

inquiry I found that they were of a rather exciting nature and were forbidden to those of nervous temperament as likely to produce a rise of temperature or some other unfavorable symptom. There are five meals a day, reinforced by milk. Kefir is prepared on the premises in large quantities and is much used, especially in gastrointestinal troubles and in conjunction with alcoholic drinks for night sweats. Most of the patients use wine or beer. In fever milk is the principal diet, and as much as three litres in twenty-four hours is given a patient. Hydrotherapeutics, as in the other sanatoria, is an important adjunct of the treatment in the form of simple bathing with acidulated water, the wet pack with mas-

it comprises abundant alimentation, outdoor air (rest in the reclining chairs and walking in the paths of gentle ascent) and hydrotherapeutics.

Dr. Römpler's personality is most pleasing, which doubtless has much to do with the success he attains. He is a great lover of nature and inspires his patients with his enthusiasm for outdoor life. In a few words he well sums up the conditions of cure: "Upon the ability of the organism to resist depends finally the possibility of cure. To increase this power of resistance through gradual blunting of the susceptibility to irritation (hardening); through the improvement of the nutrition and quality of the blood; and, finally, through the avoidance of hurtful influences and through instruction and training for future guidance, is the principal problem of the physiotherapist."

The third sanatorium at Goerbersdorf is that of Dr. Weicker, which is a small one, and, as Dr. Weicker says, on the plan of a home rather than on that of a large institution, he and his wife living in the institution with his patients; and the method is essentially that of the others. It was originally founded by the Gräfin Pückler, under whose name it still stands. Dr. Weicker also has charge of a people's large sanatorium in Goerbersdorf, consisting of seven villas, which received 256 persons during the year 1896. It was established for working people who are members of the so-called insurance society for the disabled and aged; the expense being defrayed by the society, which allows each member a certain sum. The insurance societies of Germany of this nature are finding it to their interest to send their consumptive members to

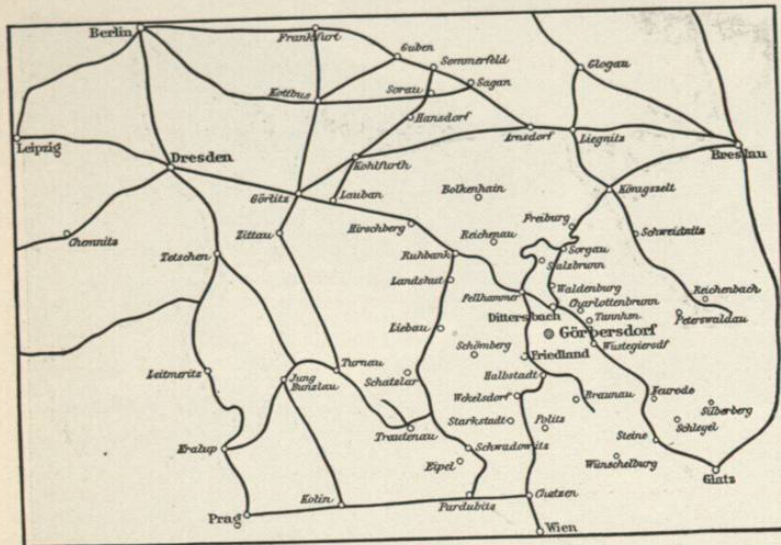


FIG. 233.—Map Showing the Railroad Connections Between Goerbersdorf and some of the Chief Cities of Central Europe.

sage, and cold douches. I was interested in watching the method of giving the latter. In a room adjoining the douche sits a physician at a table, with a watch provided with a second hand, and with the names of those for whom the bath is prescribed. The attendant informs the physician through a speaking tube when the patient is ready, and the doctor turns on the water (which he alone manipulates) for the specified number of seconds, as indicated in his list. When the douching is completed, the attendant throws a blanket about the patient and rubs him down. Only the stronger and convalescent patients are allowed this douche.

The sputum is deposited in shallow cuspidors containing sawdust, scattered about the building. Each patient also has a Dettweiler pocket spit-cup. The sputum is destroyed by burning.

A few minutes' walk from the Brehmer establishment brings one to Dr. Römpler's sanatorium, which is also extensive, accommodating about one hundred patients. Although not so imposing as Brehmer's, it is equally comfortable and complete, and, on account of the lighter character of the architecture, gives one a very pleasing and cheerful impression. In common with the other sanatoria, it possesses a fine winter garden, which is practically a great conservatory affording an extensive and beautiful view even to the horizon, and is the favorite lounging place for the inmates when the weather forbids outdoor life. The "Liegehalle" is in the second-story balcony with a glass roof, which seemed to me preferable to those on the ground floor. The extensive park is laid out with pleasant paths of varying grades (some protected) extending up to the richly wooded mountain-side, with seats, terraces, and pavilions, which afford comfortable and picturesque resting places. The method of treatment is similar to that of the larger establishment;

such an institution and have a certain proportion of them returned to their usual avocation, rather than support them indefinitely as invalids. Of 185 persons who were dismissed in 1896, 70.3 per cent. were capable of resuming their work; and for the three years from 1894 to 1896 inclusive, of those communicated with who were dismissed in these respective years as capable of resuming their work, 60, 71, and 89 per cent. respectively, still remained so at the beginning of 1897; so that from an economic point of view this plan of people's sanatoria is a profitable venture for the insurance societies.

Goerbersdorf is reached either via Breslau and Friedland, or from the station of Dittersbach on the Silesian Mountain railway. Either from Friedland or Dittersbach one has to ride four or five miles to the sanatoria. As to the results obtained at Brehmer's sanatorium, of 75,032 patients treated from 1876 to 1886, 26.6 per cent. were reported "cured and almost cured," of the first, second, and third stages of the disease collectively.

