," 1896.

Edward O. Otis.

BISMUTH.—1. GENERAL MEDICINAL PROPERTIES OF COMPOUNDS OF BISMUTH.—Experiments upon animals have shown that impregnation of the blood with bismuth produces poisonous effects generally similar to those wrought by other heavy metals. So far, however, as concerns the compounds of bismuth used in medicine, these, if pure, can be given with great freedom without constitutional disturbance—a fact commonly, and probably correctly, accounted for by the great insolubility of these compounds, by reason of which absorption of the mineral is both feeble and slow. Poisoning, it is true, does occasionally follow a prescription of bismuth, but in such cases, when investigation has been made, the article dispensed has been pretty surely found contaminated with arsenic, a contamination dangerously common with the poorer grades of bismuth subnitrate. Locally, soluble bismuth compounds are astringent and irritant, and the insoluble ones soothing, healing, and antiseptic. But if applied abundantly to extensive wound surfaces, the insoluble compounds are capable of producing constitutional effects—acute stomatitis, catarrh of the intestines, and nephritis. Taken internally, bismuth compounds allay gastric pain or nausea, and tend to check diarrhœa.

2. THE COMPOUNDS OF BISMUTH USED IN MEDICINE.—The compounds of bismuth official in the United States Pharmacopœia are basic bismuth *nitrate* and *carbonate*, and a composite scale preparation containing the *citrate*.

Basic Bismuth Nitrate, $BiONO_3.H_2O$.—This salt, the *magistery of bismuth* formerly so-called, or *white bismuth*, is official as *Bismuthi Subnitras*, Bismuth Subnitrate. It is "a heavy, white powder, of somewhat varying chemical composition, odorless and almost tasteless, and permanent in the air. Almost insoluble in water, and insoluble in alcohol; but readily soluble in nitric or hydrochloric acid. When heated to 120° C. (248° F.), the salt loses water (between 3 and 5 per cent. of its weight); and when subsequently heated to redness, it evolves nitrous vapors, leaving from 79 to 82 per cent. of its weight of a yellow residue which is soluble in nitric or hydrochloric acid, and blackened by hydrogen sulphide. When brought upon moistened blue litmus paper, the salt shows a slightly acid reaction" (U. S. P.). This salt should not be prescribed with potassium iodide nor with the carbonates of the alkalies. Specimens of poor quality are apt to contain variable proportions of arsenic, even enough, it may be, to cause distinct poisoning in therapeutic doses. To detect this contamination, treat the specimen with sulphuric acid, evaporate to dryness, dissolve the residue in hot distilled water, and test the solution by Marsh's test for arsenic.

Bismuth subnitrate produces the effects of the insoluble bismuth compounds already described, and is the principal medicinal preparation of the metal. The only peculiarities of its action are the production of a garlicky odor to the breath of the taker, and a blackening of the stools. The salt is given internally in doses of wide range, from 0.30 gm. to 2.50 or even 4.00 gm. (from five grains to a drachm), taken as a powder or suspended in mucilage. Externally it is used as a dusting powder in excoriations and sores, or, suspended in water, ten-per-cent. admixture, in the so-called antiseptic treatment of wounds.

Basic Bismuth Carbonate $(BiO)_2CO_3.H_2O$.—This salt is official as *Bismuthi Subcarbonas*, Bismuth Subcarbonate. It is "a white, or pale yellowish-white powder, of somewhat varying chemical composition, odorless and tasteless, and permanent in the air. Insoluble in water or alcohol, but completely soluble in nitric or hydrochloric acid, with copious effervescence. When heated to redness, the salt loses water and carbon dioxide, and leaves from 87 to 91 per cent. of a yellow residue which is soluble in nitric or hydrochloric acid, and blackened by hydrogen sulphide" (U. S. P.).

Bismuth subcarbonate is substantially a duplicate of the subnitrate in all its properties, and may be used for the same purposes and in the same manner as the latter salt.

