Mineral waters have long been regarded of value in the treatment of obesity.

Cathell recommends a course of Vichy and Kissingen waters. They are used alternately, each for a day, a large glass a half-hour after each meal.

These alkaline and saline waters are effective only in so far as they remove fat-forming substances of the food from the intestine by increased peristalsis before absorption can take place.

Baths are of value in increasing metabolism. Hot baths and vapor baths are especially recommended.

Sleep should be restricted to seven or eight hours.

Joseph H. Pratt.

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ADIRONDACK MINERAL SPRING.—Washington County, New York.

POST-OFFICE.—Whitehall.

The water of this spring is found in the markets under the name of the Adirondack Medicinal Water. An analysis by Professor Collier, of the University of Vermont, shows the following results:

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Sodium carbonate	5.14
Potassium carbonate	5.32
Calcium carbonate	18.54
Magnesium carbonate	16.62
Lithium carbonate	0.02
Manganese carbonate	Trace.
Iron carbonate	5.04
Calcium sulphate	11.13
Sodium chloride	14.34
Alumina	Trace.
Silica	0.74
Total	76.89

This analysis shows an excellent chalybeate water. Experience has shown its efficacy in cases of anæmia and general debility, in subacute and chronic articular rheumatism, in muscular rheumatism, and in some of the scaly skin affections.

James K. Crook.

ADIRONDACKS.—This extensive forest and lake region is a plateau studded with mountains and lakes and situated in Northern New York, between lat. 42° 30′ and 44° 30′, long. 74° to 75° 30′ W., being, roughly estimated, 125 miles square.

The average elevation is 1,600 feet, the mountain peaks varying from 2,000 to 5,000 feet, trending in general toward the southwest in several irregular ranges.

The northern and southern boundaries are gradual slopes to the St. Lawrence and Mohawk valleys respectively, while the eastern is more abrupt to Lakes George and Champlain, and the western less so to Lake Ontario.

Geologically, this region is related to the Archean or earliest formation, with glacial drift and moraines much in evidence.

The soil is chiefly light sand, which forms a feature of importance in determining the climate and character of the forest growth.

The lake shores, lowlands, and valleys are wooded chiefly with fir, pine, white cedar, tamarack, red spruce, and balsam. The lesser elevations and foothills have deciduous trees in greater proportion, such as sugar maple, birch, beech, poplar, mingled with a few evergreens, while the majority of the peaks are wooded to the top with firs and spruces.

The combination of dark-green-clad mountains and numerous island-dotted lakes gives at all seasons a landscape of great beauty.

Large tracts of forest are owned by the State and individuals for permanent preserves, insuring protection for fish and game and conserving the water supply. Temporary camps are permitted on State land, and during the trout and deer seasons great numbers of sportsmen find delight in these haunts. Modern camp life for the invalid or convalescent in the Adirondacks is a pleasure hardly surpassed, when all the luxuries are available.

The climate has long been noted for its invigorating qualities. The winters are usually cold and dry, the summers cool but moist, though relatively dryer than coast climates or lowlands.

The porous soil, elevation, and coolness render the moisture less apparent, though the rains are very frequent in summer. Meteorological data for the past six years are now available for the comparison of different sections of the plateau. The mean annual temperature for the whole region is 42.8° F.; average total precipitation, forty-two inches.

The prevailing winds are west and southwest, being much varied and retarded by the mountains and immense areas of forest. The coast winds do not reach inland far enough to affect the climate, but Lake Ontario modifies the western slope, while the northern part is influenced more by the St. Lawrence valley winds, which, especially in winter, sweep across the level plains of Canada from the west.

The precipitation is greater on the southern and western slopes than in the interior and northern portion of the Adirondack plateau, though local conditions appear to influence the amount greatly. Thus at Saranac Lake, in the northern centre, the average annual precipitation for six years was thirty-four inches, yet in the forest, within a few miles, it is manifestly much greater. At the same place the annual mean temperature was 41.7° F., and for the four winter months 19.5° F., with an average of ten rainy days for the winter. The mean summer temperature was 62° F.

Quoting from the Annual Report of the New York Weather Bureau, 1896: "The Adirondack plateau is subject mainly to the same influences which determine the climate of the St. Lawrence valley, excepting that the central and eastern portions of the highlands are not reached by the lake winds. A very broken and heavily timbered surface offers great obstructions to the circulation of air currents, and hence the summer temperature, although the lowest in the State, is somewhat higher than would otherwise be, due to the elevation of the region. . . .

"So far, then, as present records show, the whole of Northern New York has substantially the same average winter temperature, except as certain deep valleys are subject to a local cooling through an accumulation of the colder and denser air. In summer the warmth of the highlands decreases at about 0.3 degree per hundred feet of elevation above sea level, and the average temperature of the Adirondack region at that season is thus reduced to nearly the same level as that which prevails on the seacoast of Northern Maine; the days, however, being warmer and the nights cooler than in the coast region."