Edward O. Otis.

**GOITRE.**—(Synonyms: *Bronchocele*, *Struma*, *Derbyshire Neck*, *Kropf* [Ger.]) German writers apply the term "struma" solely to enlargements of the thyroid gland. Among English writers the word has a double meaning. It is used to indicate not only disease of the thyroid gland but also a tuberculous condition of the lymph nodes. Hence its use may lead to confusion.

The word "goitre" is probably a corruption of the Latin "guttur," the throat. Like many terms of popular origin it cannot be defined satisfactorily in scientific language. It is used rather loosely. It seems best to apply the term goitre to all enlargements of the thyroid gland. Wölfler, Orth, Kaufmann, and Ziegler use the word in this sense. Virchow, Murray, and Ewald at-

tempt to restrict it to the benign thyroid tumors. If the use of the word is to be limited at all it would be better to designate as goitre that form only of thyroid tumor which occurs endemically or epidemically in certain regions of the world.

**HISTORICAL NOTE.**—The occurrence of endemic goitre is known to antedate the Christian era. That the disease abounded among the Alps was well recognized by the ancients. Juvenal asks—"Quis tumidum guttur miratur in Alpibus?" References to goitre by Greek and Roman physicians are few and indefinite. Paracelsus, who studied endemic goitre in the Duchy of Salzburg, was the first medical writer to treat of the subject in a satisfactory manner. In his work, which was based on personal observations, he indicated the relation of goitre to cretinism. Scientific inquiry in regard to goitre, according to Hirsch, may be said to date from the work of Malacarne, published toward the close of the eighteenth century.

Knowledge of the pathological anatomy of thyroid tumors began with the studies of Ecker, Frerichs, and Rokitsky. A little later Förster's monograph on the malignant tumors of the thyroid appeared. In 1867 Virchow published his classical description of the anatomical forms of goitre. Wölfler in 1883 finished his monumental work on the development and structure of thyroid tumors. Clinical knowledge of the subject has been greatly advanced by the work and writings of Lücke, Kocher, Ewald, Berry, and Murray.

In America, the first and only attempt at a systematic study of the distribution of goitre was made by Benjamin Barton, professor in the Medical School of the University of Pennsylvania, and was issued in 1800. The monograph was entitled "A Memoir Concerning the Disease of Goitre as it Prevails in Different Parts of North America." W. Gibson in 1820 published an able essay which included a study of the morbid anatomy and means of diagnosis of thyroid tumors.

In Dr. Osler's paper on cretinism published in 1893 he showed that endemic goitre no longer exists in those regions where, early in the last century, it prevailed extensively. The endemic disease has been studied in Michigan by Dock, and among the North American Indians by Munson.

**ANATOMY.**—The thyroid (*glandula thyroidea*) is a ductless gland, which consists of two lateral lobes connected by a middle portion, varying markedly in size, called the isthmus. The thyroid gland lies in front of the larynx and trachea, and is bound to them by fibrous bands so that it follows the movements of these organs in deglutition. The outer margins of the lateral lobes are anterior to the common carotid arteries. Sometimes a slender pyramidal process (*lobus pyramidalis*) projects upward from the middle of the isthmus to the hyoid bone. The lateral lobes (*lobus dexter et sinister*) measure 5 to 7 cm. in length, 3 to 4 cm. in breadth, and 1.5-2.5 cm. in thickness. The weight of the entire gland varies between 30 and 60 gm. (Orth). Weibgen found that the most active growth occurs between the eleventh and twentieth years. The average weight between the sixth and tenth years was 11.9 gm., between the eleventh and twentieth years 36.7 gm. The thyroid is slightly heavier in men than in women. It is relatively larger in the young than in adults.

Although a portion of the lateral lobes is developed from the fourth branchial clefts, the greater part of the gland arises as a diverticulum of the pharynx.

In the embryo the thyroid body consists of solid nests and strands of epithelial cells. Later these solid masses become converted into closed vesicles filled with colloid and lined with a single layer of cylindrical or cuboidal cells.

Wölfler holds that small nodules of embryonic tissue are normally present in the developed gland, and furnish the congenital *Anlage*, in the sense in which Cohnheim used that term, for the development of tumors. It is fully as probable, however, that these embryonic remains which Wölfler describes are in reality small adenomas.

His has described what he considers to be the rudiments of an excretory duct (*ductus thyroglossus*) which extends from the thyroid to the tongue and opens at the site of the foramen cæcum. The finding of accessory thyroid tumors in the root of the tongue is certainly in support of this view, although Kanthack was not able to confirm the observations of His.

The thyroid vesicles range from 0.045 mm. to 1 mm. in diameter. The epithelial cells vary in size and shape. Sometimes in young individuals they have a cylindrical form, but usually they are cuboidal. Low, flat cells, according to E. Schmid, are seen chiefly in old age. On fresh examination colloid droplets and a varying number of fine and coarse granules can be demonstrated within the cells. The granules are most abundant near the free margin of the cell.

The viscid, homogeneous colloid substance present in the vesicles usually appears vacuolated in hardened specimens (see Fig. 2324). It takes nearly the same color with eosin as do the red blood corpuscles. Ernst has shown that colloid can be distinguished from hyalin by staining more deeply with fuchsin when treated with Van Gieson's mixture.

The origin of colloid has not been fully determined. It is probably a secretion of the epithelial cells. These have the characteristics of secreting cells. Virchow believes that the cells secrete a clear fluid into the vesicles, and that the colloid is formed from the fluid. Many histologists and physiologists hold to the view of Frerichs that colloid is formed within the cells or is the product of a specific transformation of the cells. They regard the process as partly secretory and partly degenerative. Reinbach holds that colloid in normal glands is a secretion, but the colloid in goitres is formed by the degeneration of the cells. He adduces little evidence in support of the latter hypothesis, and Müller is probably right in regarding the colloid substance of both normal and goitrous thyroids as a secretion and not a degeneration.