Bismuth Citrate, $BiC_6H_5O_7$.—This salt is official under title *Bismuthi Citras*, Bismuth Citrate, solely for the purpose of making the next-to-be-named compound. Bismuth citrate is made by boiling the subnitrate in a solution of citric acid. It is "a white amorphous or microcrystalline powder, odorless and tasteless, and permanent in the air. Insoluble in water or alcohol, but soluble in ammonia water, and in solutions of the citrates of the alkalies" (U. S. P.). By dissolving this salt in water of ammonia, filtering, evaporating to a syrupy consistence, and spreading the syrupy fluid on glass plates to dry, a dry film breaking up into scales is obtained, analogous to the scale preparations of iron. These scales are official under the title *Bismuthi et Ammonii Citras*, Bismuth and Ammonium Citrate. They appear as "small, shining, pearly or translucent scales, odorless, having a slightly acidulous and metallic taste, and becoming opaque on exposure to the air. Very soluble in water, and but sparingly soluble in alcohol" (U. S. P.). The compound should be kept in small tightly stoppered bottles, and away from the light, for on exposure it loses ammonia, and then fails to dissolve wholly in water. The chemical composition, as in the case of the analogous preparations of iron, is obscure; some regard the scales as containing a true double citrate of the bases, and others consider them as a mere admixture.

This preparation is unique as being a soluble compound of bismuth. It is used internally for diarrhœa, and, in medicinal dose, proves astringent and mildly irritant. The dose ranges from 0.06 to 0.20 gm. (gr. i. to iij.).

Edward Curtis.

BISMUTH, POISONING BY.—The two most important compounds of bismuth are the subnitrate (basic nitrate, magistery of bismuth) and the subcarbonate. These preparations are extensively used, in doses of 0.65 to 3.9 gm. (gr. x. to lx.), or more, in the treatment of diarrhœa and other forms of intestinal irritation. The subnitrate of bismuth was considered an active poison by many of the earlier writers, who state that symptoms of gastro-enteritis frequently follow its administration in doses of 1.9 to 7.7 gm. (ʒ ss. to ij.) daily. A case is recorded in which 7.7 gm. of this substance, administered to an adult, caused severe symptoms of irritant poisoning, followed by death on the ninth day. At the post-mortem examination the tonsils, uvula, pharynx, and epiglottis were found gangrenous; the œsophagus and stomach were very red, and the whole intestinal canal was red, and here and there gangrenous, especially at the rectum (Christison).

As the subnitrate and subcarbonate of bismuth are used very freely without any bad results, it is doubtful if they can be considered irritants even in comparatively large doses. The best authorities of the present day generally agree in attributing the effects noticed by the earlier writers to impurities in the drug or to some other cause. The preparations of bismuth have frequently been found to contain arsenic in the form of arseniate of bismuth. Dr. Taylor found arsenic in three samples of subnitrate of bismuth out of five examined by him; Dr. Rogers, in eight samples out of ten. Herepath examined fourteen samples and found arsenic in all. Salisbury found arsenic in thirteen samples out of eighteen; he also examined five samples of the subcarbonate of bismuth and found arsenic in all.

There can be no doubt that the symptoms produced

by subnitrate of bismuth have been sometimes due to the arsenic which it contains, as in the following cases: A physician had occasion to place himself upon a treatment of subnitrate of bismuth. After a day or two he noticed a puffiness about the eyes and gastro-intestinal irritation. These symptoms disappeared when the use of the bismuth was discontinued, but reappeared upon the renewal of the medicine. The bismuth was found, upon analysis, to contain arsenic (Fullerton). Twenty-six grains (400 grains) of subnitrate of bismuth was administered to a child ten months old, over eleven consecutive days, for a moderately severe attack of inflammatory diarrhœa. After one week there was puffiness of the limbs and face; the child became severely ill, fretted, moaned, and was very restless; the diarrhœa became suddenly worse. The conjunctivæ were slightly injected, the tongue was dry, the pulse rapid, the skin hot and dry. There was no eczema. The urine was free from albumin. The symptoms disappeared when the medicine was discontinued. The bismuth was found, upon analysis, to contain 0.150 per cent. arsenic acid. Another sample was found to contain 0.240 per cent. arsenic acid (Underhill). This is the largest amount of arsenic which has been found in any of the preparations of bismuth, so far as the writer has been able to learn.

