cent. of tannic acid and is a brown, odorless and tasteless, slightly hygroscopic powder, which is insoluble in water, alcohol, ether, or weak acids, but dissolves, probably undergoing change, in weak alkalies. It is said to liberate tannic acid and formaldehyde in the intestine, and for this reason is employed as an intestinal antiseptic and astringent. Schreiber, Meier, and Tittel have reported highly satisfactory results in tuberculous enteritis, and in acute, subacute, and chronic diarrhœas. The dose is 0.2–1 gm. (gr. iij.–xv.) several times a day.

W. A. Bastedo.

TANNOSAL, or Creosal, is the tannic acid ester of creosote, representing sixty per cent. of the latter. It is a dark-brown powder with biting taste and a slight odor of creosote, and is soluble in water, alcohol, and glycerin. As it sets free tannic acid and creosote in the intestine, it is employed as a means of administering creosote in pulmonary tuberculosis, or as an intestinal antiseptic and astringent. The dose is 0.2–1 gm. (gr. iij.–xv.) several times a day. As it is hygroscopic, a solution is marketed containing 1 gm. (gr. xv.) in each tablespoonful

W. A. Bastedo.

TANSY.—(*Tanacetum*, U. S.; *Tanasia*, Cod. Med.) The dried leaves and top of *Tanacetum vulgare* L. (fam. *Compositæ*). Tansy is a perennial herb, native of Europe and Southern Asia. It was introduced into the United States as a cultivated aromatic and has become abundantly naturalized as a weed along roadsides and in waste places. The stems are somewhat tufted, erect, nearly simple, a foot or two, rarely a yard, high; leaves shortly and stoutly petioled, rarely exceeding 20 cm. (8 in.) long and 10 cm. (4 in.) broad, obovate when flattened, pinnate, the pinnæ about ten or twelve pairs, linear-oblong, obtusish, pinnatifid, their segments oblong, acute, incisely serrate or lobed; thin, with a strong midrib, smooth, dark-green, finely depressed-glandular; flower heads in a small, loose, terminal corymb, long-peduncled, yellow, nearly 1 cm. (about ½ in.) broad, having an imbricated, saucer-shaped involucre, a convex, naked receptacle, and numerous yellow tubular florets, which are perfect, or the outer circle pistillate; highly and peculiarly aromatic, the taste pungent and very bitter.

It contains the peculiar bitter substance *tanacetin*, which is amorphous, very hygroscopic, and soluble in both alcohol and water. This imparts the most of the bitter taste, although the volatile oil is also bitter. The latter exists to the extent of about one-fourth of one per cent., has a specific gravity of about 0.955, and is of a yellowish-green color, becoming more or less brown upon exposure. It is soluble in about three parts of seventy-per-cent. alcohol. It is highly aromatic, bitter, and pungent, its important constituent being *thujone* (*tanacetone*). Tansy also contains some tannin, malic acid, and other unimportant constituents.

Besides the properties of tansy as one of the more powerful aromatic bitters, together with the diaphoretic and diuretic properties of its class, it and its oil have been used from time immemorial as anthelmintics. Oil of tansy, and tansy itself in large doses, are poisonous, the general symptoms being similar to those of the coniferous oils (juniper, turpentine, savin, etc.). These symptoms are: great irritation, vomiting, abdominal pain, painful diuresis, convulsions, coma, and death. They belong to the more painful class of poisons. They are also powerfully emmenagogue, though the symptoms are painful and the use of the drug for this purpose is not desirable. They are liable to cause abortion, though they usually fail of this purpose when taken with such intent, as is commonly done.

The dose of tansy is 1 to 4 gm., usually in the form of the fluid extract (1 to 4 c.c.), though this represents the extreme dose which should be used. The oil may be administered in doses of ♏ i.–v. So little as a fluid-drachm of the oil has proved fatal.

Henry H. Rusby.

TAPHOSOTE is a grayish syrupy liquid of faint odor and taste and containing tannic acid, creosote, and phosphoric acid. It is employed in pulmonary tuberculosis and as an intestinal antiseptic and astringent. The dose is 4 c.c. (℥ i.).

W. A. Bastedo.

TAPIOCA.—*Manioca; Mandioca; Cassava Starch.* The starch of *Manihot utilissima* Pohl ("Sweet Cassava") and of *M. Aipa* ("Bitter Cassava"), (fam. *Euphorbiaceæ*).

