Aerotherapy is chiefly of value in all forms of hyperæmia and congestion of organs, and in anæmias and cachexias.

In phthisis the earlier it is employed the greater will be the advantages derived from its use. Its proper rôle is that of a prophylactic, and in the treatment of the earliest stages, as during these periods the action of the lung is diminished and the areas of congestion are only beginning. It should not be employed during acute inflammation, nor when the morbid process is approaching the stage of softening. If there is any tendency to hemorrhage it should not be used. The contraindication to its use in these conditions arises from the disturbance to which the affected areas are subjected, at a time when nature calls for rest, with a hope of cure. In pleurisy with effusion, absorption may be accelerated; and at the termination of empyema, when the chest wall is contracting, it is a most rational treatment to overcome or prevent the consequent deformity.

In all conditions in which the blood is anæmic and the various organs are deficient in action, it forms a valuable adjunct to massage, baths, and other hygienic measures. It rapidly improves the character of the blood and promotes tissue change, which with proper medicinal treatment will lead to the most satisfactory results.

The increased blood pressure that follows its use requires it to be employed with much caution in all forms of cardiac and renal disease, in which there are any degenerative changes in the vessels.

The density of the air required in this form of aerotherapy is very much less than that to which the patient is submitted in the pneumatic chamber. Instead of ranging from one-fifth to one-half of an atmosphere, it should vary from one-eightieth to one-thirtieth of an atmosphere. This difference is determined by the greater expansive force of the compressed air, when the external pressure on the thoracic walls is not increased. The inhalations should be taken regularly twice and even three times a day, and should continue for from half an hour to one hour. Solis-Cohen recommends the patient to inhale for ten minutes and then to rest for the same space of time. The inspirations should be made standing, if possible; they should be slow and deliberate, and everything should be done to facilitate the expansion of the lung.

Beaumont Small.

AEROTONOMETER. See *Respiration.*

AEROZOL. — A proprietary remedy representing twenty-five volumes of ozone dissolved in certain volatile oils.

W. A. Bastedo.

ÆSTHESIOMETER.—The word æsthesiometer is derived from the Greek *αἰσθάνομαι*, I perceive, *αἴσθησις*, perception, sensation, and *μέτρον*, a measure; thus meaning literally a measure of sensation; and it is used to denote an instrument which measures that form of sensation known as tactile sensibility (*Tastsinn* in German).

Tactile sensibility or the sensations of tactile impressions may be considered as comprising the sensations of touch, of locality or position (*Raumsinn, Ortsinn*, in German), and of temperature. The sense of touch is in this sense nothing more than a sense of pressure applied to the skin. These sensations differ in certain important respects from the *general* or *common sensations*, which include pain, sensual pleasure, and perhaps hunger and thirst.

Æsthesiometers, properly so called, are instruments for testing the sense of locality. The first one used, one which under slight modifications still retains its place, is that of E. H. Weber, who, in 1829, appears to have published his first account of his investigations in regard to the sense of locality. The instrument had probably, however, been for some time in use at that date, for in 1846 he refers to its use twenty years ago. It consisted simply of a pair of compasses with cylindrical arms, the points of which were so ground down that their ends had a diameter of one-third line, so that they should produce simply a sensation of touch and should avoid any sensation of pain. To use this instrument it was only necessary to place the two points upon the skin of the person to be examined, care being taken at the same time that he should not see whether both points or only one touched his skin, and by examination to find out at what distance from each other it was necessary that the points should be in order that they should be distinctly felt as separate. For in any portion of the skin two distinct points, if placed near enough together, will be felt as only one.

Weber found that the sense of locality, that is, the distance at which the points could be distinguished as two, varied much in healthy individuals in different parts of the body, and varied also somewhat, especially on the limbs, according to the direction in which the points were placed, whether longitudinally, obliquely, or transversely. His figures and those of Valentin for the normal distance between two points, which can be distinguished as such in the various parts of the body, are as follows:

Table of Variations of the Sense of Locality in Different Portions of the Skin (Weber and Valentin).

[The subjoined table gives the mean minimum distances (in Paris lines) for different parts of the body between the points of the æsthesiometer at which two impressions can be distinguished when the points are applied simultaneously. The first column gives the results of the experiments of Weber, the second of those of Valentin, while the third column (also from Valentin) gives the relative obtuseness of each portion of the body, the most delicate part, the tip of the tongue, being taken as the unit of measurement.]