How the thyroid secretion enters the circulation is not known. The explanation of Biondi and Schmid that rupture of the vesicles occurs as a physiological event and thereby the colloid escapes into the lymphatics is

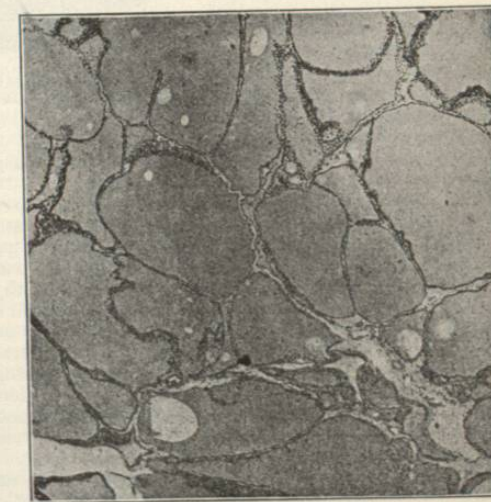


FIG. 2324.—Accessory Thyroid Tumor from Root of Tongue. The vesicles are filled with colloid and lined with low epithelium. (× 41 diam.)

improbable. The existence, between the epithelial cells, of ducts communicating with the lymphatics, as described by Hürthle, is doubtful.

A number of histologists have described colloid within the lymphatics of the thyroid, and Podack found it in lymphatics outside of the thyroid. The observation by



Zielinska of colloid in the capillaries, veins, and even in the arteries of the thyroid and by von Ebner in the vessels of the larynx, would seem to show that this supposed demonstration of colloid within vessels is due to an artefact possibly produced in removing the organ or in the process of hardening. It may be coagulated blood serum which sometimes simulates colloid in appearance. I have recently studied a specimen of syphilis of the testicle in which the veins were filled with a homogeneous hyaline material which presented exactly the appearance of the colloid of the thyroid. Fine projections of the hyaline material attached it to the walls of the vessels which gave the festooned border seen in thyroid vesicles. This observation suggests that the lack of apposition between the epithelium of the thyroid vesicles and the colloid mass is not due to the presence of a clear secretion between the epithelium and the colloid mass, but to a retraction of the latter.

The morphology of the epithelial cells and their relation to the abundant capillary network rather favor the view that the thyroid secretion passes without the intervention of lymphatics directly into the circulating blood.

The thyroid is an extremely vascular organ. Mayer estimated that it receives almost as much blood as the forearm. Sommering calculated that the size of the thyroid arteries was relatively eight times greater than those of the brain. Both the arteries and the veins form large anastomoses upon the surface of the organ.

Horne in 1892, working under von Recklinghausen, described bud-like projections composed of proliferated endothelial cells on the inner wall of the arteries of goitrous thyroids. M. B. Schmidt found similar cell buds quite regularly in the small arteries of the healthy thyroid at all ages. They may involve the media as well as the intima. The significance of these nodules is not known. Ricker has suggested that they represent a temporary infolding of the wall and thus offer a morphological explanation for the great variations in the blood content of the gland. Years ago the idea was advanced that the thyroid was, in a certain sense, a safety reservoir to prevent an excessive flow of blood to the brain.

Accessory thyroids (*glandulae thyroideae accessoriae*) are not rare. They may occur anywhere from the root of the tongue to the middle of the thorax, but they are most frequently found in the neighborhood of the hyoid bone. Zuckerkandl found them anterior to the hyoid bone in fifty-seven out of two hundred cases.

Streckeisen distinguishes between the median and the lateral accessory thyroids. The former he divides into four groups: (1) the *prehyoid* which lie superior to the mylohyoid muscle; (2) the *suprahyoid* which lie between or within the geniohyoid; (3) the *epihyoid* which lie above the geniohyoid; (4) the *intrahyoid* which lie in the hollow or even in the substance of the hyoid bone. The

lateral accessory thyroids are usually found in the neighborhood of the greater cornua of the hyoid.

Wölfler has observed accessory thyroids on the ascending aorta in children. In dogs they are commonly found in this situation. Piana states that aortic accessory thyroids were present in sixty-six per cent. of the dogs examined. In cats accessory thyroids are rare.

**PARATHYROID GLANDS** (*Glandulae parathyroideae*).—These bodies were described first by Sandstrom in 1880. They are composed of solid masses of epithelial cells, and do not contain colloid. The parathyroids in man have been studied by Welsh, of Edinburgh. As a rule, there are two parathyroids on each side. Sometimes the distribution is irregular, so that one or more may be overlooked. Two glands may be intimately connected so that they appear, on superficial examination, as one gland. They vary in size, but most commonly measure about 6×3×1.5 mm. I have seen them 1 cm. in length, and Welsh states that they may measure 1.5 cm. They are thin, oval bodies which are moulded to the form of adjacent structures. Their characteristic color is yellow, admixed with red and brown. The yellow hue is due to clusters of fat cells lying between the masses of epithelial cells. This adipose tissue within the gland is well shown in Fig. 2325. The