The genus Manihot contains some eighty species of tropical America. Besides the above species, used as food, the genus is important as a rubber-yielder, by the species *M. Glaziovii* Muell. Arg., a small tree of Brazil. Our only interest in the Manihot is from a dietetic standpoint, if we except the poisonous properties of the bitter variety, due to the presence in it of hydrocyanic acid. The starch-yielding part is the cluster of large fleshy roots, which much resemble sweet potatoes, save in their paler color. These roots, under the above names, as well as that of *Yuca*, constitute the principal edible root crop of Brazil. Their use, boiled and baked, for the table, as well as for bread-making, far exceeds that for the manufacture of tapioca. Even among savage tribes, who had never before seen white men, the writer has seen it thus in use. Although slightly sweetish, it is far more like a white than a sweet potato in flavor. The finely ground pulp, pressed, dried, and then pulverized, is cassava meal, and is made into bread, in huge circular cakes, a yard in diameter and nearly a half-inch in thickness. These are transported in bales, bound with leaves. Their special advantage is to be found in their long-keeping qualities. The taste is negative rather than strongly pronounced, thus well qualifying the article for staple use. Bitter cassava is rarely used in its entirety, but is made into bread, or tapioca, after the poison has been dissipated by fermentation and other processes. The extraction of cassava starch as commercial tapioca differs only in details, as regards convenience, from that of other starches. It is, however, partly hydrated to cause it to form in the peculiarly irregular and hard masses known to us. In many parts of Brazil, dry tapioca is served at table, as a side-dish, as a substitute for bread. This is usually in smoothish, yellowish grains, resembling pebbles, very hard and trying to both teeth and gums. Tapioca is merely an amylaceous food, and has no medicinal properties.

Henry H. Rusby.

TAR.—*Pine Tar* (*Pix Liquida*, U. S. P., B. P., P. G.). An empyreumatic oleoresin obtained by the destructive distillation of the wood of *Pinus palustris* Miller, and of other species of *Pinus* (fam. *Pinaceæ* or *Coniferæ*).

The essential features of tar distillation are the partial burning of a wood rich in turpentine, the heat thus produced serving to expel from the wood near it the volatile and liquid products present, or which form during the process, the volatile ones ascending into the flame and being destroyed, the heavier ones settling downward and being collected as tar. It is almost altogether performed in rude stills constructed in the forest where the wood is gathered. The still is formed by stacking the wood upon a level and hardened spot of ground, surrounding it with a trench leading into a pit and surrounding the stack with a circle of earth and sods, thus preventing the free access of air. The stack is then ignited at the top and slowly burns downward, the expelled tar gradually trickling to the bottom and flowing into the pit, from which it is removed and stored in barrels, in which it hardens and is marketed. The wood used consists chiefly of dead branches and trunks and stumps of the trees which have been killed by tapping for turpentine. Tar is thus described by the Pharmacopœia:

"Thick, viscid, semi-fluid, blackish-brown, heavier than water, transparent in thin layers, becoming granular and opaque with age; odor empyreumatic, terebinthinate; taste sharp, empyreumatic.

"Tar is slightly soluble in water, soluble in alcohol, fixed or volatile oils, and solution of potassium or sodium hydrate.

"Water agitated with tar acquires a pale yellowish-brown color and an acid reaction, yields with ferric chloride T.S. a transient green color, and is colored brownish-red by an equal volume of calcium hydrate T.S."

The composition of tar is highly complex. Its constituents are, as might be expected, closely similar to those of coal tar, the sources of the two differing more in the length of time consumed in the production than in the essentials of the process. A large number of these constituents and their products are considered under separate titles in this work. The more important constituents are contained in the oil, considered below, and in the pyroligneous acid, which, when distilled off, leave *common pitch* or *naval pitch* (*Pix navalis*). In the distillate the acid and the oil separate, either on account of their different distilling points or on account of their different specific gravities. The acid is a source of acetic acid and numerous other substances. The relative percentages of the different portions, as also of the constituents of the latter, differ widely in different tars, depending upon the kind of wood employed, its condition and character, the details of the distillation, etc., so that both tar and tar oil are exceedingly irregular in character. The properties of tar are considered below, under Oil of Tar. Tar is itself employed externally, chiefly in the form of the *ointment* (*Unguentum picis liquidæ*, U. S. P., consisting of 50 parts of tar, 12½ parts of yellow wax, and 37½ parts of lard), and internally chiefly in the form of the *syrup* (*Syrupus picis liquidæ*, U. S. P., containing 7½ parts of tar, 10 of glycerin, and 80 of sugar, with water to make 100). The dose of tar is 1 to 4 gm. (grs. xv. to lx.); of the syrup, about four times as much. Tar is often given in the form of the water, made by thoroughly stirring four ounces of tar in a pint of water, allowing to settle, and decanting. Of this, half a tumblerful may be taken three or four times daily, and it is an excellent antiseptic diuretic.