Part of Surface.	Weber.	Valentin.	
		Mean.	Relative obtuseness.
Tip of tongue	0.50	0.483	1.000
Palmar surface, third phalanx of forefinger	1.00	0.603	1.248
Palmar surface, third phalanx of middle finger	1.00	0.706	1.462
Palmar surface, third phalanx of ring finger	1.00	0.723	1.497
Palmar surface, third phalanx of thumb	1.00	0.725	1.501
Palmar surface, third phalanx of little finger	1.00	0.733	1.518
Red surface of under lip	2.00	1.500	3.106
Red surface of upper lip	2.00	1.520	3.147
Palmar surface, second phalanges of fingers	2.00	1.558	3.226
Palmar surface, first phalanges of fingers	....	1.650	3.416
Dorsum of tongue (one inch from tip, Weber)	4.00	1.916	3.967
Dorsal surface, third phalanges of fingers	3.00	2.125	4.400
Portion of lips not red	4.00	2.208	4.572
Tip of nose	3.00	2.250	4.658
Edge of tongue, one inch from tip	....	2.478	5.130
Palmar surface of the metacarpus (capitula ossium)	3.00	2.625	5.434
Lateral surface of dorsum of tongue	....	2.500	5.176
End of great toe (plantar side of last joint, Weber)	5.00	3.250	6.729
Metacarpal joint of thumb	4.00	3.333	6.901
External surface of eyelids	5.00	3.833	7.936
Palm of hand	5.00	3.833	7.936
Dorsal surface of second phalanx of thumb	5.00	3.893	8.660
Dorsal surface of second phalanx of forefinger	5.00	3.893	8.060
Dorsal surface of second phalanx of middle finger	5.00	3.900	8.075
Dorsal surface of second phalanx of little finger	5.00	3.943	8.163
Dorsal surface of second phalanx of ring finger	5.00	3.971	8.221
Centre of hard palate	6.00	4.042	8.369
Mucous membrane of lips near gums	9.00	4.125	8.540
Skin of cheek over buccinator	5.00	4.541	9.402
Skin of cheek over anterior part of malar bone	7.00	4.620	9.565
Dorsal surface, first phalanges of fingers	7.00	4.917	10.180
Prepuce	....	5.100	10.559
Dorsal surface of heads of metacarpal bones	8.00	5.250	10.869
Cheek, over posterior part of malar bone	10.00	5.286	10.944
Plantar surface of first metatarsal	7.00	5.875	12.164
Lower part of forehead	10.00	6.000	12.422
Back of hand	14.00	6.966	14.423
Lower part of hairy scalp in occipital region	12.00	8.292	17.168
Surface of throat beneath lower jaw	15.00	8.292	17.168
Back of heel	10.00	9.000	18.634
Pubes	....	9.200	19.048
Crown of head	15.00	9.583	19.840
Patella and surrounding parts	16.00	10.208	21.135
Areola around nipple	....	12.066	24.982
Dorsum of foot, near toes	18.00	12.525	25.932
Axilla	....	13.000	26.915
Skin of forearm (upper and lower extremities of forearm, Weber)	18.00	13.292	27.520
Back of neck (over spinal column, Weber)	24.00	13.292	27.520
Upper and lower extremities of lower leg	18.00	13.708	28.381
Penis	18.00	13.850	28.675
Acromion and upper part of arm	18.00	13.886	28.708
Sacral region	18.00	14.958	30.969
Sternum	20.00	15.875	32.867
Gluteal region	18.00	16.625	34.420
Middle of arm	30.00	17.083	35.368
Middle of thigh	30.00	17.633	36.507
Spine near middle of cervical vertebræ	30.00	18.542	38.389
Spine near fifth dorsal vertebra	24.00	19.000	39.337
Lower part of thorax, and over lumbar vertebræ	24.00	19.912	41.225
Middle of dorsal vertebræ	30.00	24.208	50.120

Foster gives the following figures in millimetres obtained by the use of a pair of compasses (a Paris line equals 2.256 mm.):

Tip of tongue	1.1	mm.
Palmar surface of terminal phalanx of finger	2.2	"
Palmar surface of second phalanx of finger	4.4	"
Tip of nose	6.6	"
White part of lips	8.8	"
Back of second phalanx of finger	11.1	"
Skin over malar bone	15.4	"
Back of hand	29.8	"
Forearm	39.6	"
Sternum	44.0	"
Back	66.0	"

Weber's æsthesiometer is still in constant use, and serves its purpose well, but certain other forms or modifications have been introduced. In 1858 Sieveking published the account of his æsthesiometer in the *British and Foreign Medico-Chirurgical Review.* The principle is the same as that of Weber's, but the form is somewhat altered. Instead of using the common compasses Sieveking has made his instrument in the form of the beam-compass used by mechanics; that is to say, of a solid graduated bar of metal, which terminates at one end in a point running at right angles to the bar, while on the bar slides another point of horn or ivory, which can be fixed at any desired distance from the first by means of a screw on top. A modification of Sieveking's æsthesiometer has been made by Brown-Séquard, who has apparently made both the bar itself and the points lighter, and has done away with the screw at the top of the movable point. In his instrument the points are of steel, and there is a roughened prominence on the side of the second point to enable it to be readily moved by the finger or thumb (see Fig. 55). Nearly all the æsthesiometers at