There is an excess of cloudy weather in November, December, April, May, and frequently at other seasons; the virtues of the climate being attributable to coolness, altitude, aseptic atmosphere, freedom from dust, rather than to the amount of sunshine.

The suitability of the climate for the cure of early tuberculosis has been amply demonstrated, and arrest or amelioration of advanced cases is secured by a prolonged residence, when the powers of resistance can be stimulated. It has been found beneficial, particularly in summer, for chronic bronchitis and asthma dependent upon it, also for hay fever. The winter is equally good, if not better, for early tuberculosis. It is unsuited for rheumatics, renal cases, and patients beyond middle life.

The principal resort, Saranac Lake, is generally known because of the Adirondack Cottage Sanitarium, founded by Dr. E. L. Trudeau, for tuberculous patients of moderate means. This establishment has one hundred rooms, and was the first people's sanatorium of its kind in America. Twenty-five per cent. of all cases and from sixty to

seventy-five per cent. of the incipient class are discharged apparently cured. One other institution is at present available in this region—the Sanitarium Gabriels, located at Paul Smith's Station, and accommodating sixty patients.

A list of the various resorts in the Adirondack region, with their respective elevations, is appended. Further information can be found in Solly's "Medical Climatology," in Knopf's "Pulmonary Tuberculosis," in guidebooks, etc.

Resort.	Elevation.
Saranac Lake	1,535 feet.
Lake Placid	1,863 "
Tupper Lake	1,546 "
Keene	1,000 "
Elizabethtown	759 "
Old Forge	1,684 "
Fulton Chain	1,700 "
Paul Smith's	1,623 "
Saranac Inn	1,560 "
North Elba	1,685 "
Chazy Lake	1,500 "
Blue Mountain Lake	1,800 "
Schroon Lake	806 "

E. R. Baldwin.

ADONIDIN (*Adonin*).—A glucoside obtained from several species of *Adonis*, chiefly from the root of *A. vernalis* L. It is a light-yellow powder, without odor, but intensely bitter, very hygroscopic, soluble in both water and alcohol. Moisture must be carefully excluded from the containers. As it exists in commerce, it is a mixture of variable degree of purity. Its action is described under *Adonis*. The dose is 0.004 to 0.016 gm. (gr. $\frac{1}{16}$ to $\frac{1}{4}$).

Picradonidin is merely the very pure form of adonidin.

H. H. Rusby.

ADONIS.—*False Hellebore* (family *Ranunculaceæ*). The herb of *Adonis vernalis* L., one of some sixteen species in the genus.

It is a small plant, growing wild in Southern Europe, and somewhat cultivated as an ornamental flower. Owing to the instability of its active constituent, adonidin, it should be carefully preserved in a cool and dry place and should not be kept on hand too long. The plant is poisonous.

Besides the active constituent described above, it contains aconitic acid to the extent of ten per cent. The action of adonis is apparently due altogether to the adonidin, which exists to the extent of 0.02 of one per cent. Its effects are for the most part exerted upon the circulation. Its first and chief action is to stimulate the vasomotor centres and thus greatly increase blood pressure. Next it stimulates the heart directly, increasing both its rate and force, and thus still further increases the blood pressure. This pressure then reacts against the heart and may slow it. If the dose is larger, the inhibitory centres are stimulated, and this markedly slows the heart. The same causes render it a powerful indirect diuretic. The vasomotor stimulation is not long continued, and is succeeded by depression, as is to a less extent the direct cardiac stimulation, the two together causing a sudden fall in blood pressure. If the dose is a poisonous one, death will occur with the heart in diastole. Large poisonous doses cause vomiting and purging. The treatment of poisoning is entirely physiological and symptomatic.

Adonis is used in exactly the same way as digitalis, as a cardiac and arterial stimulant, and is liable to the same contraindications. The greatest difference of opinion exists as to which is preferable, but it appears established that adonis, at least in the form of adonidin, acts more quickly, though the action is not so prolonged, and is more apt to be followed by reaction. No attempts have been made to ascertain whether the tissue of the heart muscle is permanently changed in quality or quantity by adonis, as appears to be the case with digitalis.

Adonis is best given in the form of tincture or fluid extract, which are miscible with water, or as adonidin. The dose of adonis should represent 0.05 to 0.25 gm. (gr. i. to iv.). It is best to begin with a small dose and increase gradually.