Oil of tar (*Oleum picis liquidæ*, U. S. P.) is thus described in the Pharmocopœia: "An almost colorless liquid when freshly distilled, but soon acquiring a dark reddish-brown color, and having a strong, tarry odor and taste. Specific gravity about 0.970 at 15° C. (59° F.). It is readily soluble in alcohol, the solution being acid to litmus paper." It contains, as its principal part, creosote, which in turn consists of *guaiacol*, cresol, creosols, and phlorol, and which has been elsewhere considered; carbolic acid in small amount, toluene, xylene, paraffin, naphtalene, pyrocatechin, etc.

Oil of tar possesses, in lesser degree, the antiseptic and poisonous properties of the substances which it contains, as above stated. It has at the same time the diuretic and diaphoretic, as well as the irritant properties of the closely related substance oil of turpentine, though in milder degree, but is more distinctly expectorant than that substance. Its uses, both professional and domestic, depend directly upon these properties. As a counter-irritant, its action is very mild, and it is an excellent chest application for young children. Its antiseptic action is often secured as a constituent of mixtures destined for inhalation purposes. Internally, its chief use is in bronchitis, especially the chronic form, and its internal administration is commonly combined with its use as an application to the chest. Oil of tar is less frequently administered than the syrup, but may be given in doses of ♏ i. to v. or even ♏ x. There is no official preparation.

Henry H. Rusby.

TARASP-SCHULS.—This health station and spa is situated in the Lower Engadine Valley, thirty-four miles from Samaden, with which it connects by diligence twice daily. It consists of the three places, all near together, Tarasp-Schuls, Schuls, and Vulpura. Schuls, 3,970 feet above sea level, is the largest village in the Engadine, and contains about a thousand inhabitants. It is picturesquely situated on a slope of the valley, with the Inn below and, opposite, a stately range of well-wooded mountains, and is divided into an upper and a lower town, in the former of which most of the hotels and pensions are situated. On the high-road separating the two portions of the town is situated the bathing establishment, with eighteen bath- and two douche-rooms for iron and fresh-water baths.

Vulpura is a suburb consisting of large and well-appointed hotels, lying on the opposite side of the river from Schuls, and about two hundred feet above it, on a thickly wooded height. It is at a distance of twenty minutes from the Kurhaus Tarasp, by a good road.

On the high-road about a mile to the west of Schuls are the baths of Tarasp, consisting of an extensive Kurhaus with a "pump-room" and baths, and surrounded with pleasant gardens and parks. The whole country about is most attractive, and affords innumerable opportunities for walks and excursions in every direction, amidst grand scenery and in a pure mountain atmosphere. One who desires to take a course of these waters can conveniently reside at any of the three localities.

The climate of this region is somewhat milder than that of the Upper Engadine, although it partakes of the same general characteristics, viz., a rarefied atmosphere, moderate temperature, dry air and free from dust, protection from high winds, and increased intensity of the sunlight and heat. The mean temperature during the season (June 1st to September 15th) is 57.14° F.; the maximum, 87.08° F.; and the minimum, 33.8° F. The mean relative humidity is from 65 to 75 per cent., and there is an average rainfall of 9.40 inches. There are on an average during the season 39 perfectly clear days, 27 fair ones, 34 more or less overcast, only 6 or 8 of which are actually rainy.

The effect of the climate iss timulating and tonic, and may be rather severe for delicate persons, as sudden changes occur. For one, however, fairly robust and who desires to unite the high mountain air cure with a course of the waters and baths offered here, hardly a more admirable and charming resort could be found. "Scarcely another station in Europe," says Linn, "unites so many important qualities."

There are eight cold mineral springs that are used at this resort, although there are many more in the neighborhood. Four of the springs used yield sulphated alkaline waters of the class known as the "Cold Glauber's Salt Springs," similar to those at Carlsbad. The Lucius and Emerita Springs of this class are used for drinking and bathing; and the Ursus- and Neue Bade Quelle are only used for bathing. The rest of the springs are iron, yielding a gaseous chalybeate water known as "Sauerwasser." Of these the Bonifacius is used for drinking alone; the Wy for drinking and bathing; while the Carola is used for bathing alone. The four springs of Sotsass are used as a favorite table water. Compared with the waters of Carlsbad, Marienbad, Kissingen and Vichy, the Lucius Spring at Tarasp contains about the same amount of sulphate of soda as Carlsbad, but nearly or quite three times as much carbonate of soda and chloride of sodium, and at least three times as much carbonic acid. The carbonate of soda is slightly in excess of that found in the water of Vichy, and the chloride of sodium is about a fourth less than at Kissingen. Marienbad contains more sulphate of soda, but less of the other ingredients.