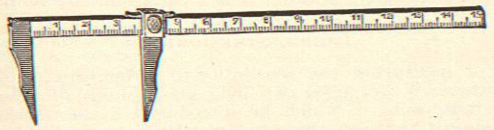

Fig. 55.—Brown-Séquard's Æsthesiometer (reduced in size).

present used are modifications of these two forms. Hammond's convenient little instrument is a modification of Weber's, consisting essentially in allowing the index bar to swing on a rivet fastened to one arm of the compass, the bar, while in use, being held by a catch on the other arm, in which it slides freely. When not in use, it can be lifted from the catch and swings into approximation with the arm to which it is fastened, so that the whole instrument, when closed, occupies but little space and can readily be carried in the pocket. Carroll's instrument is simply a compass, each arm of which ends in two points, one blunt and one sharp, either of which can be used as desired; while Vance's is an arrangement of compass with flattened arms, which shuts up in a case like a penknife.

The delicacy of the sensation of space in various parts of the skin may be tested by the æsthesiometer in two ways. In the first place, as mentioned above, by determining how far apart the points must be placed in order to be felt distinctly as two separate points in any part of the skin; and, secondly, by fixing the points of the æsthesiometer at a certain distance apart and moving the instrument from one portion of the body to another. Thus it is found that the distance of the two points appears to increase when the æsthesiometer is drawn from the cheek horizontally over the mouth, one point resting on each lip, to the median line, and that if continued across that line to the other cheek, the distance appears proportionately to diminish. This method of testing with the æsthesiometer is, however, of no practical use, as we have no means of measuring the strength of our sensations.

From the numerous experiments made in regard to the normal tactile sensibility the following results have been deduced: 1. The points of the æsthesiometer always seem to be farther apart when one point is placed on one side of a natural opening and one on the other. Thus, when one point is placed on the upper lip and one on the lower, they appear farther separated than if both points are placed in a corresponding position on either lip. This in part accounts for the increase apparent when the æsthesiometer is moved from the cheek to the median line in Weber's experiment. 2. Other things being equal, the points of the æsthesiometer seem farther apart when they rest upon different tissues. Thus, for example, when one point is placed upon the mucous membrane of the lip and one point upon the skin, they seem farther apart than when both points are upon either the skin or the mucous membrane. 3. As a rule the points seem farther apart when they are on different sides of the median line than they do in corresponding positions when both are on the same side. This law does not, however, always hold good. 4. The direction in which the points are placed in relation to each other is of considerable importance in certain parts of the body, especially on the limbs. When placed transversely they appear to be at a greater distance from each other than when placed longitudinally. On the body proper there seems to be but little difference, while it is more marked on the face, and more so still on the limbs, especially the lower arms and legs. The cause of this is as yet unknown, but it may be that the skin over different muscles responds more readily to two stimulations than the skin over the same muscle when touched at two equally distant points. (According to Vierordt the relative delicacy of the sense of locality at any point on the skin of a special portion of the body, as compared to that of the other points of the same portion, is a function of its mobility, and increases proportionately to its distance from the axis on which that part moves, since it depends on the relative greatness of the excursions which it effects about its axis through the movements of the part concerned.)

In applying the æsthesiometer certain precautions should always be observed. In the first place, the operator should take especial care that both points are applied as nearly as possible *simultaneously*, as the element of time enters distinctly into our tactile impressions, and the greater the time which elapses between any two impressions of a similar kind, the more readily are such impressions recognized as distinct. For this reason, also, the points, when once applied, should not be moved, for if they be moved, a new sensation, or a series of sensations, will be produced, which will enable us to interpret the impressions more easily. It is a curious fact that, if two points be placed so near together that they are felt as only one, and a third point be drawn across the skin between the two, the sensation of a moving object can be felt, although its position cannot be localized. The impression produced by the points, moreover, becomes clearer the longer they remain in contact with the skin. Hence, in making comparative observations, the points should be held on each place for the same amount of time. In addition to the simultaneousness of the touch the pressure at the two points should be as nearly equal as possible and as slight as possible. As we shall hereafter see, the ratio of the sense of pressure in different parts of the body varies considerably from that of locality, and the two different sensations should be carefully distinguished. For practical purposes, however, the amount of pressure exercised in ordinary cases when due care is taken is not sufficient to affect in any way the result. It is otherwise, however, when a different amount of pressure is exerted on the two points. The force of the stimulus produced at one point is liable so to act that the stimulus produced at the other is perceived but indistinctly or not at all. A third and obvious precaution to be observed in using the æsthesiometer, when testing corresponding portions of the body, is that the points should in each case be placed in the same direction, that is, longitudinally, obliquely, or transversely, as may be, and that they should be on exactly corresponding parts and at an equal distance from the median line. This is of especial importance in pathological cases, where the æsthesiometer is used for the purpose of diagnosis.