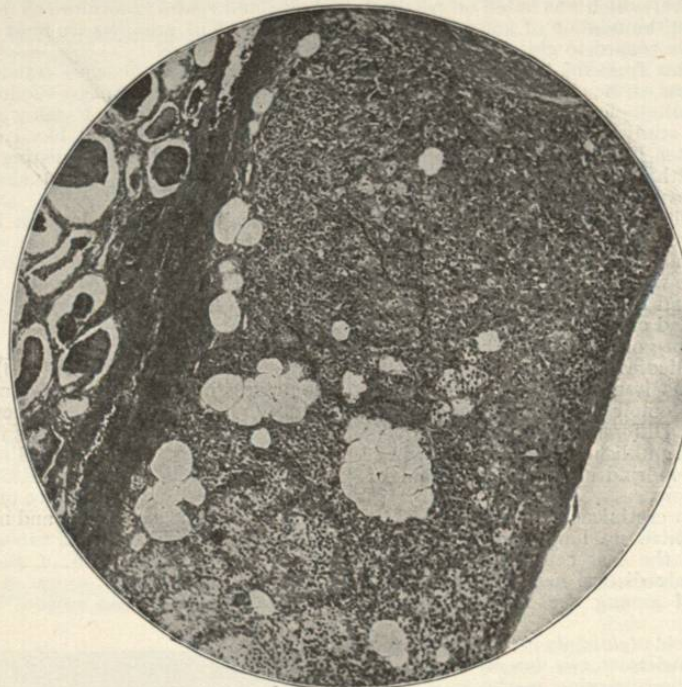


FIG. 2325.—Section Through a Parathyroid of Man. It is contiguous to the thyroid gland. The difference in structure between thyroid and parathyroid tissue is well shown. (× 85 diam.)

two parathyroids, according to Welsh, have a constant position in relation to each other. Welsh designates them as the *posterior superior* and the *anterior inferior*. The posterior superior parathyroid lies on the posterior wall of the pharynx or oesophagus at the level of the inferior border of the cricoid cartilage, just internal to the posterior margin of the lateral thyroid lobe. The position of the anterior inferior parathyroid is less constant. The parathyroids differ from the thyroids developmentally. They are formed earlier.

**PHYSIOLOGY.**—The thyroid secretes a material which is essential to the well-being of the body. Notkin's view that the thyroid serves to collect some toxic substance from the blood is interesting but improbable. The internal secretion into the blood appears to be specially concerned in producing metabolic changes in the central nervous system. In 1856 Schiff showed that complete extirpation of the thyroid in dogs resulted in the death of the animal. Some, however, recover, and in 1899 Katzenstein concluded as a result of his experiments that the thyroid is not essential to life. He probably overlooked the accessory thyroids that are so common, as Sultan (*Archiv für klinische Chirurgie*, 1901, vol. lxii., p. 620) found that total extirpation of the thyroid tissue always produces severe, characteristic, disease phenomena, and leads to a fatal issue.

If, in the dog, one lobe be removed, although no symptoms supervene, the other undergoes a compensatory hypertrophy. This was pointed out by Wagner. The

remaining lobe does not always enlarge, so, as Halsted says, the microscope must be the criterion of hypertrophy. The microscopical changes have been described by Horsley and Halsted. The vesicles enlarge. Their lining membrane becomes folded and branched. The epithelium assumes a cylindrical form, and the colloid disappears. Beresowsky removed five-sixths of the thyroid in dogs. In addition to compensatory hypertrophy he observed actual regeneration with new formation of vesicles.

Edmunds found that if one parathyroid be left in the animal the other parathyroids and the entire thyroid might be removed, and yet the dog would live and no apparent ill effects follow. The parathyroid that is left shows signs of active growth, but it does not develop into thyroid tissue. This overthrows the old view of Gley that the parathyroids are immature thyroids. Edmunds observed that compensatory hypertrophy of the thyroid took place when the thyroid was left intact, if all the parathyroids were removed. Excision of a portion of the superior laryngeal and vasosympathetic nerves on one side and of the lateral thyroid lobe on the other side leads to great hypertrophy of the remaining lobe. It may weigh three or four times as much as normal. The increase in size is largely due to a growth of thyroid tissue between the vesicles (Edmunds).

The experiments of Vassale and of Moussu show that the thyroid and the parathyroid are different organs. It is probable, however, that they are functionally associated. The removal of the former produces trophic disturbances resembling those of myxedema in man, and removal of the latter produces convulsive disorders and death.

Levin's work seems to indicate that the thyroid secretion acts upon mucin. He demonstrated that an intravenous injection of mucin which is fatal to animals deprived of their thyroids gives rise to no untoward effect in healthy animals.

The colloid substance of the thyroid gland has great physiological power. It contains phosphorus, and yet is not a nucleoprotein, neither is it allied to mucin. It belongs to the glycoproteids. The singular feature about colloid is that it contains iodine. This notable discovery was made by Baumann who isolated a substance to which he gave the name *iodothyryn*, and which Hutchinson showed is found in the colloid substance. It contains all of the phosphorus and the greater part of the iodine. Oswald, in 1899, obtained from the complex iodothyryn the simpler body *thyreoglobulin*, which de Cyon and Oswald (*Pflüger's Archiv*, 1901, vol. lxxxviii., p. 199) claim is the active principle of the thyroid secretion. Baumann estimates that every gram of the thyroid of man contains 1 mgm. of iodine. Gideon Wells has shown that the human thyroids obtained in Chicago contain four times as much iodine as the glands of individuals living in the goitrous regions of Germany. The thyroid of newly-born children is free from iodine. The accessory thyroids may be richer in iodine than the thyroid gland proper (Gley, Mendel).

**GEOGRAPHICAL DISTRIBUTION OF ENDEMIC GOITRE.**—In certain districts, widely scattered over the globe, a goodly proportion of the inhabitants are affected with enlargement of the thyroid. This peculiar form of thyroid tumor is known as endemic goitre.