The analysis of the Luciusquelle by Husemann is as follows:

In Sixteen Ounces of the Water there were:

Sulphate of soda	16.131 grains.
Sulphate of potash	2.916 "
Borate of soda	1.312 "
Nitrate of soda	.006 "
Chloride of sodium	28.216 "
Chloride of lithium	.022 "
Bromide of sodium	.173 "
Iodide of sodium	.007 "
Bicarbonate of soda	37.426 "
Bicarbonate of ammonium	.507 "
Bicarbonate of lime	18.800 "
Bicarbonate of strontium	.005 "
Bicarbonate of magnesia	7.524 "
Bicarbonate of ferric oxide	.165 "
Total amount of fixed solids	113.210 "
True free carbonic acid	33.92 cu. in.

Of the Chalybeate Springs the Bonifacius is the strongest, containing 0.045 per thousand parts of the bicarbonate of iron. The iron baths are heated by a tube through which steam passes, so as to cause comparatively little of the carbonic acid to escape.

Three hours distant from Schuls are the acidulous mineral springs of Val Sinestra, containing a little arsenic. These waters are brought daily to Schuls.

As to the therapeutics of these waters, the four soda acidulous springs are more or less successfully employed in many different functional and organic diseases and conditions, such as obesity, chronic constipation, hemorrhoids, dyspeptic conditions, gall-stones, glycosuria of

FIG. 4594.—View of Tarasp-Schuls in the Lower Engadine, Switzerland.

fat persons, affections of the kidneys and bladder, diabetes, gout. By warming the water before drinking, it can be made to resemble more closely Carlsbad water.

The Chalybeate Springs are used in anæmia and debilitated conditions. In combination with the hydrotherapeutic processes massage is given, and the diet is carefully regulated. Good physicians who speak English are found at this spa.

Most visitors taking the waters usually frequent the pump-room at the Kurhaus Tarasp at an early hour in the morning, at which time there is music. There is a very delightful path along the river from Schuls to Tarasp, a walk over this occupying about half an hour; and the hotel-keepers at Schuls provide (gratis) conveyances which run at frequent intervals during the day between these two places. It is well to be provided with warm clothing, for the weather is frequently cool.

There are several ways of reaching Schuls: by rail to Davos Platz (soon to be extended to and beyond Schuls), and thence by diligence over the Fluela Pass; or, by rail to Landeck, and thence by diligence in eight hours. Coming from the south, one can go by rail to Chiavenna, and thence by diligence over the Maloja Pass and through the Upper Engadine, a long ride, but through grand and delightful scenery; by this route it is well to break the journey at Samaden. *Edward O. Otis.*

TARAXACUM. See *Dandelion.*

TARTARIC ACID ($H_2C_4H_4O_6$).—"An organic acid usually obtained from argols. Colorless, translucent, monoclinic prisms, or crystalline crusts, or a white powder, odorless, having a purely acid taste and permanent in the air." (U. S. P.).

Tartaric acid is soluble in both alcohol and water, very freely in the latter. It forms during the process of fermentation of wine, in the form of the bitartrate or acid tartrate, which is scraped from the insides of the casks in a mass called argols or tartar, or, after purification, cream of tartar. This is converted into calcium tartrate by the action of calcium carbonate in the form of powdered chalk. The calcium is then removed by sulphuric acid, setting free the tartaric acid, which must be carefully freed from traces of potassium, calcium, and sulphuric acid.

Tartaric acid has no special medicinal properties as distinguished from those of its class. It is one of the mild acids recommended for use in alkali poisoning, and it is useful (in the form of the effervescent powder or

Seidlitz powder) for freeing carbonic acid in the production of carbonated liquors. It is also much used as a fraudulent substitute for citric acid in the production of citrate-of-potassium solution. *Henry H. Rusby.*

TARTARIC ACID DIPHENYL ESTER ($C_6H_5COO.CHOH_2$) is a condensation product of phenol and tartaric acid recommended in doses of 0.35 gm. (gr. v.) in gout and rheumatism. It occurs in fine silky needles of faint aromatic odor, which are insoluble in water or cold alcohol, but dissolve in hot alcohol, ether, or glycerin.
W. A. Bastedo.

TARTARLITHINE is a granular effervescent preparation of lithium bitartrate, a salt analogous to cream of tartar. As a uric acid solvent 0.35–0.7 gm. (gr. v. to x.) are given three or four times a day dissolved in a tumbler of water. *W. A. Bastedo.*

TARTROPHEN is a compound of phenetidin and tartaric acid analogous to *citrophen* (phenetidin and citric acid). Its uses and dosage are the same as those of citrophen, but clinical data are lacking.
W. A. Bastedo.