In an examination for physiological purposes we must also take into consideration the mental condition of the subject. Whenever the attention is strongly fixed upon any point in the body, sensations produced there by external objects are more readily and more quickly perceived than when the mind is occupied by other thoughts. Hence, when the attention is fixed upon the action of the æsthesiometer, the points will be perceived more readily and more distinctly than would otherwise be the case. The readiness with which the points are perceived and their position determined varies also greatly with practice. Cold diminishes the tactile sensibility, as does also extreme heat. Hyperæmia, as well as anæmia, probably likewise diminishes it.

Baræsthesiometer.

The term baræsthesiometer, from βάρος, weight, and æsthesiometer, has been applied to instruments which are used to determine the delicacy of the cutaneous sense of pressure.

The first attempts to measure the cutaneous sense of pressure were made by E. H. Weber, who for this purpose used weights laid directly upon the parts to be tested, the muscular sense being excluded by firmly sup-

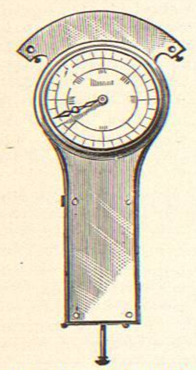

Fig. 56. — Eulenburg's Baræsthesiometer. Front view.

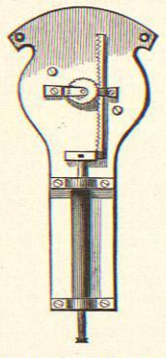

Fig. 57.—Back View of the Same Instrument.

porting the part to be examined upon some solid body. Various weights, as nearly as possible of the same size and same temperature, were applied in succession to the part, and the smallest difference which could be thus detected was carefully determined for each part. Weber himself made use for this purpose of coins (thalers) which he laid upon the forehead, the head being supported, and thus he obtained some important results. According to his researches, the sense of pressure varies much less in the different parts of the body than the sense of locality, and does not vary in the same proportion in the different parts. In the place of coins Kammler and Aubert made use of small discs of cork or elder-pith, on which weights could be placed, while Dohrn estimated the sense of pressure by means of a blunt point attached to the arm of a pair of scales. In 1863 Goltz published the account of his apparatus, by means of which he sought to determine the smallest *rhythmical* pressure which can be perceived on any given part. For this purpose he made use of an india-rubber tube, both ends of which were closed and which was rendered tense by being filled with water. The pulsations produced by the experimenter at one end of the tube were transmitted to the other end, which was laid upon the part to be tested. Goltz's results corresponded with those of Weber for the *sense of locality*, except that the tip of the tongue was found to be proportionately much less sensitive to pressure.

To determine the delicacy of the sense of *variation of pressure*, Eulenburg used the baræsthesiometer which bears his name (Fig. 56). It consists simply of a hard-rubber plate, on to which is screwed a spiral spring through whose greater or less tension a stronger or weaker pressure can be exerted on the plate. This spring is placed inside a case, and can be more or less compressed at will by means of a guiding rod. Through a toothed wheel, which is placed in connection with this rod, an index is set in motion, which marks on a dial plate the amount of tension of the spring, thus showing the strength of the pressure exerted. Each figure on the dial corresponds to a pressure of 1 gm. Eulenburg found that the sensibility to variations of pressure was most delicate on the face, especially the forehead, then on the lips, the back of the tongue, cheeks and temples. Here it is $\frac{1}{30}$, often $\frac{1}{40}$. On the upper extremities it is $\frac{1}{20}$ to $\frac{1}{10}$, and does not vary much in the different parts. In the lower extremities the anterior portions of the lower leg and thigh seem to possess the greatest sensibility; next follow the back of the foot and dorsal surface of the toes, while on the plantar surface of the toes, the sole of the foot, and the posterior portions of the lower leg and thigh the sensibility is much weaker. Löwitt and Biedermann found that by the finger tips the differences between weights which bear to each other the proportion of 29 to 30, could be appreciated, provided the weights were not too light nor too heavy. The power of determining variations of pressure varies in accordance with the amount of the pressure. Except perhaps for minimal pressures, the greater the initial pressure the greater must be the increase of pressure in order that a variation may be felt.

Thermæsthesiometer.

