three-color printing processes now in use, it can be quite faithfully reproduced in its original colors.

Preparation of Specimens.—The special preparation of specimens for photomicrography is not at present so necessary as before the introduction of the color-sensitive plate and the color filter. There are, however, certain requirements that have to be complied with if the best results are to be obtained, as, for instance, sections of tissue must be thin, evenly cut, and, above all, they should be flat. Many an otherwise good specimen cannot be used for photomicrography because sufficient care was not taken to get it perfectly flat upon its slide, and with its cover-glass down upon it. Now it must be remembered that the objective has no depths of focus: that is, only those objects or portions of the object in one plane at right angles to the optical axis can be in focus at one time. Any other plane of the object requires a separate focussing of the objective to render its image sharp; and therefore a section only slightly irregular, and which to the eye, (owing to its power of accommodation, which is involuntarily used) seems quite flat, upon being photographed will give a negative for the most part sharply defined, but containing spots or areas of various shapes which are quite blurred. The photomicrographer cannot by any means short of flattening such a specimen obtain from it a good result: for if he should, by stopping down the substage condenser or when possible the objective, seek to render more than one plane of the specimen sharp, he would inevitably introduce errors of refraction which in themselves would spoil the result. Ridges or knife marks, due to the chattering of the knife blade of the microtome when cutting the section, will always show in the photograph. Special staining, as mentioned above, is not necessary, though it is always difficult to secure a good result from a section too deeply or too lightly stained; but in general any section stained so as to show well to the eye in the microscope will make a good photograph.

Limitations.—To photomicrography, as to all other things, there are limitations. These are more especially evident when we seek very high magnifications. As we go beyond one thousand diameters, it becomes more difficult to obtain satisfactory images; and while it is possible to obtain sharp images of certain selected objects, such as a portion of the frustule of a diatom, up to five thousand diameters, it will be found that only such objects as lend themselves to the work can be so taken, and that, except as a *tour de force*, the results are all out of proportion to the labor and time expended. When much higher magnifications than one thousand are desired, the only practical way is first to photograph the object with as high a power as will give a good, sharply defined image (say up to three thousand diameters), and then to enlarge the negative. In this way it is possible to attain magnification of ten or twelve thousand diameters. But again we are limited in this method, as when we attempt to enlarge a gelatin negative more than three or four diameters, the grain of the gelatin begins to become disagreeably apparent and to interfere with the sharpness of outline of the image. It should always be remembered that the magnification of the objective is the only magnification that resolves the details of the object. What further enlargement we may get by oculars of high power, by increased length of camera bellows, or by enlarging the negative, does not add any detail to that resolved by the objective originally; it simply spreads the image as given by the objective over a larger surface. It follows then that to magnify any object further than to make its details clear to the unaided eye is useless and to be condemned. *Edward Leaming.*

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PHOTOTHERAPY. See *Roentgen Ray, etc.*

PHOTOXYLIN.—A nitro-cellulose, similar to pyroxylin, but prepared from wood pulp instead of cotton.

A three- to five-per-cent. solution in equal parts of alcohol and ether is recommended to replace collodion in plastic surgery and other conditions in which such an application is suggested. The solution forms a thick liquid, which upon evaporation leaves a firm, dense film, which is stronger than that of collodion. *Beaumont Small.*

PHRENIC NERVE.—ANATOMY.—The phrenic nerve, or the internal respiratory nerve of Bell, is the principal motor nerve of the diaphragm. The spinal origin in dogs and rabbits is located in the anterior horn of the spinal cord at the level of the fifth and sixth cervical vertebræ, and in man in the centre of the anterior horn, extending from the middle of the third to the sixth cervical segment. The superficial origin of the nerve is from the third, fourth, and fifth cervical nerves in the following proportions:

	Number of cases.	Fourth only.	Fourth and fifth.	Third, fourth, and fifth.	Third and fourth.
Luschka	32	12	7	7	6
Brook	16	4	9	3	0
Green	52	9	21	13	9
Total	100	25–25%	37–37%	23–23%	15–15%

When there is a single root, it is always from the fourth nerve.

COURSE.—The course of the nerve is as described in the standard text-books, there being but few variations. Passing over the anterior surface of the scalenus anticus, diagonally downward and outward, it passes in front of the first part of the subclavian artery and behind the subclavian vein. In about four per cent. of cases, however, the nerve passes in front of the vein, and so lies immediately behind the clavicle. Two cases are on record in which the nerve passed through the vein. Passing into the thorax it lies, on the right side, external to and slightly behind the right innominate vein and the superior vena cava; on the left side, in front of the arch of the aorta. On both sides it passes between the pleura and the pericardium, anteriorly to the roots of the lungs; on the right side being in close contact with the root, and on the left side passing out and to the left, in order to pass around the heart. The right nerve has an almost vertical direction, and passes to the upper surface of the diaphragm, where it divides into from three to six branches, which pierce the diaphragm externally to and in front of the opening for the inferior vena cava. The left nerve has a more circuitous route, and generally divides in the substance of the diaphragm.