TASTE.—1. DEFINITION AND INTRODUCTION.—Taste is a special sense. A special sense is one provided with specialized end organs and located in structures that are especially adapted to serve the organism in receiving and conducting the stimuli to the sensory end organs.

The sense of taste possesses as specialized end organs the gustatory or taste buds, located on the surface of the tongue, the fauces, the soft palate, and the epiglottis. That the taste buds are the sole organs of taste is far less certain than it is that the eye is the sole end organ of vision. It is true that those portions of the oral mucous membrane which possess the sense of taste are the only places where the taste buds are found. On the other hand, there are many other nerve fibres which possess filaments and other endings in this same region. The other nerve endings in this region are similar to those found in other parts of the body, and serve in those parts the tactile and temperature senses. The tongue possesses the tactile and temperature senses to a high degree. Although our conclusion that the gustatory buds are the sole end organs of taste is reached by a course of inductive reasoning, we may feel secure that our conclusion is a tenable one.

2. ANATOMICAL CONSIDERATIONS.—The taste bud is an epithelial structure composed of spindle-shaped cells grouped in a spheroidal mass with one pole at the surface of the epithelium. The cells may be classified in two orders, the sustentacular and neuro-epithelial. The sustentacular cells when located on the surface of this spheroid are called tegmental cells, and are somewhat larger than those which make up the internal part of the bud. Lying between the sustentacular cells in the midst of the bud are the delicate, spindle-shaped, neuro-epithelial cells, whose nuclei are in the basal portion farthest removed from the epithelial surface and whose external ends terminate in delicate hair-like filaments. Surrounding the nuclear end of the neuro-epithelial cells is a copious arborization of the delicate terminal fibrils of the telodendria of the gustatory neurones. These arborizations may also be found in some cases to surround the inner ends of the sustentacular cells. The taste bud possesses at the epithelial surface a minute pore, through which substances in solution may pass into the taste bud and will be drawn by capillary attraction into the innermost spaces between the sustentacular cells and neuro-epithelium, and thus be brought into immediate contact with the gustatory nerve endings.

Those gustatory nerve fibres which leave the posterior third of the tongue, the fossæ, palate, and epiglottis, pass to the gustatory centre by way of the glosso-pharyngeal nerve. Those which leave the anterior two-thirds of the tongue pass at first into the lingual branch of the inferior maxillary division of the fifth nerve. They all leave the lingual branch and pass by way of the chorda tympani back to the seventh nerve. From here to the gustatory centre their course has not been definitely traced. The clinical evidence seems to favor the view that they pass by way of the seventh nerve into the base of the brain, while experimental evidence as well as observations on the embryonic development of the cranial nerves indicates that the fibres leave the seventh nerve at the geniculate ganglion and pass by way of the Vidian nerve and Meckel's ganglion back to the fifth. Leaving the final course of the lingual gustatory nerves to be determined by further experiment, we may rest assured that eventually they make their way to the same gustatory centre to which the glosso-pharyngeal fibres make their way.

3. PHYSIOLOGY OF THE SENSE OF TASTE.—Many of the perceptions attributed to taste really depend quite as much upon smell as upon taste. We usually apply the term *flavor* to those sensations which depend upon both smell and taste; *e.g.*, one speaks of the flavor of roast beef or of coffee. The fact that closure of the nose impairs the flavor of the beef or coffee indicates that a part of the flavor is to be attributed to the sense of smell. The sense of taste alone seems to be confined to sensations arising from four distinct stimuli: (1) *sweet*, (2) *bitter*, (3) *acid*, (4) *salt*. All purely taste sensations are either modifications of or combinations of these four fundamental sensations. The sense of taste is excited usually by those substances which pass into solution—*i.e.*, insoluble substances are tasteless. It may be noted in passing that mechanical stimuli applied to the gustatory surface are capable of arousing sensations of taste, and the same is true of electrical stimuli. In the case of the latter, the fact that the cathode usually tastes bitter-alkaline, while the anode usually tastes acid, would seem to show that the efficient stimuli are the basic ions which gather at the cathode and the acid ions which gather at the anode respectively. Though this is undoubtedly the way to account for the taste of the cathode and anode in the constant current, it does not throw light upon the fact that taste sensations are also aroused by induction shocks.

The sensation will vary in strength with: (1) the size of the area stimulated, the sensation being more intense the greater the area stimulated; (2) the concentration of the solution, being more intense the stronger the solution; (3) the temperature of the solution, being more intense the nearer the temperature is to that of the blood; (4) the mechanical friction of the tongue against the palate, being stronger with moderate friction than without it.

The sense of taste varies in acuteness (1) through certain hereditary influences, and (2) through cultivation. A good example of marked acuteness of taste acquired by cultivation may be found in professional tea-tasters and wine-tasters.