For measuring the sensibility to differences of temperature, Weber used two long glass phials filled with oil, into each of which he introduced a thermometer, passing it through the stopper. By means of this apparatus he found that the skin of the face was the most sensitive, especially that of the eyelids and cheeks. The lips, on the contrary, which are more sensitive to sensations of place, are less so to those of temperature. Moreover, the sense of temperature, as tested in this way, instead of being greatest in the middle of the lips, is greater on the lateral portions of the upper lip, greatest on the cheeks, and less as we approach the median line. In 1866, Eulenburg described his thermæsthesiometer. The instrument consisted simply of a "frame" and two thermometers thereto attached. For "frame" he made use of Sieveking's æsthesiometer, to the bar of which he fastened two exactly similar thermometers which corresponded accurately to each other. Their lower ends were drawn into broad glass bulbs, and flattened at the bottom so as to rest readily upon the skin. These thermometers worked like the points of the æsthesiometer, one of them being fixed at the end of the bar, while the

other could be moved along it as desired, and be fastened at any distance by means of a screw. Thus the distance between the thermometers was determinable at will, and could be estimated by a scale marked on the bar. In using this apparatus, one thermometer was heated or cooled as desired, while the other was left at the temperature of the room. In the following year, 1867, Nothnagel published a series of very careful investigations into the cutaneous sensibility of the temperature, in making which he used a special instrument. Nothnagel's thermæsthesiometer consists of two exactly similar cylindrical vessels, two and a half inches high and one and a half inches in diameter. Their walls are made of wood and are double, some poorly conducting substance, as ashes, being placed between the two parts. The bottom is formed of copper, a good heat conductor. On the top of the vessel is a tightly closing wooden cover which moves on a hinge, and which has an opening on one side. Corresponding to this opening there rises perpendicularly from the edge of the vessel a piece of wood to which are fastened two rings. Through these rings and through the opening in the cover a thermometer is thrust into each vessel, which is partially filled with water, whose temperature may readily be rendered different in the two vessels by plunging into it some good conductor, which has been previously heated or cooled. The vessels should be placed rapidly one after the other on the part to be examined, and the time of contact should last until the subject has formed a judgment in regard to the temperature. Care must be taken that the whole surface of the bottom of both vessels should rest against the skin, since, as is well known, the strength of the impression and the delicacy of the sensibility to temperature grow with the increase in the number of nerve ends affected. By this means Nothnagel determined that the greatest capacity for distinguishing differences of temperature exists when the temperature is between 27° and 33° C.; up to 39° C. it is but slightly diminished, but from thence to 49° C. it diminishes rapidly, and at the latter point pain occurs. From 27° to 14° C. the capacity diminishes in much the same ratio as from 33° to 39° C., but between 14° and 7° C. it falls off rapidly. He found that in different parts of the body the following differences in temperature could be distinguished:

	Centigrade.
Sternum	0.6°
Chest, upper and outer portion	0.4°
Epigastrium	0.5°
Abdomen, upper lateral portion	0.4°
Middle part of back	1.2°
Lateral portions of back	0.9°
Palm of the hand	0.5°–0.4°
Back of hand	0.3°
Forearm—extensors	0.2°
Forearm—flexors	0.2°
Upper arm—extensors and flexors	0.2°
Dorsal surface of foot	0.5°–0.4°
Lower leg—extensors	0.7°
Lower leg—flexors (calf)	0.6°
Thigh extensors and flexors	0.5°
Cheeks	0.4°–0.2°
Temples	0.4°–0.3°

The sensibility to variations of temperature seems duller as we approach the median line. The hand and fingers are generally alike, the lower arm more sensitive than the hand, and the upper arm more so than the lower arm. By extremes of heat or cold a thermanæsthesia is produced. Anæmia increases sensibility to temperature, hyperæmia is said to diminish it.

Kronecker's thermæsthesiometer resembles Eulenburg's, but the latter's thermometers are replaced by metal tubes, each divided nearly to the end by a partition, as in a double-irrigating catheter. Through these water of a fixed temperature can be caused to flow.

Goldscheider studied the topography of the temperature sense by means of warm and cold metal cylinders with a round contact surface 1 cm. in diameter. He also used in other experiments a metal globe which could be heated or cooled.

William N. Bullard.

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ÆTIOLOGY. See *Infectious Diseases.*

ÆTNA SPRINGS.—Napa County, California.

Location.—At the upper end of Pape Valley, sixteen miles northeast of St. Helena.

Access.—By rail via Napa to St. Helena, and thence by stage over a well-graded, picturesque road. Hotels and cottages.

This resort is delightfully situated at an elevation of 1,000 feet above the Pacific, in the midst of wild mountain surroundings. The mountains are well stocked with game, and the streams afford good fishing. There are a number of excellent springs in the neighborhood, those used for drinking purposes having a temperature of 98° F., while those employed for bathing show a temperature of 106° F. The following analysis was made by Dr. Winslow Anderson in 1888:

One United States Gallon Contains:

Solids.	Grains.
Sodium chloride	28.75
Sodium carbonate	73.06
Sodium sulphate	8.92
Potassium sulphate	0.56
Potassium carbonate	13.23
Magnesium sulphate	0.45
Calcium carbonate	8.94
Ferrous carbonate	0.05
Silica	0.09
Organic matter	Trace.
Total	134.05

Carbonic acid gas, 63 cubic inches.