The presence of arsenic in these preparations is explained by the fact that the ores of bismuth, from which they are manufactured, contain arsenic. The processes employed for their manufacture are intended to remove all but the slightest trace of arsenic. Up to a comparatively recent date this result was frequently not attained. At the present time, however, greater care is taken in their preparation, and it is only rarely that either the subnitrate or the subcarbonate of bismuth is found to contain more than the merest trace of arsenic.

It has been stated that subcarbonate and subnitrate of bismuth containing 0.129 per cent. arsenic did not produce symptoms of poisoning when administered to dogs in doses of 15 to 30 gm. (Parral and Garnier). It is possible, therefore, that the bad effects which have been caused by these preparations are to be attributed, in some cases at least, to other causes. Idiosyncrasy has been suggested. Monneret thinks they may be due, in certain cases, to an exacerbation of the trouble for which the bismuth was administered. It has been suggested that an excess of free acid in the stomach, or acid salts, administered simultaneously with the subnitrate, may, in some cases, have converted the latter into a soluble poisonous salt of bismuth. Sobernheim explains the poisonous effects in the fatal case related by Christison, by supposing that the bitartrate of potassium, which was administered with the subnitrate of bismuth, converted the latter into an acid nitrate, which is shown by experiments on animals to be an irritant poison. Herbelin has found considerable free nitric acid in subnitrate of bismuth. The presence of this acid, or of the normal or acid nitrate, in specimens which have been carelessly prepared, may also explain some of the symptoms which have been observed. Lead has been detected in subnitrate of bismuth (Carnot, Chapins, Linossier), but the amount was small, and it does not appear that the symptoms which have been observed in any case can be attributed to it. It is noticeable that, with improved methods of manufacture and greater care in carrying them out, cases of poisoning by these preparations have become exceedingly rare, if, indeed, they occur at all. No cases have been reported during the past few years. This fact tends to confirm the belief that the cases which have been reported were due to some of the causes which have been mentioned, rather than to any direct poisonous action of the preparations themselves.

Preparations of bismuth are frequently administered in the treatment of gastro-enteritis caused by the metallic irritants. The discovery of arsenic in the subnitrate of bismuth thus administered has been sufficient to invalidate the results of the chemical analysis in certain cases of alleged poisoning by arsenic, in which the amount of arsenic detected in the organs was small (Rogers, Reese).

The attempt to account for the presence of arsenic in the body by suggesting that it may have come from the bismuth administered, is frequently made. It is important, therefore, whenever these preparations are given in cases of suspected poisoning, to preserve a sample for subsequent analysis, if necessary.

The subcarbonate of bismuth, if pure, is undoubtedly as free from irritant properties as is the subnitrate. It is, however, more soluble than the subnitrate, and is, therefore, more liable to become converted into a soluble salt of bismuth by the acids of the gastric juice, or by acid salts if these are administered simultaneously with it. As the soluble salts of bismuth are poisonous, the subnitrate would appear to be the safer preparation when large doses are to be administered, or when the administration is to be continued for a long time.

Under the name "pearl white" the subnitrate of bismuth is used to a considerable extent as a cosmetic. The subcarbonate and oxychloride of bismuth are sometimes used for the same purpose. There is no evidence to show that they are absorbed through the skin, or that they produce, if pure, any injurious consequences, aside from stopping up the pores and thus interfering with the healthy action of the skin. Bismuth preparations containing arsenic or lead might, however, produce injurious effects when used as cosmetics.