I. *To Determine the Acuteness of Taste.*—Make four standard solutions, as follows: (1) *Sugar*, 1 gm. of dry saccharose in 100 c.c. of distilled water. (2) *Quinine sulphate*, 1 cgm. in 1,000 c.c. of distilled water. (3) *Acetic acid*, 1 gm. of glacial acetic acid in 1,000 c.c. of distilled water. (4) *Salt*, 1 gm. of dry sodium chloride in 100 c.c. of distilled water.

In the use of these solutions prepare the gustatory surfaces by thoroughly rinsing the mouth with distilled water or with boiled water. Take a uniform quantity of the solution into the mouth at each observation. A convenient quantity is 4 c.c. or a common teaspoonful. Rinse the mouth before each new observation.

The following table gives results obtained by a number of observers. (The numbers indicate the number of parts of water to one of the substance to be tasted.)

Mr.	Sugar.	Quinine.	Acetic acid.	Salt.
A.....	700	1,000,000	7,000	425
B.....	600	500,000	8,000	500
C.....	....	250,000	4,400	....
D.....	300	400,000	3,000	700
E.....	700	.....	4,000	400
F.....	400	400,000	6,000	600

Mr.	Sugar.	Quinine.	Acetic acid.	Salt.
G.....	333	400,000	6,000	....
H.....	500	400,000	4,500	480
I.....	500	450,000	6,000	325
J.....	650	200,000	7,500	325
Average.....	1 to 520	1 to 444,000	1 to 5640	1 to 469

Besides the results here recorded, numerous data were furnished by other observers.

This table and the supplementary data justify the following conclusions:

1. The acuteness of taste for sugar varies from 1 part of pure cane sugar in 300 parts of water to 1 in 708, with an average of 1 in 520.

2. The acuteness of taste for salt varies from 1 in 325 to 1 in 700, with an average of 1 in 469.

3. The acuteness of taste for acetic acid varies from 1 in 3,000 to 1 in 8,000, or an average of 1 in 5,640.

4. The acuteness of taste for sulphate of quinine varies from 1 in 200,000 to 1 in 1,000,000, with an average of 1 in 444,000.

From these results it is evident:

5. That there is considerable individual variation.

6. That the taste is most acute for the less common stimuli of bitter and acid than for the more common stimuli of salt and sweet.

7. Several subjects recorded a marked decrease in the acuteness after the use of tobacco.

8. One subject recorded a noticeable increase in the stimulation when the solutions were warmed from 20° to 40° C.

9. One observer found that the tip and edge of the tongue were more acute than other parts of the tongue in detecting slight differences in the strength of the solutions.

10. One observer, reporting a series of very careful experiments upon four individuals, three of whom are members of the same family and accustomed to the free use of salt and vinegar in their regular diet, concluded that the fourth individual, not accustomed to the free use of salt and vinegar, has a greater sensitiveness for saline and sour substances than have the three individuals who are so accustomed.

As to the interval of time between the application of the stimuli and the taste perception, the observations seem to justify the following conclusions:

11. The interval between stimulation and sensation (latent interval) varies inversely as the number of papillæ per unit area in the portion of the gustatory apparatus stimulated.

12. The interval between stimulation and sensation varies directly as the blood supply of the part at the time of stimulation.

II. *To Determine Localization of the Sense of Taste, i.e.,* to find whether there are areas of gustatory region which are especially sensitive to particular stimuli—quinine, for example.

Solution.—Through the aid of a probang or a camel's-hair brush apply to different limited areas of the tongue, palate, or fauces either the standard solutions given above or somewhat stronger solutions of the same substances.

Results.—The accompanying figure gives the results which coincide substantially with those of other observers: Outline of tongue showing location of tonsils (*T*), foramen cæcum (*F.C.*), circumvallate papillæ (*C.P.*), and fungiform papillæ (*F.P.*) upon the left side, while the right side shows the outline of the area particularly sensitive to quinine (——), acid (....), salt (—.—.—), and sugar (- - - -) respectively.

"O. Ehrwall has examined the different fungiform papillæ over the tongue with reference to their sensitiveness to taste stimuli. One hundred and twenty-five separate papillæ were tested with succinic acid, quinine, and sugar. Twenty-seven of the papillæ gave no response at all, indicating that they were devoid of taste fibres."

[It may be suggested in passing that perhaps the twenty-seven papillæ were sensitive to salt alone.—W. S. H.]