The water is sparkling and invigorating, and possesses a decided tonic influence as well as slight aperient properties. It is a good type of alkaline-saline-carbonate water and, as will be observed, resembles the waters of Ems to quite a marked extent. This water is increasing in favor on the coast, and has already acquired considerable reputation in renal diseases. Good results have also been reported in cases of rheumatism and neuralgia as well as in those of dyspepsia, torpidity of the bowels, hepatic disorders, and uterine disease.

Several other springs whose waters have not been fully analyzed are found close by. They contain more iron than those above mentioned, and are known as the "Iron Soda" Springs. They are much resorted to for anæmia and wasting affections. *James K. Crook.*

AGAR-AGAR.—The name of a large number of East Indian sea weeds which are used in the manufacture of "vegetable gelatin"; also the name of this gelatin. The general nature of these substances is similar to that of chondrus, or Irish moss. It is one of these species which yields the material for the Chinese "bird's-nest pudding." Agar-agar is manufactured chiefly in China, the sea weeds being sent there from other countries for this purpose. It is, however, more or less manufactured in other countries also, especially in Japan, and it is the latter variety which is chiefly used for bacterial cultures. In the country of its production, agar-agar is very largely used for food, both alone and as an ingredient of jellies. It is also very largely employed as a sizing in silk manufacturing. It occurs in thin, transparent, colorless sheets, a great many bound together, or as bundles of long shreds, or in the form of irregularly square sticks, nearly a foot long. The latter form is that generally used in bacteriological work. It is less transparent than either of the others, and is not so white.

Agar-agar consists almost wholly of gelose, a substance the solution of which cools to a jelly, which is much more stable than that of gelatin, requiring a higher temperature for melting. It is said that a solution of 1:500 of water will yield a stiff jelly. Gelose is precipitated by alcohol, but not by tannin.

Gelasine is merely a variety of agar-agar.

Agar-agar has no medicinal properties, its uses being wholly nutritive and mechanical.

H. H. Rusby.

AGARIC, PURGING.—(*White agaric; Touchwood, Spunk, Tinder.*) The decorticated hymenium of *Polyporus officinalis* Fries (*Boletus Laricis* Linn.); order, *Basidiomycetes, Hymenomycetes;* a large fungus growing upon the stems of the European larch and of one or two other conifers. It forms large hoof-shaped masses upon the sides of the trunks, and penetrates with its mycelium deep into the wood. When young they are soft and juicy, but when fully grown hard, and of a consistence between spongy and corky. The masses are collected in Europe, Asia Minor, etc., and usually prepared by drying and peeling. Agaric is in yellowish-white, friable, light, and spongy irregular balls and lumps, from the size of an orange to that of a cocoanut and larger. It has evidently been peeled, and the surface is finely rough and dusty with minute separated particles. The texture is rather firm, but soft; it can easily be reduced to a coarsish powder by friction or by rubbing on a sieve, but is difficult to pulverize finely; its microscopic structure—a tissue made up of interlacing, thread-like cells—explains its peculiar consistence.

Agaric has a heavy fungous odor, and a slowly developing, bitter, nauseous taste, which is at first sweetish. Its powder is very irritating to the eyes and nose, and produces violent sneezing. As it is also light and dusty, persons employed in beating it in mortars are obliged to resort to devices to prevent its rising.

It contains nearly one-third of its weight of resinous matters, extractible by strong alcohol, and these can be separated further into three or four simple resins. The active principle is *agaric* or *agaricic acid.* Commercial *agaricin* is a concentrated extract of agaric, and constitutes an impure and indefinite form of agaricic acid.

Agaric, as its name indicates, was originally used chiefly as a cathartic, but such use is rare at present. It is now rather considered that purgation is indicative of over-dosing. It is, in fact, but little employed in its own form, while agaricin and agaricic acid are growing in favor as remedies for the control of sweating, especially in phthisis. The dose of agaric is 0.02 to 0.06 gm. (gr. iij. to x.). More than this acts as a purgative. (See also *Agaricic Acid.*) *H. H. Rusby.*

AGARICIC (or AGARICINIC) ACID.—($C_{16}H_{30}O_5 + H_2O$.) The active constituent of agaricin. It occurs as a white, almost tasteless powder, soluble in alcohol and with some difficulty in water, and may be given in doses of .02–.03 gm. (gr. $\frac{1}{3}$ to $\frac{1}{2}$), for the same purposes as those for which agaricin is used. (See *Agaric.*)

H. H. R.

AGATHIN.—Cosmin-salicyl-alpha-methyl-phenyl-hydrazone, $C_6H_5CH_3N_2,CH,CH_4OH$. This compound results from the reaction between the basic alphamethylphenylhydrazin and salicylic aldehyde. It occurs in colorless crystals, or in greenish-white crystalline flakes; is odorless, tasteless, insoluble in water, and soluble in alcohol and ether. It was introduced by Roos as a remedy for rheumatism, and it has been found effective in this disease and in neuralgia. It has been known at times to produce headache, but not any of the other symptoms of salicylism. This is one of the rheumatism remedies which do not depress the heart. Dose: gr. iij. to x. from three to six times a day.