Branches.—1. Communicating: (1) From the upper ganglion of the cervical sympathetic gangliated cord. (2) Occasionally, from the loop formed by the descendens and communicans hypoglossi. (3) From the nerve to the subclavius. (4) The right nerve, at its termination, sends branches to the right semilunar ganglion of the solar plexus. (5) The left communicates with the sympathetic plexus to the œsophagus above the diaphragm.

2. Distribution: (1) On the right side, to the superior vena cava. (2) Pleural branches, from one to three in number. (3) Branches to the pericardium, usually three. (4) Luschka has described twigs to the right auricle. (5) Terminal branches to the diaphragm. This is the main distribution of the nerve. It supplies the entire diaphragm except an area along the costal margin, about 3 cm. in width, which is supplied by the lower six intercostal nerves, and an indeterminate area on the crura,

probably supplied by the vagus. The exact area, supplied by the fibres from the various roots of origin, is as yet undetermined. A single case of a dog, in which Schroeder divided the upper roots of origin, and on post-mortem found degeneration of the anterior and middle portions of the muscular portion of the diaphragm, with the lateral and posterior portion intact, is the only case of the kind on record.

RELATIONS.—In the neck the nerve lies on the anterior surface of the scalenus anticus muscle, behind the great vessels and the sterno-cleido-mastoid muscle, the omohyoid muscle and the transversalis colli vein. In crossing the subclavian artery the nerve generally lies external to the origin of the internal mammary, but internal to the course of the artery in its course in the thorax. The other relations have been noted.

The physiological function of the nerve is that of the principal motor nerve supply to the diaphragm.

PATHOLOGY.—1. Paralysis of half of the diaphragm, as a result of inflammation or degeneration of the phrenic nerve, on the corresponding side, as a result of exposure, lead poisoning, or compression, may occasionally occur. The condition generally comes on slowly and is characterized by inversion of the type of respiration, which reduces intra-abdominal pressure, causing difficulty in defecation, etc. Respiration is usually affected only during exertion, when dyspnœa results.

2. Neuralgia. Some authorities describe a form of neuralgia characterized by pain in the lower and anterior part of the thorax, along the line of diaphragmatic attachment, extending up into the neck and along the inside of the arm, with painful areas at the points where the nerve becomes superficial. This condition is said to complicate angina pectoris, Graves' disease, and some forms of cardiac disease.

3. Surgical Pathology. Injury to or division of the nerve may occur in gunshot wounds or stab wounds, or in the course of surgical operations. This complication has generally been regarded as fatal, and the statement has been generally made in the surgical literature that it was necessarily so. A careful review of the literature, however, shows only six cases on record in which the nerve was injured. In all other cases, usually reported as injuries of the phrenic nerve, an examination of the original article shows that some other adjacent structure had been injured instead of the phrenic. Of the six cases of actual injury to the nerve, in the first four (those reported by Schurmayer, Beck, Bardeleben, and Erichsen) there was also injury to some other important structure, which was alone sufficient to cause death. Of the two cases of injury to the nerve alone, the first (reported by Mackenzie) was instantly fatal. The second (reported by Schroeder in 1902) ended in recovery, with paralysis of the corresponding half of the diaphragm. Mackenzie's case was that of an Indian coolie, who suddenly fell dead, and on post-mortem examination the reporter was unable to find any sufficient cause of death, except a rupture of the right phrenic nerve. It hardly follows, however, that the rupture of the nerve was the cause of death.

Schroeder's case, then, is the only one on record in which the phrenic was injured without injury to surrounding structures, and in which the exact extent of the injury was known. In removing a fibroma, which was attached to the borders of the foramen formed by the third and fourth cervical vertebræ, the upper root of the phrenic, coming from the third cervical, was found traversing the upper and outer part of the tumor, while the lower root came from below. As the tumor was thought to be malignant, an attempt was made to dissect the nerve from the tumor; but in doing so, the roots of the nerve were torn off. There was no material change in the patient except an increase of respirations to 32. The nerve was united by sutures, and on being pinched below the suture, the diaphragm responded. There was no cough or hiccough nor any other symptom, either during the operation or afterward, except that the respirations remained at 24 to 32 for four or five days, and then came down to 20. Examination after recovery showed the left half of the diaphragm stationary and two and one-half inches above its normal position. The patient left the hospital completely recovered, and resumed his former occupation.

Experimental Researches.—1. On the Human Being. In eighteen cases of tuberculous glands of the neck, the nerve was pinched during operation with the following results: Contraction of the corresponding half of the diaphragm, with sudden rising of the anterior abdominal surface below the costal arch. In ten cases the right nerve was pinched and the left in eight. In one case on each side there was some pain in the region of the diaphragm, but it subsided in forty-eight hours. The symptoms usually attributed to irritation of the diaphragm (*i.e.*, sneezing, coughing, and hiccoughing) were not observed in a single instance.