Experiments on animals show that the soluble salts of bismuth are poisonous. The action of the following salts has been investigated: the nitrate (Orfila), the citrate of bismuth and ammonia (Stefanowitch, Lebedoff, Feder-Meyer, Mory), the acetate (Bricka), and the tartrate of bismuth and potassium (Rabuteau). The symptoms which follow the administration of these salts do not differ materially from those produced by the metallic irritants generally. The most constant post-mortem appearances are inflammation of the stomach and intestines, and a more or less extensive fatty degeneration of the liver, kidneys, and heart. Lebedoff states that the glycogen disappears from the liver after the long-continued administration of the citrate of bismuth and ammonia. The red blood corpuscles in animals poisoned by this compound present a finely granular appearance, and masses of small free granules may be seen in the serum. These appearances point to the destruction of the blood corpuscles (Feder-Meyer).

Absorption and Elimination.—When subnitrate of bismuth is administered, the greater part is separated with the fæces, either unchanged or in the form of sulphide. A part is absorbed. Orfila detected bismuth in the liver, spleen, and urine of dogs to which the subnitrate had been administered. Bergeret and Mayençon state that, when the subnitrate is administered, bismuth can always be detected in the urine after a few hours. They also detected it in the serous exudation of dropsy. When a few grains are given to rabbits, it can be found, in from twenty to thirty minutes, in the urine, spleen, blood, and muscles, and even eight days after the administration it can be detected in all the tissues. The last-named authorities detected traces in the liver and kidneys of a man who had taken 1 gm. of the subnitrate five days before death, but they failed to find it in the body of a woman who died sixty-two days after the ingestion of 2 gm. (quoted by H. C. Wood, Jr.).

After the administration of the soluble salts of bismuth, the metal has been detected in the urine, fæces, saliva, stomach, liver, spleen, and bones. It can be detected in the liver many months after the last administration (Bricka). It is eliminated with the urine, fæces, and, according to Dubinski, with the saliva.

William B. Hills.

BISTORT.—The rhizome of *Polygonum Bistorta* L. (fam. *Polygonaceæ*).

The rhizome is covered with roots. It is as large as the little finger, from 5 to 15 cm. long (2 to 6 inches), somewhat flattened, transversely wrinkled, variously, often excessively, once or twice doubled upon itself like the letter S. When dry it is hard and brittle, dark brown

externally, reddish brown within, with a single circle of well-marked woody bundles; taste, astringent; odor, slight.

Chemical Composition.—Galli-tannic (twenty-one per cent.) and gallic acids, starch, and less important substances.

Use.—Bistort has been a well-known and considerably used astringent. The large proportion of tannic matters entitle it to rank high in this rather numerous class of medicines. Of course it is vastly exceeded in this respect by the various galls, and has no advantage over the tannic acid so easily prepared from them. It is, therefore, now but little used. It has also been employed as a source of starch.

Dose, 1 or 2 gm. (gr. xv. ad xxx.).

W. P. Bolles.

BITTERSWEET.—Dulcamara. "The young branches of *Solanum Dulcamara* L. (fam. *Solanaceæ*)" (U. S. P.). This is a weak, straggling, half-woody, hairy perennial, its stems often six or eight feet long and reclining upon shrubbery. It has alternate leaves, many of them pinnately three to five lobed or parted, pretty blue star-

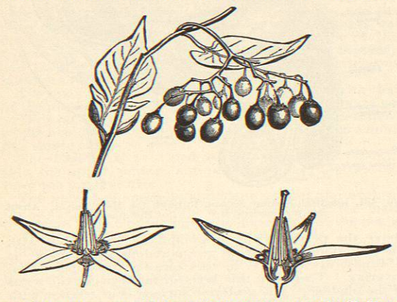

Fig. 482.—Bittersweet. Plant reduced and flower enlarged. (Baillon.)

shaped flowers, in small cymes, and bright scarlet, shining, oval fruits, about half as large as cranberries, and somewhat poisonous. It is a native of Europe and Asia, and thoroughly naturalized in this country, where it is abundant along streams and ditches and in wet pastures. The Pharmacopœia describes the drug as follows: "About 5 mm. or less, thick, cylindrical, somewhat angular, longitudinally striate, more or less warty, usually hollow in the centre, cut into short sections. The thin bark is externally pale greenish or light greenish brown, marked with alternate leaf scars, and internally green, the greenish or yellowish wood forming one or two concentric rings. Odor slight, taste bitter, afterward sweet."