Early in the last century the disease prevailed in New England and in New York State. Dorr, writing in 1806, mentioned a number of New England towns in which goitre was very common. In 1893 Osler reported that the disease no longer existed in these towns. In many towns of Vermont it was especially prevalent. Dorr states that in Chester one-half of the inhabitants were affected. Osler found that goitre is now rare in Alabama, although it was common in 1854, and it is also interesting to note that the disease has gradually disappeared from those parts of Virginia where it was formerly endemic. Barton states that in 1798 bronchocele prevailed to such an extent in Pittsburg that out of fifteen hundred inhabitants no less than one hundred and fifty

had the disease. The number of cases gradually declined, and in 1825 Denny wrote that no new cases had occurred since 1806.

As both Hirsch and Osler complain that they have been able to learn nothing of the occurrence of endemic goitre in Massachusetts, I have made inquiries of physicians in various parts of the State, especially of those connected with the hospitals for the insane. I have not been able to discover a single focus of the disease in the State.

Dock has found that goitre prevails in all parts of Michigan, but particularly in the northern section. The southern portion of the lower peninsula also contains many cases. Dock asserts that the disease exists in parts of Ohio and Indiana, and still more in the States bordering on Lakes Michigan, Superior, and Huron.

In 1895 Munson published his observations on the occurrence of endemic goitre among the Indians of the United States. A century before Barton called attention to the frequency of the disease among the Indians of New York State. Munson found goitre most prevalent in the southern part of Montana. It is common on the single reservation in Wyoming, and on the reservations of Utah, Idaho, and Colorado, situated on the western slope of the Rocky Mountains. It abounds in the western portion of the Dakotas, especially in the region of the Black Hills. The district examined includes a total of 18,182 Indians, made up of various tribes, and from this number were reported 764 cases of goitre, which is over four per cent. Munson states that the disease is frequently seen among the Chippewas of Minnesota, and is especially prevalent among the Menominees of eastern Wisconsin. "With the exception of a single reservation in Southern California, goitre is unknown throughout Washington, Oregon, western Utah and Idaho, California, Arizona, and New Mexico, although this region contains a comparatively dense Indian population."

In the Province of Quebec (Osler) and the Island of Montreal (Adami) endemic goitre occurs. It is still more common near Lake Ontario in the Province of Ontario. Osler mentions the extraordinary prevalence of this affection in the Kingston Insane Asylum, where in 1893 there were 288 cases of goitre among 600 patients.

In England endemic goitre is especially common among the Derbyshire Hills, hence the name Derbyshire Neck. It exists in the Pennine range in the North. Morris in 1895 stated that he had seen fifty cases among a population of two thousand in the Chiltern Hills. The greatest centres in Scotland are in the Lowlands and in and around the Lothian Hills (M'Kenzie).

A glance at the map prepared by Bircher shows in a striking manner the association of the disease with the mountainous countries of Europe. In Switzerland it is very prevalent. Bircher found that in some parts of the cantons of Freiburg and Berne eighty or ninety per cent. of the recruits were goitrous. In Italy the disease is common on the southern side of the Alps. It also exists in Savoy, in the Black Forest, and in Styria. The departments of France chiefly affected are those occupying the regions of the Alps, the Pyrenees, the Central Plateau, the Jura, and the Vosges. The disease has diminished in France, especially during the last fifty years, yet it is estimated that there are now between 375,000 and 400,000 goitrous people in that country (Mayet). The distribution of the disease throughout Europe is much the same as it was several centuries ago.

In Asia endemic goitre exists in the Himalayas, in the hilly districts of China, and in Siberia.

A great zone of goitre begins in Mexico and extends with increasing intensity through Central America and South America as far as Chili, and "forms a region of the disease worthy to be named besides those of the Alps and the Himalayas" (Hirsch).

**ETIOLOGY OF ENDEMIC GOITRE.**—Goitre is said to occur in endemic, epidemic, and sporadic forms. The term "sporadic" in this connection is unfortunate and misleading. It implies that the cause of the scattered cases of thyroid enlargement which are found every-



where is the same as that of endemic goitre. Like other glandular organs the thyroid may be the seat of a variety of new growths. The etiology of these tumors will probably remain obscure until more light has been thrown on the formation of tumors in general. In Massachusetts endemic goitre does not exist, and yet I have been able to collect in Boston over fifty specimens of thyroid tumors which have been removed during the past few years. These would be classified as "sporadic" cases, and yet the evidence is all opposed to the view that they were caused by the same agent that produces the endemic disease.

The cause of endemic goitre is not known. There seems to be little doubt that it is an infectious disease; but the *contagium vivum* has not been discovered.

Epidemic outbreaks of goitre may occur. With rare exceptions they have developed in districts where endemic goitre existed. Nearly all the cases have been observed in France. The epidemics have always been sharply localized. Most of them have been in barracks or boarding-schools. At Clermont-Ferrand fifty of the seminary pupils were attacked within a few days.

St. Lager in 1868 stated that he could number no less than 378 authors and 42 different views of the causation of the disease.

The geological formation has been held by some recent writers to be of importance in the genesis of the malady. Bircher concluded, as a result of careful study, that it occurred only upon the marine deposits, especially of the Paleozoic, Triassic, and Tertiary periods. He held that volcanic rocks, the crystalline rocks of the Archæan group, chalky sediments, and those of the Jurassic formation, as well as all fresh-water deposits, were free from goitre. Kocher in 1889 pointed out that it existed on the rocks exempted by Bircher, and Dock has shown that in America goitre is found on the Laurentian, the drift, and many intermediate formations.

For a detailed account of the various theories and the evidence adduced in support of them Hirsch's "Handbook of Geographical and Historical Pathology" should be consulted. His conclusion is so reasonable and so well stated that I give it in full: "The absence of results to all these inquiries about the genesis of goitre and cretinism—inquiries which have extended to every influence perceptible to the senses that could be brought into the consideration of the question before us—warrants, I will not say compels, the conclusion that in these diseases we have to do with a specific agent, a *veritable morbid poison*, and that endemic goitre and cretinism *have to be reckoned among the infectious diseases*. This doctrine finds a certain support in two things: on the one hand the fluctuations in the amount of the sickness, which we have had frequently occasion to notice, and for which there is no sufficient explanation to be found in the states of the atmosphere or of the soil or of hygiene; on the other hand, the epidemic outbreaks of goitre, for which the theory of infection, as Saillard, Viry and Richard, Thibaud, and other French military surgeons have recognized and said, is hitherto the only one that affords an explanation, and an explanation that accords most nearly with the facts of the case."