H. H. Rusby.

ADRENAL GLANDS.—ANATOMY.—The adrenal glands, formerly known as *capsulæ atrabiliariæ*, from the dark brown color sometimes seen in the medullary portion after death, or *renes succenturiati*, also called suprarenal bodies, or capsules, are classified as "ductless glands," together with the spleen, thyroid, and thymus, since they have no excretory duct. They are situated in the epigastric region, one on either side of the vertebral column, in the posterior part of the abdominal cavity, behind the peritoneum, and they surmount their respective kidneys to which they are attached by connective tissue.

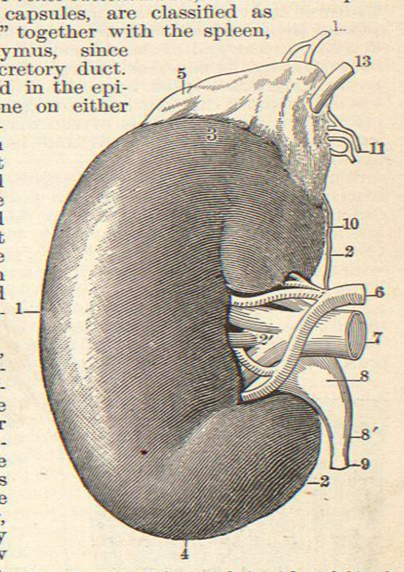

FIG. 48.—The Kidney and the Adrenal Gland of the Right Side Anterior view. (From Testut: Traité d'anatomie humaine, vol. iii.) 1, External border; 2, internal border with 2′ hilum; 3, upper extremity; 4, lower extremity; 5, adrenal gland; 6, renal artery with its branches; 7, renal vein; 8, pelvis with 8′ neck of pelvis; 9, ureter; 10, inferior adrenal artery; 11, middle adrenal artery; 12, superior adrenal artery; 13, large adrenal vein.

They are flat, yellowish, glandular bodies, differing from one another in their shape and relations. In the fœtus these glands are larger than the kidneys, but later, although they continue to grow till adult life, they increase in size more slowly than the kidneys, and consequently the difference in the relative size of the two organs in the fœtus and in the adult is very striking. Thompson thought that this preponderance of the adrenal in the fœtus was a peculiar characteristic of the human gland not shared by that of any other mammal. In childhood these glands are firm and partly translucent at the edges, and they do not contain much fat, whereas this element appears to increase in amount with the age of the individual. The healthy adult organ is never translucent and is less firm than in early age.

The right adrenal is triangular and flattened and has been likened to a cocked hat. It presents two surfaces, anterior and posterior. The anterior surface has three angles, superior, inferior, and external. It is divided into two parts by a groove called the hilum. This groove runs horizontally from the upper outer margin inward, a little below the upper border, then curving downward at the emergence of the capsular vein it runs vertically a little internal to the median border. The upper and inner part of this surface is somewhat depressed, and comprises about one-third the whole area. Its superior part is in direct contact with the liver, while the median part lies behind the inferior vena cava. The external two-thirds of the anterior surface of the capsule is separated from the liver by its covering of peritoneum, except a small area about the inferior angle, which is in contact with the duodenum. The posterior surface is also divided by a furrow into the upper larger part lying against the diaphragm and the lower smaller part which lies in contact with the kidney.

The left adrenal is a little larger than the right and is not so prominent above its respective kidney, but it extends downward along the upper half of its median margin. It has two angles, superior and inferior. From the anterior view, its outline is rather semilunar or crescentic, its concave surface looking downward and outward toward the kidney. It also presents two surfaces, anterior and posterior. The anterior surface is traversed by a furrow which passes downward and forward, and from its lower end emerges the suprarenal vein. The superior part of the anterior surface lies in contact with the spleen and the cardiac end of the stomach, while the lower part is covered by the pancreas and splenic vessels. The posterior surface is divided by a vertebral elevation so that the inner part is directed inward and backward and is in contact with the left crus of the diaphragm, while the external part looks outward and backward and rests against the kidney.

STRUCTURE.—The gland on perpendicular section is seen macroscopically to consist of two parts, cortex and medulla. It is surrounded by areolar tissue in which there is much fat. Besides this covering, it is invested with a fibrous envelope consisting of two parts, the outer of which is looser and the inner of closer, firmer structure. Flint has shown by chemical manipulation that the periglandular connective tissue and a large part of the external layer of the capsule consist of white fibrous tissue. This fibrous envelope has connective-tissue cells, smooth muscle fibres, nerves, and ganglionic cells which are derived from the neighboring plexus cœliacus. Stilling first described the superficial plexus of lymphatics of the adrenal, in addition to which there are the arterial and venous plexuses.