Composition.—In spite of a great deal of study, our knowledge of the composition of dulcamara is very uncertain. Its bitter and sweet taste are due to two glucosides, *dulcamarin*, similar to saponin, and *picroglycion*, besides which there exists a body called *solanin* or *solanine*. The latter is the most indefinite of all the constituents. It is said to decompose after the manner of a glucoside, with which it is classed by Merck, yet it contains nitrogen and yields salts, like the alkaloids. It is not even known if it be identical with the solanine of other species of the genus. For a full account of solanin see article on Potato, under *Poisonous Plants*. Wax, gum, starch, and resin are also present.

Solanin exists in such very small amount as to contribute little activity to the drug, which has been used in the most indefinite way as an alterative and tonic.

Its close relation to a number of deleterious solanin-bearing plants has made its reputation suspicious, but the records of injury, from the green plant even, are very few; from the dried, almost none. A large quantity of a decoction made from a peck of the stems has been taken, followed only by transient numbness, dryness of the mouth, and paralysis of the tongue. In medicinal doses it can scarcely be said to have any physiological action. The amount of solanin, especially in old stalks, is very small. Given in copious hot decoction, bittersweet is probably diaphoretic and diuretic, and is still occasionally used in chronic rheumatism, as well as in psoriasis and some other chronic skin diseases. Dose, 4 to 8 gm. (℥i. ad ℥iv.). A fluid extract is made (*Extractum Dulcamaræ Fluidum*, U. S. P.), but an extemporaneous decoction is probably a better form.

H. H. Rusby.

BITTERSWEET, FALSE OR CLIMBING, should not be confounded with the above, though its composition is in part similar. It is the bark of *Celastrus scandens* L. (fam. *Celastraceæ*), a very woody twiner, very common in many parts of the United States. This is the "bittersweet" whose orange-colored fruits, after bursting open in the fall to display the handsome scarlet-arilled seeds, is largely used for decorative purposes. Its composition and properties are even less known than those of the last. Its active constituent is apparently a saponin-like glucoside, and it has been used in syphilis and hepatic disorders.

H. H. Rusby.

BLACK BARREN MINERAL SPRING.—Lancaster County.

Post-Office.—Pleasant Grove. Hotel.

Access.—Viâ Pennsylvania Railroad to Columbia, on the Susquehanna River; thence viâ Columbia and Port Deposit Railroad to Haines' Station; thence by private conveyance two and one-half miles to springs.

The location is in the southern portion of Lancaster County, one mile from the Susquehanna River and about three miles from where it crosses the Maryland line. The springs have an elevation of about six hundred feet above the sea level, and are surrounded by a picturesque, undulating farming country, containing varied and pleasing landscapes. About a mile to the south is an extensive serpentine ridge known as the "Black Barren," from which the spring receives its name and doubtless its source. An analysis of the water by Messrs. B. H. Rand and Charles Cresson, of Philadelphia, resulted as follows:

One United States Gallon Contains:

Solids.	Grains.
Sodium sulphate	1.20
Magnesium sulphate	3.24
Silica and suspended matter	1.30
Total	5.74

The water appears to be a light-sulphated saline. A re-examination is desirable, as this analysis is evidently incomplete. The water is bottled and sold, and the spring is also used as a resort from May to October. The water is recommended in renal and hepatic disorders, dyspepsia, and rheumatism.

James K. Crook.

BLACK DEATH. See *Bubo Plague.*

BLACKBERRY.—Rubus. "The bark of the root of *Rubus villosus* Ait., *R. Canadensis* L., and *R. trivialis* Mx. (fam. *Rosaceæ*)" (U. S. P.). The first mentioned of these species is the common high-bush blackberry of the Northeastern United States, the second is our running blackberry or dewberry, the last is the common sand blackberry of our Southeastern coast region, and this contributes the most of the drug. Experiments with the collecting of the second-named species lead the writer to doubt greatly that it can be collected on a commercial scale. The operation is excessively tedious, and the amount collected in a day extremely small. Both the others are collected with great ease.