The infectious agent is probably conveyed through the drinking-water. The water of certain wells is known to cause goitre, and there are some in Switzerland whose water Kocher found had invariably produced goitre in the children who drank of it. The water is rendered harmless by boiling. There are noted goitre wells in Europe to which young men wishing to avoid enlistment resort. In a few weeks goitres develop which are large enough to exempt them from military service.

Dock noted that a very large proportion of all the cases in Michigan had used well-water. In Ludington goitre became much less frequent when lake-water was substituted for well-water. Singularly enough, according to a statement made by Dr. Hurd, the reverse is true at the Kingston Insane Asylum, Ontario. There, the patients developed goitre when the water of the River St. Lawrence was substituted for well-water.

Numerous attempts have been made to show a causal relation between certain micro-organisms and goitre. Klebs detected some minute animal or vegetable structures, which he called "naviculæ" from their shape, in the water of goitrous wells. Rüdell was not able to find these peculiar organisms. Bircher found diatoms and other micro-organisms in water from districts where goitre is prevalent.

Kocher discovered that water from goitrous wells is characterized by the large number of bacteria it contains. Tavel compared goitre-water with that of wells known to be harmless. Both were pure upon chemical analysis, but the former contained more bacteria. One bacillus isolated from two goitrous waters produced hypertrophy of the thyroid when inoculated into guinea-pigs. Experiments with this bacterium upon dogs yielded negative results. Lustig and Carle claim that a bacillus with definite characteristics is constantly present in water known to induce goitre.

Grasset in 1898 described a hæmatozoon, somewhat similar to the parasite of malaria, in the blood of goitrous individuals. M'Kenzie has not been able to confirm Grasset's observations.

Adami thinks that if micro-organisms cause the malady they do so indirectly, by forming injurious products in the water. The disease would then be regarded not as an infection but as an intoxication.

Endemic goitre is more common in women than in men. In England the proportion is from 7 to 1, to 44 to 1 (Murray). It usually develops at or before puberty. Hausleitner said that it rarely, if ever, occurred after the fortieth year; but we now know that cases may occur in older people.

In goitrous localities the lower animals are frequently affected, especially dogs and horses. Dock saw in a short time one day in Calumet, Michigan, six goitrous horses.

**CONGESTION.**—Vascular disturbances of the thyroid are favored by the richness of its blood supply. A transient enlargement occurs under a variety of conditions. There seems to be a definite connection between the sexual functions and the thyroid gland. Prof. Milnes Gaskell has shown that in the primitive vertebrate—the human progenitor—the sexual organs lay in intimate relation with the thyroid. Freund's careful investigations would seem to prove that a physiological enlargement occurs during menstruation and pregnancy. Transient swelling is also a consequence of parturition. Lange examined over three hundred pregnant women and confirmed Freund's observations. He does not agree with Freund, however, that the swelling is due simply to congestion. As reduction followed the administration of thyroid extract Lange maintains that the condition is due to a hypertrophy of the glandular elements.

It is also claimed that defloration is accompanied by an enlargement of the thyroid. If this be true there is a scientific basis for the ancient custom,\* still followed in the East, of testing a bride's virginity by measuring the circumference of her neck before and after the marriage-night.

Sexual excitement in women and in animals is said to produce an engorgement of the thyroid. I have been told of a case in which a physician measured his wife's neck immediately after coitus and found a definite increase in the size of the thyroid. Berry says that one of his patients insisted that sexual excitement was always followed by temporary enlargement of his goitre, usually sufficient to cause dyspnoea.

In girls enlargement of the thyroid is common at puberty. Schönlein, Friedreich, and Heidenreich described it as a special type of goitre, the *struma antemenstrualis*. The swelling is probably due to hyperæmia or congestion. A connection seems to exist between thyroid enlargement and chlorosis. Ewald in Berlin, a non-goitrous locality, has been struck with the frequency of

\* "Non illam genitrix orientis luce revisens hesternò poterit collum circumdare filo." Catullus, Epigram 1.

goitre in chlorotic girls. Capitan has called attention to this association. He thinks chlorosis is sometimes dependent upon abnormalities in the thyroid gland. Hayem in thirty-five subjects of chlorosis examined within a short time found goitre twenty-nine times.

A case of acute enlargement of the thyroid in mumps has come under my notice. The patient was a student in the Harvard Medical School. A few days after the onset of the disease a swelling of the thyroid was observed, which continued to increase for several days. The gland was neither painful nor tender. There was slight dyspnoea. It remained enlarged for about two weeks. The case appears unique. There is no reference to this complication of mumps in the "Index Catalogue of the Surgeon-General's Library."

Alfred Stengel recently reported an interesting case of acute non-inflammatory thyroid enlargement. It was probably the result of congestion.

**HYPERTROPHY.**—When a portion of the thyroid is removed the remainder undergoes a compensatory hypertrophy. This type of hypertrophy is known to occur in man and it has been produced experimentally in animals by Ribbert, and Beresowsky. Berry relates a case in which symptoms of cachexia thyreopriva, which appeared after a supposed complete thyroidectomy, disappeared upon the development of a small tumor at the site of the operation. Either a bit of the goitre, fortunately not removed, or an accessory thyroid, had undergone compensatory hypertrophy and assumed the function of the normal thyroid.