W. A. Bastedo.

AGE.—The age of a human being does not, as usually reckoned, correspond to the length of time it has existed, because the ordinary calculation starts from the date of birth, and excludes the preceding period of uterine existence. If we are to be strictly accurate, the age of any animal ought to be reckoned from the time of impregnation, especially if we are to compare different species one with another, in regard to the changes which correspond to successive ages. The act of impregnation creates a new individual, which alters as time elapses, and the liberation from the womb is only one of the alterations, one event, occurring in the life history of the individual; it is therefore artificial arbitrarily to select the date of delivery as the zero point from which to start the reckoning of the age, the more so as we know that the period of gestation varies very considerably in length, and that consequently the age of the child at birth is not by any means uniform. In the case of man it is the most convenient plan to adopt popular custom, because the ages as reckoned from birth are generally known with exactitude, but the age of the fœtus at birth is almost never known for a given individual. Indeed, we have at present no means of determining satisfactorily the age of a human embryo or fœtus, because we have no sufficient available data for ascertaining when impregnation takes place. As is shown in the articles *Fœtus* and *Impregnation*, there is always a possible error of several days in any estimate of the age of a fœtus, even when the history of the case is fully and accurately known, and there are decided reasons for thinking that there may be sometimes an error of a month or whole menstrual period. Obviously it is not practicable to calculate the age of man from an event the time of which we cannot know correctly, and it is the only practicable course for us to follow custom, and assume the commencement of life's journey to be some way along the route, namely, at birth; at least, whenever we have occasion to measure age.

From impregnation to death, at the natural term of life, the organism undergoes a definite series of changes which are termed the phenomena of senescence; in plain words, the organism grows old. The most important, if, indeed, not all the changes, may be grouped under three heads: First, the increase in the number of cells; second, the weight of the cells; and third, the differentiation of the tissues. The first and second are the essential factors of growth, and under *Growth* they are more fully discussed. Unfortunately, we have no knowledge as to the number of cells in the body at different ages, nor is it possible to make even a valid estimate. It appears entirely practicable for some patient investigator to make an approximate determination of the number of cells in the body; a trustworthy result would be extremely valuable. But though we cannot speak of actual numbers, we are able to say that the rate of multiplication of cells diminishes gradually with one or two possible interruptions in man. The demonstration of this law is given in the article on *Growth*. As regards the size of the cells, we know that at first the size is reduced; during the segmentation of the ovum, the amount of material remains nearly constant, while the segments (cells) multiply; hence they necessarily become smaller. During fœtal life they remain small, even after their differentiation into distinct tissues, but it is still uncertain how much of the growth of children is due to the mere increase in size of the histological elements and how much to the increase in their number. The difference between the fœtal and adult cells is readily seen; unfortunately, it is impossible to give a table of comparative measurements, for the micrometric data, even of the best authorities, are, with very rare exceptions, utterly worthless, from their extreme inaccuracy. The structure of the tissues varies according to the age; for each age there is a characteristic phase of development of the histological

elements, both in structure and arrangement; hence the general anatomy and, therefore, also the functions alter in correspondence with the age. Thus, in a philosophical view of the career of any organism, we are compelled to regard it as a function of the time elapsed since the procreation of the individual. It is important to insist upon this conception, because the student of human anatomy derives his notions almost exclusively from the study of the adult, and consequently fails to seize the idea that much of what he conceives to be essential and typical is only temporary.

There is another general consideration to be urged upon the attention of the reader: the older the organism the longer it requires to change. An infant alters more rapidly than a child, an adult more rapidly than an old person. This fact has a more profound significance than at first appears, because it not only suggests the only theory of the origin and nature of natural death having any serious value, but also is the clew to the distribution of variations in age. For the theory of death, see the concluding portion of the article on *Growth*. The law of variations to which we refer demands brief elucidation. Varieties occur in all degrees: with living organisms there is in each case a certain variety which occurs most frequently, and on either side of this most frequent type (geometrical mean) occur other varieties which are found to be less frequent the more they depart from the central type. On the doctrine of chances the distribution should be alike above and below the mean, provided always there is no predominating factor or factors of variation to disturb the symmetry. In the development of living organisms there is such a disturbance through the effects of age; a concrete example shows the phenomenon plainly. The following table, after Heinricius,* gives the ages and number of persons observed in 3,500 recorded cases of first menstruation in Finland. Below the table is given the graphic representation of the same data.