The commercial bark is of a rather dark gray brown color, and occurs in slender, rather tough, tightly curved quills, rarely so thick as a lead pencil, with more or less adhering rootlets. Occasionally the wood is contained in them, but they are commonly so tightly closed and cord-like that they appear solid, as though containing the wood, when in reality they do not. The bark is decidedly thick for so small a quill. The drug has little odor, and a very astringent, slightly bitter taste.

Rubus contains about twelve per cent. of tannin and nearly one per cent. of the bitter glucoside villosin, which is soluble in alcohol and slightly so in water. Its properties are merely astringent, due to its tannin. The dose is 2 to 8 gm. (ʒ ss to ij.), and the fluid extract is official. The leaves of blackberry, raspberry, and strawberry are similarly used. They combine considerable gum with their tannin.

H. H. Rusby.

BLADDER. (ANATOMICAL.)—The urinary bladder presents a body, a neck, an apex, and a base, or bas-fond. It is sometimes absent as a distinct organ, owing to an arrest in the development of the parts, when it forms but one cavity with the rectum. It is never double.

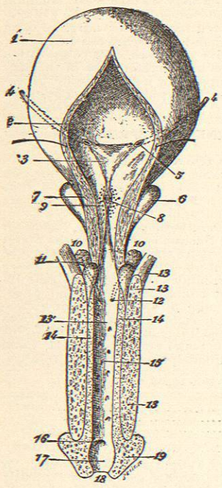

FIG. 483.—Bladder and Urethra. (After Charles Debierre.) 1, Bladder; 2, fundus of the organ; 3, triangle of Lieutaud; 4, 4, ureters; 5, vesical orifice of one ureter; 6, prostate; 7, section of the anterior portion of the neck of the bladder; 8, verumontanum, pierced by the orifice of the prostatic utricle and by the ejaculatory canals; 9, orifices of the prostatic glandules; 10, membranous portion of the urethra; 11, Cowper's glands; 12, opening of outlet from these glands; 13, 13, corpora cavernosa of the penis; 13′, spongy portion of the urethral canal; 14, 14, corpora spongiosa; 15, sinus of Morgagni; 16, valve of Guérin; 17, fossa navicularis; 18, meatus; 19, glans penis.

It may, however, extend in a constricted form up to the umbilicus in those cases of arrest of development in which the urachus fails to undergo obliteration.

In a general way it may be said that when distended to its full capacity, the bladder is about twice as large as the fist of the subject. In this description the organ will be supposed to be distended to its usual capacity.

It occupies the front part of the pelvic cavity and the lower part of the hypogastrium.

The direction of its axis, that is, of the line extending from the apex to the centre of the base, is about the same as that of the upper strait of the pelvis, and therefore the same as that of the body and neck of the female uterus. The direction of the neck is forward, parallel to the line of the axis of the lower strait of the pelvis. The line from the apex to the orifice of the neck would be represented by a curved line corresponding to the curved axis of the cavity of the pelvis.

The bladder is held in its position by the connection of its neck with the pelvis through the short glistening fibres of fibrous tissue called the ligament of the bladder; also by the connection of the apex with the urachus and the umbilicus opening. The reflection of the peritoneum from the abdominal wall to the rectum, along its posterior surface and over the upper part of the lateral surfaces, assists in keeping the organ in position. The bladder is also supported by the rectum upon which the base rests. Thus fixed, it may expand and contract more or less, but it possesses no movement in its entirety.

The shape of the organ is more or less conical, with the base situated below. The anterior surface is in relation below with the posterior surface of the pubis, and,

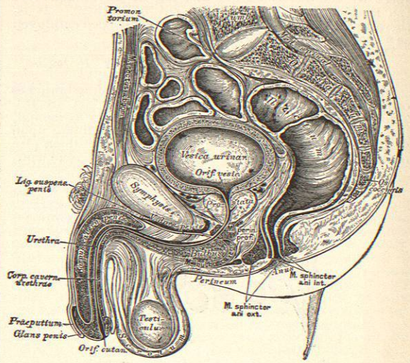

FIG. 484.—Sagittal Median Section through the Male Pelvis. About one-third natural size. (After Heitzmann.)

above the pelvis, with the abdominal walls, *i.e.*, with the posterior surface of the rectus abdominis muscles. It is almost always free, in this locality, from peritoneal covering. There is a thin layer of fat between the walls of the bladder. The posterior surface is in relation with the peritoneum, with coils of the ileum, and with the rectum. The peritoneum forms there the recto-vesical cul-de-sac.