2. Experimental Researches on Dogs. In the course of an extended series of experiments on dogs, the following results were obtained: After resecting as much as possible of the cervical portion of the nerve, it was found that after resection of one nerve only, there was an increased thoracic expansion and a slight abdominal retraction, changes which were more evident on the divided side than on the normal side. In case of a double resection there occurred an inverted type of respiration, *i.e.*, decided retraction on inspiration and increased thoracic expansion, due to the action of the accessory respiratory muscles. In unilateral resection kymographic tracings showed that the normal half of the diaphragm rose half an inch on inspiration and fell the same distance on expiration, while the half of the diaphragm on the side on which the nerve had been resected moved only an eighth of an inch, as it was moved passively by the movements of the normal side. After division of the nerve, the diaphragm becomes relaxed and the muscle arches up into the thorax. The type of respiration becomes increasingly costal when one nerve is divided, and inverted when both nerves are cut. The accessory respiratory muscles become very active. There is no sneezing or coughing. In one case of double division the respiration became labored, but remained so for only a few days.

Post-mortem Findings.—In cases in which the dogs were killed in from seven to fourteen days after resection of the nerve, the atrophy of the diaphragm was not great and the color was reddish-yellow. When a longer time had elapsed, the atrophy was marked, the paralyzed part being thin and flabby, the color pale yellow, and in older cases translucent. In all cases there remained a margin from one-quarter to three-eighths of an inch in width at the costal border, which retained its normal color and thickness. This margin is supplied by the intercostal nerves.

Summary.—1. From clinical, experimental, and anatomical data it would seem that the diaphragm is not an essential muscle of respiration, and that the importance of injury to its principal nerve, the phrenic, has been exaggerated. Injury to the phrenic or division of one nerve is not necessarily fatal. It may, however, predispose to lung infection or be followed by diaphragmatic hernia.

2. While the diaphragm is supplied with branches from the lower six intercostal nerves, they are inferior to the phrenic in importance and unable to take the place of the phrenic after division of the latter.

[A full bibliographical list will be found in the February number, 1902, of the *American Journal of the Medical Sciences.*] *William E. Schroeder.* *Frederick R. Green.*

PHTHISIS PULMONALIS. See *Lungs, Tuberculosis of.*

PHYSICAL MEASUREMENTS. See *Naval Hygiene,* and *Recruits, Examination of.*

PICHI.—FABIANA. The dried leafy twigs of *Fabiana imbricata* R. et P. (fam. *Solanaceæ*).

This large evergreen, heather-like shrub is common upon high dry hills in Chile. It is rather closely related to the tobacco plant. Only the small twigs should be collected, though much of the drug of commerce includes the large woody branches, or even the trunks, several inches in diameter. The branchlets are slender and crowded with leaves. The bark is ashy gray and finely roughened by minute, short, sharp, thickly set longitudinal ridges and minute gland-like protuberances, both of which exhibit, under the lens, a peculiar resinous structure. The bark of the trunk and larger branches scales off in ragged strips. The bark is rich in the resinous constituent, which exists also, to a much smaller extent, in the young wood, but is practically wanting from the old wood. The leaves are broadly ovate and thick, about a line long, bluish or whitish-green by reason of the resinous exudation, which is profusely deposited at their bases and edges. Toward the ends of the branches are numerous very short branchlets, each terminating in a persistent white or bluish flower, which is funnel-shaped and from a third to a half-inch long. These flowers are rarely seen in the drug. Five unequal, included stamens are borne upon the constricted portion of the corolla. The style is slender, the stigma small and two-lobed. The fruit is a two-celled capsule, about one-fifth of an inch long, and contains several brown seeds.

The important constituent of pichi is a large and variable amount of a bitter resin. Associated with this is a little volatile oil, the important constituent of which is *fabianol*, and to which the peculiar odor of the drug is due. A fractional amount of the alkaloid *fabianine* and a fluorescent glucoside, occurring in bitter crystals and resembling æsculin, also occur, together with gum, an inert crystalline resin, and ordinary plant constituents.

Pichi is a highly valued drug, both with the laity and with the profession, in Chile and other South American countries, and was introduced into use in the United States by the present writer (*Ther. Gaz.*, 1885, p. 810). Its special repute is for the treatment of vesical and renal troubles arising from the uric-acid diathesis and for the expulsion of gravel and small calculi. It also acts as a sedative to the irritable mucous membrane, modifying the secretion and subduing the pain. The following account of its action and uses, by Beaumont Small, in the preceding edition of this work, can scarcely be improved upon:

"Its use has been extended to all forms of acute and chronic inflammation of the urinary organs, and numerous reports of cases in which it has been employed tell of its beneficial action, not only in cystitis and vesical irritation due to simple causes, but also when these have arisen from gonorrhœal and prostatic disease. A special indication for its use is said to be the presence of pus in the urine. Dr. Reginald Harrison, after using the drug for four years in private and hospital practice, stated that he obtained considerable benefit from it, particularly under the following conditions: (1) In renal colic and the passing of calculi through the kidneys and along the ureters attended with hæmaturia; though not exercising any solvent power, it seems by its action on the tissues in some way to favor the escape of the stone, and thus to suppress the bleeding. (2) In the hemorrhage which frequently accompanies cancer of the bladder. (3) The sedative action of the drug on the mucous membrane of the bladder has proved beneficial in many instances of irritability connected with an enlarged prostate.