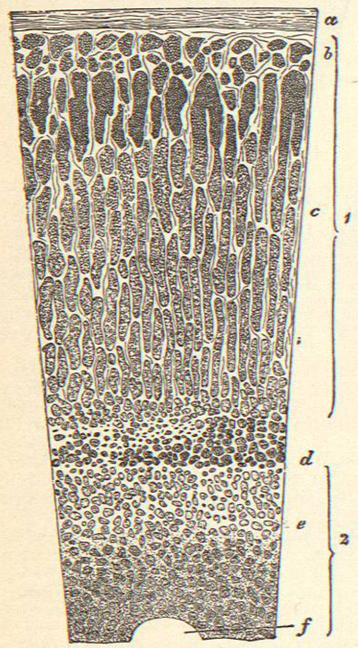

FIG. 49.—Vertical Section of Adrenal Body: Human. Magnified. (Eberth.) 1, Cortical substance; 2, medullary substance; *a*, capsule; *b*, zona glomerulosa; *c*, zona fasciculata; *d*, zona reticularis; *e*, groups of medullary cells; *f*, section of a large vein.

Cortex.—The cortical part is deep yellow in color and compact in consistence. It forms the larger part of the organ. On examination three zones are discernible: the external, *zona glomerulosa;* the middle, *zona fasciculata;* and the internal, *zona reticulata*—these names indicating the general appearance of the individual layers. The framework of the gland consists of reticulum. This substance is not yellow elastic tissue, since it resists pancreatic digestion, as shown by Ewald and Kühne. Neither is it white fibrous tissue. Mall has shown its difference in chemical nature and reaction from the latter, as well as from the elastic fibres. He has also proved that the interstitial tissue of many glands and organs has no connection with the connective-tissue cells, but consists of an interlacement of branching fibrils. This substance he calls reticulum. It is very abundant in the splanchnic area. As the result of chemical manipulation it yields a residue called reticulin. From the inner part of the capsule particularly, two kinds of processes extend into the gland. These are the large septa, which reach nearly, if not completely, to the zona reticulata, and the smaller septa, which divide the outer part of the cortex into irregular oblong spaces in which are found the coiled columns of cells that form the zona glomerulosa. These spaces are still further divided by reticular processes which separate the cell columns. The cells of the zona glomerulosa are irregularly columnar or cylindrical in shape, having small oval nuclei nearly central in position. Flint, in describing the zona fasciculata of the dog, says that the reticulum takes origin from the larger septa which spring from the capsule and from those at the inner border of the zona glomerulosa. These filaments reach toward the medulla, twining in and out between the cells. The anastomosing cell columns of the zona fasiculata lie at right angles to the capsule and are composed of polyhedral cells. Capillaries and fibrils of reticulum coming from the capsule and septa of the zona glomerulosa give to this layer its columnar arrangement of cells. The cell columns of the zona fasciculata of the human adrenal are distinctly outlined, the capillary endothelial nuclei assisting in great measure to make them clear. The filaments of the zona reticularis are derived from the layer above, and their structure is so complicated that Arnold has declared that practically each cell has its individual space. Many of these fibrils run parallel to the capsule, a direction at right angles to their course in the zona fasciculata, although the meshwork is so dense that the separate fibrils can be followed for only a short distance. This zone separates the rest of the cortex from the medulla, and in some animals is very irregular. The cells of the zona reticularis in the human adrenal are large, containing, as well as albuminoid and fat granules, brown pigment, which is more abundant in adults than in infants and children.

Medulla.—The medullary part of the adrenal in the adult is soft and pulpy and of a dark brownish-black hue. After death it quickly changes, becoming rapidly almost diffluent. Its first appearance in the embryo is indicated by small groups of cells under the capsule after the cortex has been formed. These cells gradually migrate toward the centre of the gland, and in doing so they increase in size and intricacy, but it is not till just before birth that a hint of the arrangement of the cell groups appears. The shape of the cells is polygonal; they are larger than the cortical cells; they are destitute of oil globules, and are arranged in round, oval, or irregularly crescentic groups, enclosed by the reticular septa. The reticulum of the medulla is derived from that of the zona reticularis, and its appearance is quite like that of the zona glomerulosa, although far more delicate. The differentiation of cortex from medulla is very distinct, not only by the gross appearance, the cortical framework being very dense in contrast to the looser medullary septa, but also by the characteristic reactions. This is particularly shown in the different effect of the salts of chromium on the cells of the two parts, the cortical cells giving no reaction, and the medullary cells staining a dark brown. This is generally known as Henle's reaction. The protoplasm of the cortical cells stains more deeply with ordinary stains than the cytoplasm of the medullary cells.