The lateral folds of this recto-vesical cul-de-sac are called by some the posterior ligaments of the bladder. They enclose the obliterated hypogastric arteries and the ureters. The lateral surfaces are covered by peritoneum in the upper and posterior half and are there in relation with the coils of the ileum. But the lower and anterior half of these surfaces is free from peritoneum and is in relation with the pelvic areolar tissue. The obliterated hypogastric arteries cross, obliquely downward, the lateral surface; the peritoneum does not extend in front of this cord. The spermatic duct curves backward along the posterior portion of the lateral surface, passing on the inner side of the ureter.

The apex gives attachment to the urachus. It is covered with peritoneum.

The base is in relation, on the middle line and in front, with the prostate and behind with the rectum. On the side it is in relation with the spermatic duct, seminal vesicles, and the ureters.

The bladder is of a white flesh color. It is a resistant organ; it is contractile. It presents first a peritoneal coat which invests only its apex, its posterior surface, and the upper part of the lateral surfaces. The anterior surface, the lower part of the lateral surfaces, the base, and the neck are entirely free from peritoneum.

The second coat is a muscular coat composed of three layers or sets of fibres. The superficial fibres are formed of longitudinal fibres and are composed of three groups. The upper group comes from the urachus and spreads

over the apex of the bladder. The anterior group comes from the pubis, to which they are attached by glistening aponeurotic fibres called the ligaments of the bladder; they spread over the anterior surface. The posterior group comes from the base of the prostate and expands over the posterior surface of the organ. The middle muscular fibres are more or less circular. They are in greater number around the neck, where they form the sphincter of the bladder or vesical sphincter. They form a sort of elliptical sphincter around the orifices of each ureter. The last and innermost layer of fibres are the plexiform fibres, which have no definite direction. These fibres are not uniformly distributed over the organ, but form bundles more or less prominent which cross one another in all directions. Some of the bundles make quite a projection on the inner surface of the bladder, and may give rise to small pouches or alveoles. The muscular fibres are all of the smooth variety.

The submucous areolar layer is marked, but presents nothing special.

The mucous layer presents nothing of interest except at the base. There the organ presents posteriorly a slight depression called the bas-fond. In front is seen a triangular surface called the trigone; it corresponds to the prostate. The front angle corresponds to the urethra, and the two posterior angles to the openings of the ureters, remarkable for their slit-like shape. The surface of the trigone is smooth, and there the submucous layer is scanty and the mucous membrane is adherent to the subjacent muscular tissue.

The mucous membrane is continuous in front with that of the urethra, and behind with that of the ureters.

The exact nature of the glands which secrete the mucus of the bladder is not well settled as yet, but they are more like single racemose glands than anything else.

The bladder is provided with three arteries on each side, the upper, middle, and inferior. They are derived from the internal iliac.

The veins are specially abundant around the neck of the organ, where they form a marked plexus, the main formative branch of which is the dorsal vein of the penis.

The lymphatics open into the pelvic glands.

The nerves of the body of the bladder come from the sympathetic. Those of the base and neck come from the third and fourth sacral nerves.

The bladder is developed from the cloaca, *i.e.*, the cavity formed by the terminal point of the primary intestinal cord and the pedicle of the allantois. In course of development there is thrown out a transverse partition which separates it from the rectum, and the pedicle of the allantois becomes obliterated and is then known as the urachus.

PECULIARITIES OF THE BLADDER.—The bladder is the largest of all cavity organs and of all the receptacles that are found in the course of the excretory apparatuses of the organs of the body. It corresponds to the gall bladder and to the seminal vesicles. Together with the stomach it is the only organ that is susceptible of considerable enlargement within the bounds of health.