"In addition to its employment in urinary disorders, it is recommended for the relief of the headache, dyspepsia, and other symptoms arising from a condition of lithiasis, and has been used as an hepatic stimulant for jaundice and dropsy due to hepatic disease. Given in small doses, preceding the meal, it has been found to be an excellent stomachic.

"The drug is generally administered in the form of a decoction or fluid extract. The decoction is prepared by adding one ounce to twenty ounces of water, the whole to be given in four portions during the day. The dose of the fluid extract varies between ten minims and two drachms. The average dose is from half a drachm to one drachm. The effects of the drug are usually experienced after a few doses have been given. The extract is not miscible with water, and the appearance of the mixture is made more pleasant by rendering it alkaline. Glycerin is recommended as the best vehicle for its administration; it is a fairly good solvent, and maintains the drug in suspension in fine particles. Salines should not be combined with it, as they cause the separation of the resin in dense curds. Fluid extracts of hyoscyamus, hydrangea, buchu, and other remedies may be combined when they are indicated. A solid extract allows of its administration in powder in capsules. The dose is from two to ten grains." *Henry H. Rusby.*

PICRIC ACID.—(*Carbazotic Acid, Trinitrophenol*), $C_6H_2(NO_2)_3.OH$. Picric acid may be formed by adding carbolic acid to fuming nitric acid and heating. It crystallizes in yellow, glistening, laminar or acicular scales. It is soluble in 95 parts of water, and in 16 parts of alcohol. It readily combines with alkalies to form salts, of which ammonium picrate is preferred as a therapeutic agent. Picric acid and its salts form powerful explosives, and many accidents have been due to their careless handling.

Ammonium picrate forms in yellow crystals, soluble in water and alcohol. It has a bitter taste, is odorless, and imparts a yellow color to everything with which it comes in contact.

Picric acid and its salts may produce toxic effects when administered internally, or when absorbed from the skin or abraded surface. It has caused weakness and depression, diarrhœa, colic, black urine, jaundice, convulsions, collapse, and death. It stains the tissues yellow and produces an alteration in the character of the blood. Many cases are reported in which it has given rise to unfavorable symptoms when applied externally in the treatment of burns and skin affections. It also discolors the skin and has produced a vesicular rash and an erythematous condition resembling scarlet fever.

Picric acid in the form of the ammoniate has been suggested as a substitute for quinine in the treatment of malaria and malarial neuralgias. It is given in doses of one-eighth to one and a half grains three or four times a day. Although it has been of service in the hands of some, it has not proved of sufficient value to warrant its continued use. On account of its property of staining the tissues it has also been suggested as a method of treating trichiniasis.

Picric acid is employed locally in the treatment of inflammatory affections of the skin, and for burns and scalds. In erysipelas the application of a saturated solution, which has a strength of nearly one per cent., has proved of value. It is to be applied from five to ten times a day and the solution allowed to dry upon the part. Its power of reducing the inflammation is supposed to be due to the fact that it penetrates the corneous cells of the skin, and by its astringent property acts as a protective to the Malpighian layer of cells; it also acts as a parisiticide upon the specific cause of the disease.

It is recommended in eczema when the inflammation is acute and superficial and accompanied by much itching. It is of less service in chronic forms accompanied by induration of the skin. A compress of the saturated solution is kept applied to the part for several days. It lessens the weeping and pain and promotes healing.

Of late years it has been particularly recommended for the treatment of burns and has been extensively employed for this purpose. It is most serviceable in burns of the first and second degree, as its special effect is to favor the growth of new epidermis. If there is a granulating surface it is of little value. A layer of absorbent cotton, saturated with the solution, is kept applied to the part. Under this treatment the heat and pains subside and the superficial lesions quickly heal. After which, if there are deeper burns and granulating surfaces, they may be treated by other means. Ointments of a strength up to five per cent. have been used, but it has been pointed out that where absorption and ill effects have occurred, these stronger preparations have been employed. The discoloration of the skin may be removed by washing with alcohol or with a solution of carbonate of lithium.

Picric acid has also been used in genito-urinary disorders, urethritis, ear and eye diseases, and many other conditions, but has not met with much favor.

Beaumont Small.

PICROL—di-iodo-resorcin monosulfonate of potassium, $C_6HI_2(OH)_2SO_3K$—is a white, odorless, bitter crystalline powder which contains fifty-two per cent. of iodine, and is soluble in water, glycerin, and ether. It is a soluble substitute for iodoform. *W. A. Bastedo.*

PICROTOXIN.—*Picrotoxinum* (U. S. P.).—A neutral principle obtained from the seed of *Anamirta Cocculus* (L.) W. et A. (*Menispermum C.*, L.; *A. paniculata* Colebr. Fam. *Menispermaceæ*).