Flint has described several curious anomalies in position of the cortical and medullary cells which are not infrequently seen, all of which point to the embryology of the gland. These appearances have caused much confusion in the literature. The centrally migrating medullary cells sometimes cut off islands of cortical cells, which on this account remain in the medulla even in adult life. Islands of medullary cells are found in the cortex. A medullary cell group may not be closed over by cortex, and so at this point medulla may extend from the periphery of the gland to the central vein. The medullary cell groups may not joint laterally, and so a cortical column will extend from the centre to the periphery. Flint notes one curious case in which at a certain point in the gland the medullary cells failed to grow inward, and

so the cortex was found in its embryonic situation about the *vena centralis*, while the medullary cells remained beneath the cortex.

Blood-Vessels.—The arteries of the adrenal are derived from three sources, viz., from the aorta, the phrenic, and the renal arteries. Flint observes the variations of pressure and velocity in the different regions from which the adrenal arteries originate, and points out the fact that the circulation of the adrenal gland must depend to a certain extent on that existing in these various regions. He says "that the arterial system of the body is a record, to a considerable degree, of the ontogeny of its parts. For example, the course of the spermatic artery is a permanent record of the path followed by the testicle in its descent." From his work on the adrenal he has shown that what is true of the general circulation is also true of the circulation of individual organs. "Thus the course of the arteriæ medullæ through the cortex of the suprarenal body defines the path followed by the medullary substance from its embryonic to its adult position." In describing the adrenal circulation in the dog, this author speaks of the capsular plexus formed by the arteries, from which originate the three channels which nourish the three different parts of the gland and through which the flood flows into the veins. This blood from the arterial plexus passes through two sets of channels: (*a*) the arteriæ capsulæ and (*b*) the arteriæ corticis. The first of these, the arteriæ capsulæ, subdivide into capillaries throughout the capsule, and finally empty into the capsular venous plexus. This lies just underneath the arterial plexus. From the former, by means of the venæ comites of the adrenal arteries and by other independent veins emptying into the *vena lumbalis*, the venous blood is carried from the capsule. The second set, the arteriæ corticis, pour their blood into the capillaries of the zona glomerulosa, from which channels it passes into the capillary system of the zona fasciculata, and still on into the capillaries of the zona reticularis, whence it finally reaches the medullary boundary, where the smaller venules anastomose, forming branches which empty into the *vena centralis*. The arteries of the medulla spring from the cortex and reach the medulla without anastomosis. There they form a plexus. From this the blood flows away by two routes: (1) directly into the venous tree; (2) indirectly, by means of veins which empty into the central vein itself or its large branches. The venous tree is a tributary of the lumbar vein, the junction of the two being at the hilum of the gland. The venous tree, whose finer twigs are seen at the periphery of the medulla, is made up of true terminal veins, excepting the very finest branches. Those veins of the capsular plexus which empty into the *vena lumbalis* are provided with valves, while none are found in the trunks of the venous tree. Thus in this locality the medullary circulation depends to a degree on that of the lumbar vein. According to Testut, independently of the central vein, the surface of the capsule gives rise to other veins which follow more or less the course of the arteries, some of them emptying into the diaphragmatic veins, others into the renal veins. Testut also states that the adrenal veins are remarkable for the development of their muscular coat.

Nerves.—As to the nerve supply of the adrenal, Quain says that it is particularly rich and is derived from the solar and renal plexuses. Bergmann thinks that it is also supplied by the phrenic and pneumogastric nerves. The nerve twigs are especially numerous in the cortex, where they penetrate between the cells, particularly in the zona glomerulosa. In the medulla, numerous ganglionic cells are found. Before entering the cortex there are many ganglionic cells on the nerves, and the fibres are chiefly medullated. Flint thinks that these cells and fibres have no organic connection with the gland, but have been drawn in by the medullary cells, although he adds that there may be sufficient nerve supply to govern the medullary secretion.

Lymphatics.—According to some authorities the lymphatics take their origin between the cell groups and form a rich network both in the cortex and in the medulla. They form a particularly dense plexus about the central vein, and run in the general direction of the vessels. They are connected with efferent valved lymphatics both in the fibrous capsule and in the medulla, and on the external surface of the gland some of them blend with the superficial lymphatic network, while the others empty into ganglia a little above the renal vein. These ganglia into which the adrenal lymphatics empty are distinguished from their neighbors by their rich pigment. Flint has discovered lymph nodules in the medullary substance of the gland, and irregular groups of lymphatic cells in the cortex of the human adrenal. He, however, declares that our knowledge of the adrenal lymphatics is still most unsatisfactory, and he believes that the lymphatic channels have never as yet been definitely traced out as a system, nor have their relations to the cells and blood-vessels been yet discovered.

The average size of the adrenals is from $1\frac{1}{4}$ to $2\frac{1}{2}$ inches (30 to 60 mm.) in length by about $1\frac{1}{4}$ inches (30 mm.) in breadth. The thickness varies from $\frac{1}{6}$ to $\frac{1}{4}$ inch (4 to 6 mm.). The weight is about 1 drachm (4 gm.), the left being slightly heavier than the right.