It is possible that many of the thyroid enlargements in which the histological structure resembles that of the adult normal gland, and which I class as simple adenomas, are, in reality, examples of hypertrophy. Wölfler has attempted to separate the hypertrophies from the simple adenomas. The former (*Hypertrophia parenchymatosa et hypertrophia gelatinosa* Wölfler) are produced by an increase or enlargement of the normal vesicles or an increase in their contents, the latter (*adenoma gelatinosum*), he holds, are developed from embryonic remains. But as different writers (Birch-Hirschfeld, Orth, Weichselbaum, and Kaufmann) have stated, this distinction is not practical.

**CONGENITAL GOITRE.**—In goitrous districts congenital thyroid enlargement is frequent. Among 642 cases of goitre in children at Berne, Demme found 53 in which the disease was congenital. Usually the goitre is small, Virchow pointed out that it might readily be overlooked owing to its high situation in the neck. It frequently lies in close relation with the hyoid bone and may extend behind the pharynx and cause severe dyspnoea or even suffocation. Congenital goitre is not uncommonly associated with enlargement of the thymus (Virchow, Bednar).

The tumor may be very large. Hecker reported a case in which the goitre in a child who died at birth from asphyxia weighed 41.6 gm. Probably the largest congenital goitre on record is the one cited by Demme, which weighed 102 gm. In the museum of St. Bartholomew's Hospital is a huge congenital goitre. A photograph of the specimen appears in Mr. James Berry's recent work "Diseases of the Thyroid Gland."

Thyroid tumors have been found in embryos. Danyau described one in a foetus of five and a half months. It formed a mass the size of a hen's egg and weighed 46 gm. The normal weight of a thyroid at this period never exceeds 1 gm.

Congenital goitre is rare in regions free from the endemic disease. Abt lately observed a case in Chicago. The child died at birth. The tumor was the size of a walnut and involved the entire gland.

Congenital goitres may have the structure of a normal foetal thyroid and are then regarded as examples of hypertrophy (Spiegelberg, Fröbelius, Wölfler). Colloid cysts sometimes of large size have been observed. Congenital goitres are found in animals also (cattle, horses, goats, sheep, and dogs). For a comparative study the monograph of Pflug should be consulted.

Large goitres may offer a mechanical obstruction to

the delivery of the child or they may cause face presentation.

**BENIGN TUMORS—Classification.**—Virchow's division of benign goitres into the following anatomical varieties is usually adopted: hyperplastic, fibrous, colloid, cystic, and vascular. This classification is based entirely on the macroscopic appearances. Wölfler attempts to classify them according to their mode of origin. His explanation

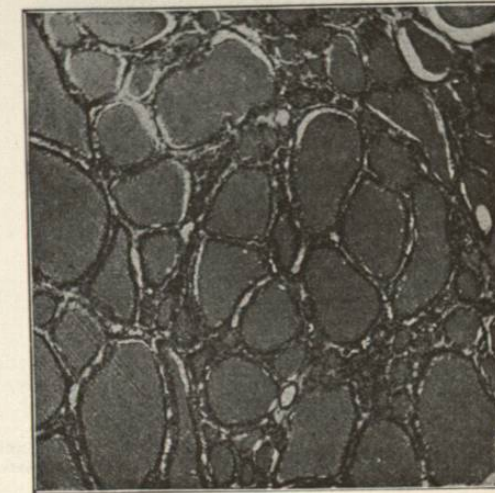


FIG. 2326.—Simple Adenoma of the Thyroid. (× 61 diam.)

of the mode of origin of the different types of thyroid tumors, however, is not convincing, and is largely hypothetical. The genesis of thyroid tumors will probably remain obscure until the general laws governing the formation of tumors are understood.

As a classification is needed for the study and diagnosis of thyroid tumors, and as neither system at present in use is satisfactory—Virchow's, because it deals only with the naked-eye variations, and Wölfler's, because it is complicated and artificial—the attempt has been made to arrange these tumors into groups according to their histological structure. To this end I have read the objective descriptions of thyroid tumors given in the literature and have personally examined many specimens.\*

There are three primary types of benign adenomatous thyroid tumors. All of these would be classed by Virchow as hyperplastic or parenchymatous goitres. They can be diagnosed with certainty only by microscopical examination.

1. Simple adenoma.
2. Foetal adenoma.
3. Papilliferous adenoma.

The vast majority of all cases are of the first type. The third is the most rare.

**Simple adenoma** (Fig. 2326).—It is composed of vesicles of various size filled with colloid. The structure resembles closely that of the normal adult thyroid. The epithelium lining the vesicles may be low and flat (Fig. 2324) or it may be cuboidal (Fig. 2326). In the intervesicular tissue similar cells are sometimes seen arranged in solid masses or forming small rosettes. These are probably areas of undeveloped thyroid tissue.

The simple adenoma may be confined to one lobe, or it may appear as a diffuse growth involving the entire gland or form a distinctly encapsulated tumor. Although usually single, multiple simple adenomas do occur (Fig. 2327). The consistence is moderately firm. The cut

\* I am indebted to Dr. W. F. Whitney, curator of the Warren Museum of Harvard University, Dr. J. H. Wright, director of the Clinico-Pathological Laboratory of the Massachusetts General Hospital, and Dr. F. T. Fulton, pathologist to the Rhode Island Hospital, for the use of their collections.



surface is usually smooth and homogeneous, reddish-brown to reddish-yellow.