The origin of picrotoxin from fish-berries has been explained under *Cocculus Indicus*. The seed alone contains the active principle picrotoxin. This is extracted with boiling alcohol, the solution concentrated and cooled, the fat removed, and the residue treated with boiling water. The picrotoxin is crystallized out from the slightly acidulated decoction, and is afterward purified by the use of alcohol. Several associated alkaloids are liable to occur as impurities of picrotoxin. The substance is thus described by the Pharmacopœia:

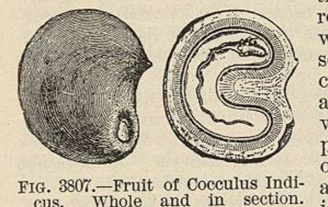

FIG. 3807.—Fruit of Cocculus Indicus. Whole and in section. (Baillon.)

Colorless, flexible, shining, prismatic crystals, or a micro-crystalline powder, odorless, and having a very bitter taste; permanent in the air.

Soluble, at 15° C. (59° F.), in 240 parts of water, and in 9 parts of alcohol; in 25 parts of boiling water, and in 3 parts of boiling alcohol; also soluble in solutions of the alkalies, and in acids. Very slightly soluble in ether or chloroform.

Picrotoxin is neutral to litmus paper.

When heated to 200° C. (392° F.) picrotoxin melts, forming a yellow liquid, and upon ignition it is consumed, leaving no residue.

Concentrated sulphuric acid dissolves picrotoxin with a golden-yellow color, very gradually changing to reddish-brown, and showing a brown fluorescence.

On mixing about 0.2 gm. of powdered sodium nitrate with three or four drops of sulphuric acid, in a small, flat-bottomed capsule, sprinkling a minute quantity of picrotoxin over it, and then adding, from a pipette, concentrated solution (1 in 4) of sodium hydrate, drop by drop, until it is in excess, the particles of picrotoxin will acquire a brick-red to deep red color which fades after some hours.

On diluting 2 c.c. of alkaline cupric tartrate V.S. with 10 c.c. of water, and adding a small portion of picrotoxin, red cuprous oxide will be separated within half an hour at ordinary temperatures, and much more rapidly upon the application of heat.

The aqueous solution of picrotoxin should remain unaffected by mercuric or platinic chloride T.S., tannic acid T.S., mercuric potassium iodide T.S., or other reagents for alkaloids (absence of *alkaloids*).

ACTION AND USES.—The most elaborate study of the action of picrotoxin was that made by Chirone and Testa, whose conclusions were as follows (*London Medical Record*): (1) Picrotoxin is capable of causing a true artificial epilepsy. (2) The epilepsy so induced is independent of the psychomotor centres, inasmuch as it is most intense after the removal of those centres. (3) Picrotoxin acts primarily on the bulb and on the commissural fibres between the cerebral and spinal centres, and secondarily on the spinal centres themselves. (4) It demonstrates the existence of a functional antagonism between the psychomotor and motor centres of the bulb and spinal cord. (5) The convulsive movements of the limbs induced by picrotoxin depend primarily upon the action of the drug on the bulb, which is thence propagated to the spinal marrow, and secondarily upon its direct action on the spinal centres. (6) In frogs the influence on the spinal functions is more marked than upon the cerebral, while in dogs and the higher animals the cerebral motor centres are the most acted upon. (7) By cinchonidine an epilepsy of cerebral, by picrotoxin an epilepsy of spinal origin, can be induced.

From the foregoing it is evident that the action of picrotoxin closely resembles that of strychnine. Besides the use of this substance for poisoning fish, it is said to be a constituent of some arrow poisons and to be employed for the poisoning of vermin. The flesh of fish poisoned by it is said to be dangerous unless early steps are taken to remove the poison from it.

The medicinal employment of picrotoxin is exceedingly limited. It has been recommended in paralysis, epilepsy, chorea, hystero-epilepsy, etc., but has not been very successful. As a retarder of the pulse it might be thought of, but we have already several safer remedies for this purpose. It has been used considerably for the prevention of the night sweats of phthisis; the hypodermic use of gr. $\frac{1}{100}$ to gr. $\frac{1}{50}$ proving very serviceable in many cases of this troublesome condition. It has been used locally in some cutaneous diseases, and as a parasiticide (in the form of an ointment); but it has no advantage for this purpose over less dangerous substances. "Convulsions and death have followed its application to the head" (Brunton); from one to two per cent. of picrotoxin in, say, petrolatum is of sufficient strength for pediculi, etc., if it is desired to use it. Dose, from 1 to 10 mgm. (gr. $\frac{1}{60}$ to gr. $\frac{1}{6}$). *Henry H. Rusby.*

PIEDMONT WHITE SULPHUR SPRINGS.—Alameda County, California. These springs are located three miles from Oakland, and have gained considerable local reputation in the treatment of rheumatism, jaundice, liver and kidney troubles, and disorders of the stomach. There is a well-kept hotel with pleasant grounds at the place, and its nearness to San Francisco makes it available for residents of that city as a day resort. The situation on the western slope of the Berkeley Hills commands a most picturesque view over San Francisco Bay and the Golden Gate. The following analysis by Winslow Anderson shows the mineral ingredients of two of the springs:

ONE UNITED STATES GALLON CONTAINS:

Solids.	The Iron Spring. Grains.	The Sulphur Spring. Grains.
Sodium chloride	5.10	7.91
Sodium bicarbonate	11.70	9.40
Sodium carbonate	.52	6.20
Potassium carbonate	3.15	.76
Potassium iodide	Trace.	Trace.
Magnesium carbonate	6.37	3.17
Magnesium sulphate	1.03	17.80
Calcium carbonate	2.13	3.32
Calcium sulphate	1.60	7.09
Ferrous carbonate	1.73	Trace.
Alumina	.45	Trace.
Borates	5.23	1.90
Silicates	4.19	5.06
Organic matter	Trace.	Trace.
Total solids	43.20	62.61
Gases.	**Cubic inches.**	**Cubic inches.**
Carbonic acid gas	7.25	4.60
Sulphureted hydrogen	Trace.	9.25
Temperature of water	58°	60°

These analyses show that the waters are valuable as a tonic, antacid, diuretic, and aperient; they are useful in dyspepsia, constipation, anæmia, rheumatism, and liver and kidney troubles. *James K. Crook.*

PIEDRA.—(Synonym: Trichomycosis nodosa.)

This is a parasitic disease that occurs on the long hairs, especially those of the scalp. It may affect the beard.

It was first described as occurring only in Cauca, one of the United States of Columbia. A few cases have been reported in Germany and one in this country. It is characterized by the appearance of from one to ten small, dark-colored, very hard and gritty nodes along a hair. When the hair affected by the disease is combed or shaken, the nodes rattle together like stones. This gave the disease its name, which in the Spanish language means stone. The hair itself is unaffected, the nodes being simply attached to it. Women are most commonly affected, men only exceptionally so, and then it is their beards.

ETIOLOGY.—It occurs in warm countries and is a fungous growth. Microscopical examination shows that the nodes are composed of a mass of pigmented spore-like bodies arising from one cell that sends out columns radially in all directions.

DIAGNOSIS.—It differs from the other diseases of the hair in which nodes form, such as trichorrhexis nodosa, in that the hair itself is unaffected. Its nodes differ from the nits of pediculi in their dark color, and in their not being placed on one side of the hair.

TREATMENT.—The nodes can be readily removed by soaking them with a hot solution of bichloride of mercury 1 to 1,000. They can be combed off or pulled off when softened. *George T. Jackson.*

PIGMENT. (PATHOLOGICAL.)—The pigments found in the human body, either under normal or under pathological conditions, are formed either by the body cells themselves (*intrinsic or autochthonous pigment*), or are derived from the bile (*hepatogenous pigment*) or the blood (*hæmatogenous pigment*), or are foreign pigments which are deposited within the body from without (*extrinsic pigment*). The last named may enter the body through the respiratory or the gastro-intestinal tract, or through wounds; or, as in the case of malarial pigment, they may be formed inside the body by the activity of the cells of parasites.

Pigment.	1. Autochthonous..	Melanin. Lipochrome. Hæmofuscin.
	2. Hepatogenous ..	Bilirubin.
	3. Hæmatogenous .	Hæmatoidin. Hæmosiderin.
	4. Extrinsic	1. Carbon. 2. Silver. 3. Lead. 4. Tattoo. 5. Malarial pigment. 6. Various dusts.

1. AUTOCHTHONOUS PIGMENTS.—*Melanin* is found normally in the cells of the rete and in the choroid. It is believed by the majority of writers to be a product of specialized connective-tissue cells (chromatophores), which in the skin lie just beneath the cells of the rete, in the upper layers of the tissue of the dermis. These cells contain fine yellow or brownish granules of melanin, or their protoplasm may be diffusely stained with the pigment. Protoplasmic processes containing the pigment extend from the chromatophores into the epidermis, between the epithelial cells of the rete, and it is believed that the pigment is transferred to the epithelium by means of these processes. The chromatophores are most numerous normally in the skin of the flexor surfaces, about the nipples, external genitals, and anus. They are more abundant in dark-skinned individuals than in those having a light skin. The chemical nature of melanin is not known; it is a nitrogenous body rich in sulphur, and is believed to be a product of the combination of certain split products of albumin that contain sulphur. It does not give a reaction for iron. It is not a derivative of hæmoglobin, but is either built up by cell activity from the end products of albumins circulating in the blood or is formed by the cell from its own albumin.

A physiological increase of melanin occurs during pregnancy, particularly about the nipples, external genitals, and in the median line of the abdomen (linea fusca, chloasma uterinum). This pigmentation is especially pronounced in brunettes. In freckles, tan, lentigines, pigmented moles and warts, etc., the pigmentation is due to an increased formation of melanin by the chromatophores. In various cachexias, but particularly in Addison's disease, there is a greatly increased production of melanin, to such an extent that the individual may become very dark. Melanin may also be formed in excess in or about scars of the skin caused by various skin lesions or eruptions. From an abnormal proliferation of the chromatophores a pigmented sarcoma (melanotic sarcoma) may arise. The cells of these growths produce melanin in great excess, so that their color is usually brown or black. Their metastases, wherever produced, likewise form melanin. Such metastases occur most frequently in the liver; and they often overshadow the primary tumor, which may be of insignificant size, often originating in a small pigmented mole. The excessive production of melanin by sarcoma cells is of the nature of a degeneration; with the formation of the melanin the cells die.