ANOMALIES OF DEVELOPMENT.—One or both of the glands may be absent, although this condition is very rare, and the defect is probably supplied by accessory glands, which, as Stilling has shown, can undergo compensatory hypertrophy. Ziegler says that hypoplasia and agenesis of the adrenals are usually found in anencephalous and hemicephalous fœtuses. Dyce Duckworth says: "In cases of congenital absence of one kidney it is usual to find a suprarenal body in its proper situation. This fact plainly indicates that there is no embryological connection between the kidney and the adrenal body, and they are thus physiologically distinct."

Accessory Adrenals.—These additional glands are not unusual; they vary in size from a pin's head to a cherry—Allbutt having seen one of the latter size. These tiny bodies are found generally on or near the capsule itself and are joined to it by connective tissue, or they may be partly embedded in the liver or kidney, and in this situation they are called "rests." They have been seen on the spermatic vessels near the inguinal canal, and in the broad ligament. Rolleston speaks of tiny elevations on the surface of the adrenal which he calls adenomata and which are composed of adrenal cells in an extreme state of fatty infiltration. They are not accessory glands, differing from them in that the latter possess a capsule of their own and are made up of cells which show little fatty infiltration. Swale Vincent says: "The suprarenals are very intimately related to the blood vascular system. This relationship is most striking in elasmobranchs, but is still evident in mammals from the very large blood supply to the organ and its close anatomical connection with the great veins." Various and interesting have been the theories concerning the origin of the adrenal elements. By some the cortex was thought to be derived from the mesoblast, while the medulla took its origin from the sympathetic nervous system. Others thought that the medulla was derived from the cortex. The latest work seems to show that this question is not yet definitely settled, although it seems certain that the medulla is not derived from the cortex.

PHYSIOLOGY.—Physiologists classify the secretions of the body under two general heads, internal and external secretions. The idea of internal secretion took its origin with Claude Bernard. It is defined, according to Osler, as consisting of certain products elaborated by gland cells from materials furnished by the blood, which are later passed back to the blood or lymph to subserve some function in general or special nutrition. External secretion is poured out on a free epithelial surface communicating with the external world. Internal secretion is discharged on the closed endothelial surfaces of the blood and lymph vessels.