"Of the remaining ninety-eight, twelve perceived acid alone, three perceived sugar alone, while none was found which reacted to quinine alone. The fact that

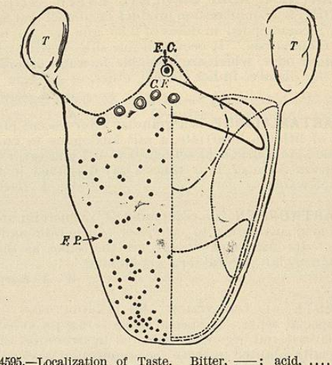

FIG. 4595.—Localization of Taste. Bitter, ——; acid, ...; salt, —.—.—; sweet, - - - -; *T*, Tonsils; *F.C.*, Foramen cæcum; *C.P.*, Circumvallate papillæ; *F.P.*, Fungiform papillæ. (Hall: "Text-book of Physiology." Lea Bros., Philadelphia.)

some papillæ respond to only one form of taste sensation is evidence in favor of the view that there are separate nerve fibres and endings for each fundamental sensation, but a majority of the papillæ (eighty-three) are provided with more than one variety of taste fibres." (Henry Sewall, in "American Text-book of Physiology.")

Winfield Scott Hall.

TATE SPRING.—Grainger County, Tennessee.

POST-OFFICE.—Tate Spring. Hotel and cottages.

ACCESS.—Viâ Morristown and Cumberland Gap Railroad to Morristown; thence ten miles by carriage to spring.

This resort is 1,400 feet above the sea-level, and is located in a charming valley environed by mountains 3,000 feet in height. It may be regarded as one of the strictly first-class summering places of the Tennessee Mountains. The beautiful and picturesque scenery and genial climate are supplemented by the addition of two excellent modern hotels and numerous cottages. There is but one spring, which yields one hundred and twenty gallons per hour. The following analysis was made in 1872 by T. S. Antisill, professor of chemistry in the National Medical College and chemist to the United States Department of Agriculture: One United States gallon contains (solids): Calcium sulphate, gr. 160.66; magnesium sulphate, gr. 32.91; sodium sulphate, gr. 8.50; potassium sulphate, gr. 1.54; sodium chloride, gr. 40.27; iron chloride, gr. 2.99; magnesium chloride, gr. 0.62; sodium iodide, a trace; calcium phosphate, gr. 1.14; calcium carbonate, gr. 21.56; silica, gr. 2.70; nitric acid, gr. 0.02. Total, 272.91 grains. The analysis shows a saline purgative water with tonic and alterative properties. It has been found beneficial in functional disorders of the nervous system induced by overwork and mental worry, in cases of hypochondria and insomnia, and in chronic metallic poisoning. Some forms of dyspepsia and liver disorders are also improved by its use. The water is now used commercially and shipped by the bottle, case, or barrel to any desired point.

James K. Crook.

TATTOO MARKS.—Tattooing consists in the introduction into the skin of insoluble colored substances which become encapsulated and thus form permanent

stains. Microscopical examination of sections from tattoo marks shows that they consist of relatively large particles of pigment, situated part of them in the corium, but the larger part in the subcutaneous connective tissue. Particles of pigment are found also in the contiguous lymphatic ganglia. Powder stains, coal-dust stains, and similar stains produced by the accidental embedding in the skin of particles of colored substances, usually carbon, are in all essential characteristics identical with tattoo marks. One form of accidental marking of the skin to which attention should be called is the whitish marks which occasionally result from the precipitation of lead in the tissues during the use of subacetate-of-lead solution or lead and opium wash upon superficial wounds involving the connective tissue. The danger of these stains on the cornea from the use of subacetate of lead in the eye is well known. A staining of the skin which is in all essentials of the same character as these we are considering, but which is produced from within, is argyria, in which there is a precipitation of silver in the derma and subcutaneous tissue after the long-continued internal use of silver. The writer has seen a marked argyria in one case in which the silver was not being taken internally, but had been used daily during more than a year in the form of a solution of the nitrate for painting patches of leukoplakia buccalis.

Tattooing is one of the most primitive efforts of man at personal adornment. Like many other things that have their origin in vanity, various kinds of significance are attached to the practice, but the underlying reason for tattooing, not only among the primitive races, but among the civilized, rests probably upon an inherent barbaric taste for distinctive personal decoration. Among uncivilized peoples and among nations in a relatively low state of civilization, like the Orientals, the practice is general, and is often carried to the most extravagant extent. Among Caucasians, aside from its general use among sailors, it is largely confined to those individuals of both the lower and the higher classes who readily accept anything that is bizarre or that gives them a fancied distinction.