Lipochrome is the coloring matter of fat tissue, corpora lutea, ganglion cells, epithelium of the seminal vesicles, and of the greenish-colored sarcomata known as chloromata. Its chemical nature is not known. It does not contain iron, and is colored black by osmic acid.

Hæmofuscin is the yellow or brownish granular pigment found in heart muscle, striped muscle, and in the unstriped muscle of the gastro-intestinal tract, vas deferens, seminal vesicles, etc. The pigment found in the cells of the glands of the stomach and intestine, as well as in the cells of the lachrymal, mucous, and sweat glands, is by some writers regarded as identical with hæmofuscin, by others as belonging to the melanin group. Its sulphur content favors the latter theory. Hæmofuscin does not give the iron reaction. In atrophic conditions of muscle, particularly when following hypertrophy, the amount of hæmofuscin is either relatively or absolutely increased. The color of such muscle may become a deep brown. This is not infrequently seen in the case of atrophy of heart muscle in failure of compensation for valvular disease (brown atrophy of the heart). Microscopically, the pigment is found to consist of fine yellow granules arranged at the poles of the nuclei, in the form of a cone, the base of the cone toward the nucleus. In all cases the presence of a notable amount of hæmofuscin in muscle cells is to be taken as an evidence of degeneration (pigment atrophy).

HEPATOGENOUS PIGMENT.—*Bilirubin* is found as a pathological pigment in the tissues in icterus. As a result of the appearance of bile pigment in the blood, the skin, conjunctivæ, the internal organs, serous membranes, subcutaneous tissue, blood plasma, urine, etc., are stained yellow in mild or recent cases; but in jaundice of long standing the color may be an olive-green or a deep bronze. The bile pigment gains entrance to the circulation as a result of obstruction to the outflow of bile through the biliary vessels, or through changed conditions of the liver cells brought about by intoxication, infection, or through nerve influences, whereby the secretion of the liver cell, instead of passing into the bile capillaries, passes into the blood. Carried through the body by the circulating blood, the bilirubin gives to all of the tissues a diffuse yellow color. After a time granules of bilirubin collect in the lymph spaces and in the tissue cells themselves, and particularly in the lymph glands, spleen, and bone marrow. In the cells of the connective tissue, liver, and kidney, rhombic plates and needles of bilirubin may sometimes be found. In the kidneys the cells of the convoluted tubules are stained with bile pigment, and in the collecting tubules yellow, brown, or greenish casts are found. The presence of the casts is due to the degenerative processes set up in the cells secreting the bile pigment. In icterus there constantly occurs a deposit of hæmosiderin in connection with the bilirubin, as a result of the destruction of red blood cells by the bile acids.

HÆMATOGENOUS PIGMENTS.—The pigments arising from the destruction of the red blood cells may be classed in two groups: one containing iron, *hæmosiderin*, and one not giving the iron reaction, *hæmatoidin*. The exact chemical nature of these pigments is not known, and the terms *hæmatoidin* and *hæmosiderin* represent groups of related pigments rather than individual pigments. The deposit of derivatives of blood pigment is known as *hæmachromatosis*, that of *hæmosiderin* alone, as *hæmosiderosis*. Hæmatoidin and hæmosiderin in all cases are derived from the destruction of hæmoglobin, either in extravasates or in the circulating blood. *Hæmatoidin* is regarded as identical with bilirubin. It is a ruby-red or reddish-yellow granular or crystalline pigment, soluble in absolute ether, chloroform and carbon disulphide, and insoluble in water and alcohol. With potassium ferrocyanide and hydrochloric acid it gives no reaction for iron. Hæmosiderin occurs in yellowish or brownish granules, which when treated with potassium ferrocyanide and hydrochloric acid give the Prussian blue reaction. With ammonium sulphide it forms a black sulphide of iron. After a time hæmosiderin may lose its iron reaction and become changed to hæmatoidin.

Hæmatoidin is formed when the blood pigment is but little exposed to the action of living cells, as in the central portions of thrombi, or in large extravasates in the tissues, or in extravasates lying in the body cavities. It may be produced artificially by enclosing blood clots in capsules which admit the tissue juices but not the wandering cells, and by introducing such capsules into the peritoneal cavity or beneath the skin.

Hæmosiderin is formed in extravasates, in those portions exposed to the action of living cells, and is usually found around the periphery of thrombi and extravasates, in the area of organization. The pigment may lie free in the tissue, or may be contained within cells. The free pigment and that contained within phagocytes give rise to a pigmentation of the tissue about the extravasate, varying from a light yellow to a deep brown. After hemorrhage into the lung alveoli both hæmatoidin and hæmosiderin granules may be found in the sputum, either free or in phagocytes (pigment cells).