Among the glands which have an internal secretion are the adrenals, and many investigators have contributed their work to the very intricate problem of the elucidation of the exact functions of this gland. Schäfer says that as early as 1855 Addison showed the great importance of these glands in relation to nutrition, since their pathological alterations were thought to be connected with asthenia and the bronzing in patches of the skin and mucous membranes. In 1856, and subsequently, Brown-Séquard showed that their removal was always rapidly followed by death in all animals. It is interesting to note that removal of one gland has apparently no untoward effect. But when the second is taken away, even though the interval between the two operations may be a long one, the fatal symptoms quickly supervene. They are practically those of Addison's disease, though more acute than the latter—asthenia, loss of vascular tone, anorexia, and general prostration. The peculiar pigment characteristics of this disease are not always noticed, probably due to the fact, as Brown-Séquard suggested, that there is no time for its development between the ablation of the capsules and the death of the animal. Tizzoni has experimented on animals which have lived a certain time after either complete or partial removal of the glands, and has in these cases observed the pigmentary changes. The cause of death seems due generally to paralysis of the respiratory muscles. Experiments by Brown-Séquard, Abelous and Langlois tend to show that blood taken from an animal which is dying from the effects of "decapsulation" has no effect on normal animals, although it is toxic for animals more recently deprived of their adrenal glands. On the other hand, normal blood transfused into animals deprived of their capsules seems to prolong life. Since muscular weakness is the most prominent symptom after removal of the glands, the conclusions of Abelous and Langlois are that the capsules when *in situ* remove or destroy some toxic substance which is the result of muscular metabolism. Observations of these experiments has suggested the "auto-intoxication" theory of the adrenal glands. This theory, like all others of its kind, is weak in that the blood of any dying animal would probably be toxic to a certain extent, and also in that the animal on which its effect is observed is, on account of its recent operation, in a state of lessened resistance to any toxin. Nevertheless, it must be admitted that the adrenal glands elaborate some material which is very different from any found in the blood of animals deprived of their capsules. The intravenous injection of the adrenal extract is most active in its physiological working. Schäfer sums up these effects as follows: First, as to its action on skeletal muscle. After one excitation of its nerve, the muscle contracts as quickly as the normal, but this contraction is extremely prolonged. The effect is like that of a small dose of veratrine, but not of curare, for the muscles continue to be as capable of excitation as they were previous to the injection. It can thus be clearly seen that these phenomena are very different from the "so-called auto-intoxication paralysis which is stated to result after removal of the suprarenal capsules in animals." Consequently the material which has been extracted from the adrenals by water is not the same which is said to collect in the blood after ablation of these glands. The effect on the circulatory system is shown in two ways—on the arteries and on the heart. As to the latter, the effect depends upon the condition of the vagi. When these nerve trunks are uncut and the connection, therefore, between the heart and the cardio-inhibitory centre in the medulla is still intact, the contractions of the auricle are slowed, or they entirely cease after the injection of the extract. The ventricle continues to beat slowly. The pulse is necessarily very slow. But if the vagi are cut or their cardiac ends paralyzed by atropine, the effect of the extract is exactly the reverse. The auricle is more energetic in its contractions, both their strength and frequency being much increased, while the functions of the ventricle are likewise augmented. All of these phenomena cause a great increase in blood pressure by sending a much larger quantity of blood into the arteries. But besides this, the extract has a direct effect on the arteries themselves, for if the blood pressure be taken in a dog and then a small injection of the extract be made, the vagi being uncut and therefore the heart action being slowed, the blood pressure increases to quite an extent; but if the vagi are cut or paralyzed by atropine, the rise is extreme. If a certain member of the body be enclosed in a plethysmograph, the effect of the extract is clearly shown in the decrease of the member in size, due to the contraction of the arterioles. This effect is exerted directly on the musculature of the vessels, since it appears as markedly when the spinal cord is cut or the bulb extirpated. Schäfer does not believe in the view of Cybulski and Szymonowicz, that the rise in blood pressure and the contraction of the arteries are due to the excitation of the vasomotor centre; for, as his experiments show, this effect is peripheral. In the bulb he states that especially the cardio-inhibitory and respiratory centres are affected. In certain experiments on dogs the first effect of the extract has been excitement, this being followed by paralysis, while great thirst was experienced by these animals. In cats, rapidity of the respiratory movements was noticed, as well as thirst and loss of appetite. Recently strong astringent properties have been observed. As a local styptic it has given potent effects. Meyers, in experiments with various organs, discovered that the adrenal body is alone found capable of neutralizing cobra poison. Guinea-pigs and sheep give the same results. The medulla is found inactive, the cortex and the entire gland active. Oliver has demonstrated that the extract when applied directly to the mesenteric vessels, either in the living or in the "surviving" animals, causes rise of blood pressure. Von Cyon, in reviewing the different theories of various workers, states that they all agree as to the increase of blood pressure caused by the intravenous injection of the adrenal extract, but not as to the influence which it exerts on the heart action. Oliver and Schäfer think this latter due to the excitation of the musculature of the small arteries, as well as of the heart vagi. Cybulski and Szymonowicz think that the extract has a special influence on the vasomotor centre of the vessels. Gottlieb believes the motor heart ganglia to be chiefly affected. Von Cyon himself believes that the extract of the adrenal gland acts in a high degree as a stimulant to the sympathetic nervous system of the heart and the vessels (accelerantes and vaso-constrictors) and also as a paralyzer to the regulatory (motor) nerves of these organs (vagus and depressors). So this extract is a powerful antagonist of iodothyrin and hypophysin. Schäfer describes the effect of the injection of the extract as quite transitory, even if the dose be large. This fact presents the interesting problem of the disposal of this extract—where is it eliminated? The kidneys are not its route of exit, for when the renal arteries are clamped, the effects are just as fleeting. Just so with the suprarenals. If the circulation in the abdominal organs is entirely stopped by tying the aorta and vena cava in the upper abdomen, the effects are nearly as short in duration. The blood does not oxidize or destroy the active principle of the extract, for after twenty-four hours' contact with this fluid the power of the extract is as great as normal. It seems logical to conclude that the active principle is stored away somewhere in the body and there rendered harmless, and, since the effects endure much longer in the skeletal muscles than in the heart and arteries, that the muscles are the great storage house.

Now as to the effect of the extract when administered hypodermically or by mouth, results by the former method vary exceedingly, depending on the animal experimented on and the dose injected. Oliver says that in man the extract, when given by the mouth, has the effect of reducing the calibre of the arteries, as measured by the arteriometer.

As in every other line of research in relation to these organs, so have there been varied and contradictory results concerning the chemical nature of their active principle. Abel has shown that the "specific blood-pressure-raising constituent" exists in the embryonic gland. At just what stage it first appears has not been determined. Oliver believes that the peculiar properties of this principle are due to an alkaloidal body and not to

the proteid elements. The substance is not dialyzable, consequently its molecule is probably very large. Cybulski, Oliver, Schäfer, and Swale Vincent believe from their work that the active principle is found only in the medulla, and that the cortex yields no appreciable amount. Schäfer and Oliver believe in the internal secretion theory which promulgates the idea that a certain substance is formed by these glands and passed out into the blood, which has a beneficial effect on the muscular contraction and tone of the cardiac and vascular walls and on the skeletal muscles.