It encroaches upon two large cavities, the pelvis and abdomen. When empty it is flat against the pelvis. The difference of direction of the various axes is worthy of notice. The organ is as it were suspended by its two extremities, the neck and the urachus; but the neck is the most immovable. The urachus recalls the pyramidal process of the thyroid body. Upon close examination the bladder will be found to be really fusiform, the two pointed extremities corresponding to the apex or urachus and to the neck.

The absence of peritoneum on the anterior surface when the bladder is distended is the reason why that surface is the spot chosen when it is desired to penetrate into the bladder. The relation of the base with the rectum makes the exploration by way of the rectum indispensable in many bladder troubles. The presence of the urachus is noteworthy. The mode of attachment and the fixed character of the neck are evidently intended to direct the action of the fibres toward the orifice of the urethra.

The presence of three muscular coats is noticeable; so also is the triple origin of the longitudinal fibres, recalling the similar arrangement of the longitudinal fibres of the stomach. The sphincters formed by the outer fibres around the neck and around the orifices of the ureters are to be noticed. The bundle arrangement of the plexiform fibres is unique. The formation of alveoles on the mucous surface by the projection of these fibres is an arrangement worthy of notice.

The presence of the bas-fond, of the trigone, and of the slit-like orifices of the ureters is peculiar, and so also is the indistinct character of the glands of the mucous membrane. That a small organ like this should be provided with six arteries is remarkable. It is true that the organ is hollow and that the arteries are small. The presence of an abundant venous plexus around the neck of the bladder is to be noted. That the body and the neck possess each a different nerve supply is also striking.

The development of the bladder in common with the rectum is to be remembered; and so also is its common development with the allantois. Arrest of development by which the partitioning of the bladder from the rectum does not take place accounts for those cases in which a cloaca persists into adult life. Failure of obliteration of the pedicle of the allantois explains the persistence of umbilical fistula. The fact that the bladder is developed separately from the urethra accounts for the cases of unperforated urethra in which the development is arrested before the proper time. The arrest of development before the abdominal wall is closed accounts for the cases of exstrophy of the bladder. In fetal life the bladder is distinctly fusiform in shape.

Owing to the smallness of the pelvic cavity in the child the bladder encroaches at that age more on the abdominal cavity.

In old people the muscular fibres become more fibrous and the glands secrete more mucus.

The bladder of the female is said to be larger than that of the male. The transverse diameter is also more apt to be greater than usual in the female sex. The posterior surface is in relation with the uterus, and the base with the vagina. The reflection of the peritoneum from the bladder upon the uterus is called Douglas' cul-de-sac. It extends down to the upper part of the posterior wall of the vagina.

Edmond Souchon.

BLADDER AND URETHRA OF THE FEMALE, DISEASES AND INJURIES OF.—The mode of origin of the female bladder and urethra makes them liable to developmental defects; their situation in the pelvis and their relation to neighboring organs may influence their size, shape, and mobility, and may render them specially subject to trauma and to the introduction of foreign bodies and infectious micro-organisms. Their connection with the kidneys and ureters subjects them to the ever-changing character of the excretion from those organs. Finally, the nature of their anatomical structures is such as to afford a favorable starting point for benign and malignant neoplasms, with or without inflammatory conditions. Either a single one or several of the above factors may be of clinical importance in so far as they possess the power to modify the function of the bladder as a reservoir, to qualify its power to expel its contents, and to interfere with the urethra as a *conduit*.

DEVELOPMENTAL DEFECTS OF THE BLADDER AND URETHRA.

For information in regard to the nature and mode of origin of these the reader is referred to the article on *Teratology* in a later volume.

ACQUIRED DEFORMITIES OF THE FEMALE BLADDER AND URETHRA.

The anatomical relations of the urethra and bladder to the pelvic and abdominal viscera subject them to numerous changes in calibre, contour, and position, and more or less seriously affect their functional activity.