Both *hæmatoidin* and *hæmosiderin* may be carried from the seat of extravasation to the lymph glands and there deposited. Soluble blood pigment in the circulation is deposited partly as hæmatoidin and partly as hæmosiderin, in the spleen, bone marrow, lymph glands, liver cells, and kidney cells; and under certain conditions in the parenchymatous cells of various organs. The greater part of the pigment thus deposited gives the iron reaction, and therefore is to be classed with hæmosiderin. Such deposits of iron-containing pigment occur in pernicious anæmia and pernicious malaria, in poisoning with arsenic, toluylendiamin, potassium chlorate, mushrooms, etc., in overheating of the body, etc. As a result of the destruction of the red cells there occurs a hæmoglobinæmia; an increased amount of bile is formed, and there is an increased excretion of urinary pigment. In the kidneys the hæmosiderin is found chiefly in the cells of the convoluted tubules. In pernicious anæmia the hæmosiderin is found in greatest abundance in the liver cells of the peripheral portion of the liver lobules. Around the central vein the liver cells may contain hæmatoidin. The endothelial cells of the liver capillaries also contain the pigment; in the early stages of the process the pigment may be found only in these, later it is transferred to the liver cells.

If hæmosiderin comes into contact with hydrogen sulphide it becomes changed into a black hæmosiderin hydrogen sulphide. This condition is known as *pseudomelanosis*. It is usually seen after death in the intestinal canal, peritoneum, and suppurating wounds, but its production is dependent upon a formation of hæmosiderin in the tissues before death. It may take place in the living body as the result of hydrogen sulphide produced by bacteria. The green color seen in the early stages of the decomposition of the cadaver is due to a sulphur compound of methæmoglobin, produced by the action of H_2S on oxyhæmoglobin.

A peculiar brown or black pigmentation of cartilage, tendons, and the capsules of the joints occurs in old people, and occasionally in younger individuals. The condition is known as *ochronosis*. By some the pigment is regarded as allied to melanin, by others as a derivative of blood pigment. Neither its chemical nature nor its mode of formation is known. A similar pigmentation of cartilage may be produced by formalin.

EXTRINSIC PIGMENTS.—*Silver* taken into the body as a soluble salt (silver nitrate) is reduced by the cells of the blood-vessels and deposited as free silver or a low oxide in the connective tissue of the kidneys, intestine, skin, intima of large arteries, adventitia of the smaller ones, choroid plexus, etc. The epithelial structures and nervous tissue are alone spared. The pigment appears in the tissues in the form of fine black granules, lying in or between the connective-tissue cells. The condition is known as *argyria*. (See *Argyria*.) *Lead* may be deposited as a grayish-black discoloration of the gums, consisting of granules of sulphide of lead. *Iron* may be taken into the body in excess and deposited in the bone marrow, spleen, and lymph glands (*siderosis*), but this is rarely of a noticeable extent. In iron workers the lungs may acquire a reddish tinge from the deposit of iron-oxide dust. *Carbon* is the most common of the extrinsic pigments. It is usually taken into the body through the respiratory tract and deposited in the connective tissue of the lungs and in the peribronchial lymph glands (*anthracosis*). Under certain conditions, such as softening or tuberculous caseation of the bronchial glands, the carbon pigment gets into the general circulation and is deposited in the spleen, bone marrow, lymph glands, liver, etc. It occurs in the tissues as a deep grayish-black, coarsely granular pigment. *Colored dusts* from pottery clays, pigments, etc., may be found in the respiratory tract of individuals following certain trades. Various *pigments* may be introduced into the body in tattooing. Cinnabar and India ink are most commonly used. The pigment occurs in the connective tissue of the dermis as coarse black granules. The greater part of the pigment introduced into the wound of the skin is carried to the lymph glands, the remaining portion lies in the spaces of the scar tissue formed. As the pigment is constantly removed by wandering cells the outlines of tattoo marks slowly become indistinct. Carbon may enter the body through wounds of the skin: powder marks, cinders rubbed into cuts, etc. Silver particles may also enter the body through the skin or respiratory tract. *Malarial pigment* is a brownish-black pigment formed by the cell activity of the malarial plasmodium. It does not give an iron reaction. By some writers it is incorrectly called melanin. Its chemical nature is wholly unknown. It collects in the small capillaries of the body and is taken out of the circulation by the endothelium and also by wandering cells, and transferred to the tissue cells, chiefly in the spleen and bone marrow.

PATHOLOGICAL ABSENCE OF PIGMENT.—A failure of melanin production leads to the conditions known as *albinism* or *vitiligo*. The absence of pigment may be congenital or acquired. A lack of pigment throughout the skin of the entire body is known as *albinismus universalis;* in certain regions only as *albinismus partialis.* The hair may also be destitute of pigment (*leucotrichia*); and in universal albinism the pigment of the choroid and iris is also wanting. Acquired *vitiligo* is a condition characterized by a loss of pigment over certain portions of the skin, following scarlet fever, typhoid, or recurrent fever; or occurring as an epidemic disease without known cause. Idiopathic cases also occur. With the loss of the skin pigment may be associated a *leucotrichia acquisita.* Vitiligo appears to depend upon an atrophy of the chromatophores; its exact nature is unknown. It may depend upon a disturbance of adrenal function, or of the sympathetic system. A third form of absence of pigment follows infectious inflammations of the skin, leprosy, syphilis, etc.; and is known as *leucoderma.* The