Allbutt calls these two theories that we have mentioned, one as the auto-intoxication theory, the other as the internal secretion theory: (1) The excretory or katabolic, which supposes that the adrenals dispose of waste materials in the blood; (2) the secretory or anabolic, which supposes that they elaborate some substance necessary to the animal economy and pass it into the circulation. Other authors, Byrom Bramwell and Boinet, have recently combined the nervous and the "adrenal inadequacy" theories by suggesting that in Addison's disease the symptoms are caused by irritation and neuritis of the sympathetic as well as by the pathological suppression of the extract.

Dreyer, in his work in 1899, has shown again what Cybulski first proved, that the active principle of the adrenal extract can be obtained from the blood of the adrenal vein; consequently it is a true internal secretion. He has further proved the influence of nervous control over the secretion, for if the splanchnic nerve below the diaphragm be stimulated by an electrical current, the amount of this active principle in the secretion is augmented, judging from the increase in the physiological effects caused by the extract. This increase has no connection with the blood vascular changes which take place at the same time. The objection was formerly raised that the active principle was found only in the dead gland, but the proof that blood collected from the adrenal vein, and from no other, has the same effect as the extract itself, establishes the significance of the reactions of the gland. Dreyer has also demonstrated that intravenous injection of the extract in a normal animal causes slowing of the heart and an increase of blood pressure, while after the vagi are cut or atropinized the heart beat is quickened and the blood pressure increases to a still greater degree. From the experiments of Oliver and Schäfer, Swale Vincent, and Dreyer, it would seem that the adrenal secretion is under nervous control. As to the relative importance of the two parts of the gland, Swale Vincent says that "the cortex from a morphological standpoint would seem to be the more important or essential element of the suprarenal gland, for it is always more abundant in amount than the medulla, and is universally present in all animals above the very lowest vertebrates, whereas the medulla appears to be absent in some orders of fishes. In the present state of our knowledge the medulla must undoubtedly be considered as the more important from a physiological standpoint."

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ADRENALS (PATH.). See *Addison's Disease*

ADRUE. See *Cyperus*.

ÆGLE MARMELOS. See *Bael Fruit*.

AEROTHERAPEUTICS, or **PNEUMATOTHERAPEUTICS.**—These terms refer to the employment of air as a therapeutic agent. They are generally restricted to the use of air that has been altered in density, by which it is possible to simulate the advantages derived from residence at high or low levels, and increase the functional power of the lungs. The term is sometimes broadened to include medicated air and air that has been altered chemically by increasing the proportion of oxygen, nitrogen, or carbonic acid gas. These latter, however, will be treated in separate articles and under *Inhalations*.

Two methods of adapting the air for use are in vogue. In one the patient is placed in a specially prepared chamber in which the density of the air may be increased or diminished; in the other the patient remains under ordinary atmospheric conditions, and inhales through a tube air that has been altered in density.

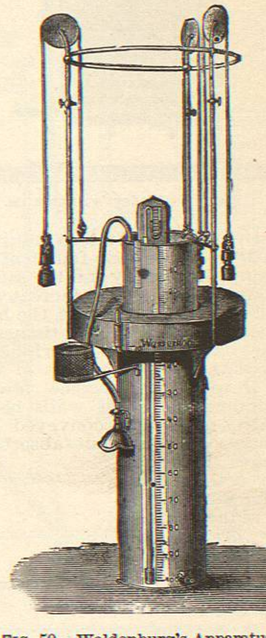

FIG. 50.—Waldenburg's Apparatus for Compressing Air. Natural height is one metre.

The pneumatic chamber, as used in the European sanitaria, is an elaborate and costly apparatus. It consists of a large metal, air-tight chamber, capable of seating three or four persons, in which the patient remains for a definite time. The arrangements are such that the air may be slowly or rapidly increased or lessened in density. There are provisions for heating and ventilating, windows through which the patient may be observed during treatment, and electric bells for the convenience of the patient. These chambers are numerous in Europe, and one has been erected at the Brompton Hospital for Consumptives, in London, England.

When the patient is placed in the pneumatic cabinet, the effect of the altered density is directed externally to the surface of the body and internally upon the lungs. The result is much the same as when the patient ascends to a high elevation or descends into a deep mine or in a diving-bell. To prevent the ill effects of a sudden change in pressure, the treatment is commenced under ordinary atmospheric conditions, then the alteration in density is made gradually, and the return to a normal pressure is equally slow. The importance of this has been noted by those in charge of men working in caissons during the construction of large bridges, where all the most distressing symptoms were traced to the workmen who too hastily emerged from the compressed air.

Air in which the density is increased is the form gen-