Brault divides tattooing among primitive peoples according to its significance, as follows: First, religious tattooing, as in the priests among the Polynesians; second, ornamental tattooing, seen in the Algerians, Tunisians, and in the inhabitants of Oceanica and Japan; third, therapeutic tattooing, practised in Tunis, in Egypt, and in the Congo region; fourth, distinctive tattooing, practised amorg the Arabs and negroes of Africa, for the purpose of defining not only different tribes, but also certain callings; fifth, obscene tattooing, which is found only rarely among savages, but which is very common among sailors and criminals.

Practical uses of tattooing are very limited. As a means of identification tattoo marks are of course valuable, and the tattooing of habitual criminals has been suggested as a means of their ready identification. Several years ago de Wecker suggested the tattooing in black of leucomatous areas on the cornea. The method has not had very wide application, and is of course not free from danger. Very recently the highly artificial suggestion has been made of tattooing the flush area of the cheeks to represent a healthy blush. It is interesting to try to imagine how this healthy blush would appear on the faded skin of later life.

Designs of the most elaborate character are often seen in tattoo marks, many of them showing some artistic taste and considerable technical skill. The extent to which tattooing has been carried in some individuals has been limited only by the cutaneous surface. In the well-known case of the tattooed man from Burmah, illustrated in Hebra's Atlas, the entire surface was occupied by tattoo marks. Numerous other cases of almost as great extent have been seen.

The usual method of tattooing is first to outline upon the surface the design, and then to prick out this design with a needle or a bundle of needles, and after that to rub in the pigments. For dark blues and blacks, carbon in some form is used, charcoal, lampblack, India ink; other pigments used for various colors are cinnabar, carmine, indigo, Prussian blue. The dangers of tattooing, at the hands of the unskilled persons by whom it is usually practised, are by no means small. All sorts of infections are possible: lymphangitis, erysipelas, chancroid, tetanus, tuberculosis, leprosy, and syphilis. Many cases of syphilis transmitted by this method are recorded in the literature. The means of transmission—by the saliva of the operator, the use of an infected needle, subsequent infection of the unhealed wound—are manifest.

Much ingenuity has been exercised in attempts successfully to remove these marks. The treatment of powder stains and similar stains is largely a matter of mechanical removal, and to be successful this must be done immediately after the production of the marks, before the particles of pigment have become so disintegrated that their mechanical removal is impossible. The individual masses of pigment have to be patiently picked out, for which purpose an iris needle or a small sharp-pointed knife is most convenient. The method requires great patience both on the part of the operator and on that of the patient, but if thoroughly done immediately after the injury it gives satisfactory results. A certain amount of anæsthesia may be obtained by the application of small quantities of weak cocaine solution or by the use of an ointment of ten- to twenty-per-cent. orthoform in lanolin. In connection with the mechanical removal of the particles of pigment, the use of a strong solution of H_2O_2 as a bleaching agent has been suggested, and it is perhaps the best antiseptic for use in these cases; but it is hardly possible that powder stains or coal-dust stains could be bleached by this means, since at the body temperature carbon (which causes most of the discoloration) cannot be bleached with oxygen.

The principle of almost all of the methods for the removal of tattoo marks is their destruction by mechanical means or by the production of a destructive inflammatory process which causes a superficial eschar. Very small stains can be destroyed by the use of the cutaneous punch or by electrolysis or by excision. In using electrolysis the needle attached to the negative pole of a battery with a current of from two to ten milliampères is inserted at various points around the periphery of the marks, and a sufficient reaction is produced to cause the destruction of the involved tissue. In a few days after the application a dry superficial eschar forms, which is thrown off, leaving a white scar. Of course these mechanical methods can only be applied to very small lesions on account of the scars which they produce. The various methods for the treatment of larger lesions depend upon the application of some chemical irritant which sets up an acute inflammatory process sufficiently intense to cause destruction of the superficial layers of the skin. Many irritants have been suggested for this purpose: chromic acid, carbolic acid, acetic acid, tincture of cantharides, potassium nitrate, etc. The two methods of treatment after this principle which have been most definitely worked out are those of Variot and Brault.

Variot's plan of treatment, according to Brocq, is as follows: First, he places on the tattoo marks a concentrated solution of tannin, and tattoos this in. Then a silver-nitrate pencil is rubbed vigorously over the surface. The action of the silver nitrate is allowed to go on for some moments until the surface becomes black from the formation of silver tannate in the superficial layers of the skin. In the next few days a slight inflammatory reaction occurs, and over the surface treated a closely adherent dark crust forms. After the third or fourth day there is no pain except when there is movement of the muscles under a large crust. Occasionally there is a little suppuration under the crusts, but if secondary infection is avoided no severe inflammation occurs. After fourteen or sixteen days the crust comes off spontaneously, the corium and the epidermis underneath have been repaired, and the locality of the mark is recognizable only by a superficial pink cicatrix which gradually be-