TABLE OF 3,500 CASES OF FIRST MENSTRUATION (observed by HEINRICIUS in Finland).

Ages (years)	11	12	13	14	15	16	17	18	19	20	21	22	23	25	26
No. of Cases	9	33	135	440	765	846	560	347	198	102	41	12	7	4	1

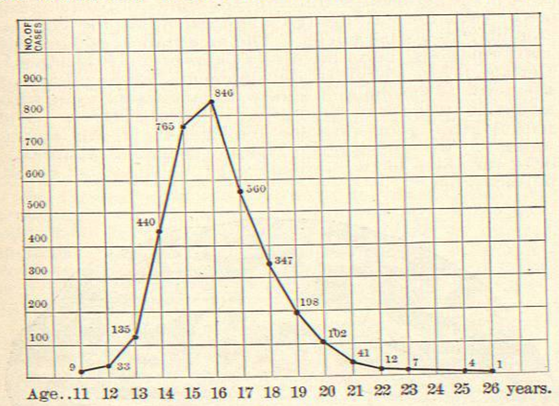

FIG. 58.

The curve shows that the year in which the first menstruation occurs most frequently is the sixteenth, and the further we follow the curve from the maximum, either forward or back, the lower it sinks. Moreover, from the maximum to the minimum is (probably) only seven years on the young side, but ten years on the old side. Here, then, we see that an equal range of variation covers a much shorter period of childhood than of later life. When a larger series of statistics are compiled, the difference in the premaximal and the postmaximal period is found to be considerably greater. This phenomenon occurs not only with menstruation, but with many, and probably all, or nearly all, phases of the development of the body; the time at which a given change takes place varies in different individuals, and, as far as at present known, always according to the law just indicated. In the article on *Growth* another set of facts are brought forward, demonstrating the same principle, which we may now formulate as follows: *The time required to accomplish a change of a given extent increases with the age of the organism.*

It is evident that this generalization needs to be tested with great thoroughness, especially to ascertain whether it is rigidly applicable in details, or only in regard to the whole course of development broadly considered. As no researches have heretofore been made to settle the alternative stated, it is very desirable that they should be undertaken. It may be discovered that diseases and recovery from diseases vary in rapidity in accordance with age, the rate of change decreasing with the age. This can be decided only by extensive statistics in regard to organic diseases. A large number of observations of the progress of fatal new formations—of cancer, for example—would be of high value. It is not to be anticipated that the diseases of a parasitic or zymotic character would exhibit necessarily any such correlation with age, because their course is dependent primarily on other causes than the condition of the organism in which they appear. If the rate of disease does vary with age, the desirability of knowing the fact is too obvious to require further emphasis; we can, therefore, only express the hope that some one having a proper opportunity will soon make an adequate investigation.

It is a common custom to divide the period of life into a succession of ages, but all such divisions are more or less arbitrary; and though extremely convenient, are quite without scientific significance. The ages commonly adopted are: (1) *Infancy*, from birth to the appearance of the temporary teeth; (2) *childhood*, from the cutting of the first permanent teeth to puberty; (3) *youth*, from puberty to the attainment of the full stature, that is, eighteen or nineteen for girls, twenty-one to twenty-two for boys; (4) *maturity*, covers the interval from youth to the climacteric, after which follows (5) the period of decline or *old age*. Another very common distinction is made between the period of development, say up to twenty-five or thirty years, and the period of decline; but, as is explained under *Growth*, there is a steady decline going on during the first period also. It would, perhaps, be more scientific to designate the earlier phase as the period of histogenesis, during which the tissues are being evolved, and the latter as the period of histolysis, in which the tissues are breaking down—degenerating. But, after all, though a great deal has been written and said, very seriously too, upon the division of life into ages, the discussions have never, and can never, lead to much result beyond fixing upon a set of arbitrary terms, which will always be convenient, provided they are left sufficiently vague.

The other matters which might be put under Age are to be found elsewhere, such as the determination of the age of a skeleton, the age at which the teeth are cut, etc For the characteristics of infancy and childhood, anatomical and physiological, see the articles on these topics. For the changes in old age, see *Senility*.

Charles Sedgwick Minot.

AGENESIA, AGENESIS.—(German, *Agenesie;* French, *Agénésie.*) Without generation; without formation; without parents; unborn; undeveloped; possessing no sex. From the latter meaning arose the conception of sterility or impotence, and the early use of the term in medicine was restricted to this meaning. Later, the idea of lack of sexual appetite became included in this, and the word was used by French writers especially with the meaning of anaphrodisia rather than with that of impo-

* Centralblatt für Gynäkologie, 1883, vii., 72 to 73.