Secondary changes are common. The colloid frequently becomes increased in amount. The walls of ad-

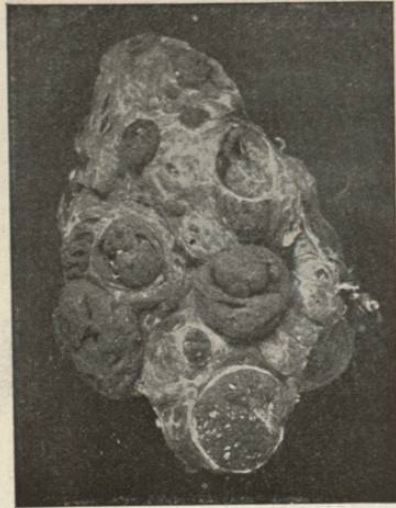


FIG. 2327.—Multiple Simple Adenomas of the Thyroid Gland. (Natural size.)

joining distended vesicles rupture or are atrophied by pressure, and cysts are formed. Thus the tumor becomes changed into a *colloid goitre* (Fig. 2328). With

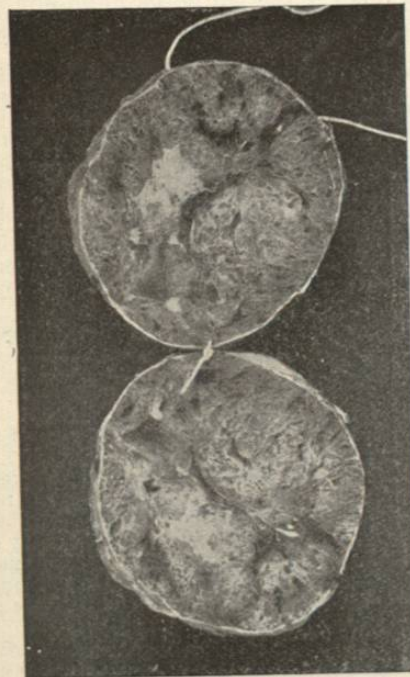


FIG. 2328.—Colloid Goitre. The vesicles are greatly distended with colloid forming small cysts; the largest are 0.5 cm. in size. The colloid in some of the cysts is tinged with blood. (Natural size.)

continued production of colloid these cysts may reach a large size, and the tumor is then spoken of as a *cystic goitre*. The cysts may be single or multiple. Their con-

tents are frequently tinged with blood or contain modified blood pigment. I cannot agree with Bradley, however, that the cysts are usually hemorrhagic in origin. Müller states that in the colloid goitre the capillaries are



FIG. 2329.—Fibrous Goitre which has Undergone Central Softening. The cyst measures 5 cm. in diameter, and has a shaggy lining composed of necrotic tissue. (Warren Museum, No. 9721.) (Reduced.)

diminished in number. The intima of the arteries is usually thickened and the elastic tissue is degenerated (Jores).

The stroma varies greatly in amount. It may form broad areas or bands of fibrous tissue, or the tumor may be largely converted into fibrous tissue and form a *fibrous goitre*. The vesicles are shrunken and separated by wide areas of fibrous tissue (Fig. 2330). The overgrowth of fibrous tissue is probably secondary to the degeneration and atrophy of the glandular tissue. This fibrous tissue, usually dense and sclerotic, is prone to undergo hyaline degeneration. Gutknecht pointed out that large cysts

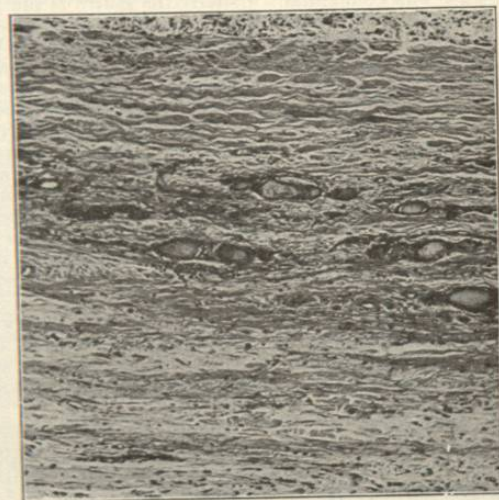


FIG. 2330.—Fibrous Goitre. It is composed of dense hyaline connective tissue. A few atrophied vesicles containing colloid are seen. (× 86 diam.)

are sometimes formed by the softening of this degenerated fibrous tissue. A good example of a fibrous goitre that has undergone central softening is contained in the

Warren Museum (Fig. 2329). This unilocular cyst measures 5 cm. in diameter. Its wall, which is 1.5 cm. in

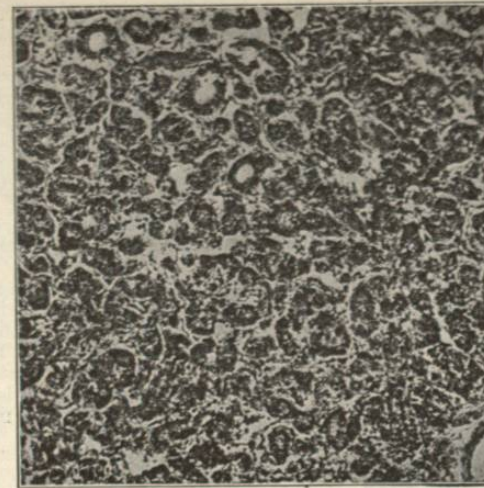


FIG. 2331.—Fetal Adenoma of the Thyroid. The cells are arranged in solid masses and in circles surrounding small spaces. No colloid. Stroma very vascular. (× 85 diam.)

greatest thickness, is formed of dense, hyaline fibrous tissue. Fig. 2330 is a section of the wall. These cysts of softening usually contain a turbid fluid composed of cellular and fatty detritus, broken-down red blood corpuscles, polynuclear leucocytes, blood pigment, calcium oxalate, and cholesterol crystals.

Lime salts are commonly deposited in the walls of old cysts. Large calcified plates may form. I have seen a cyst about 5 cm. in diameter the wall of which was entirely calcified. Bone has been found in the same sit-

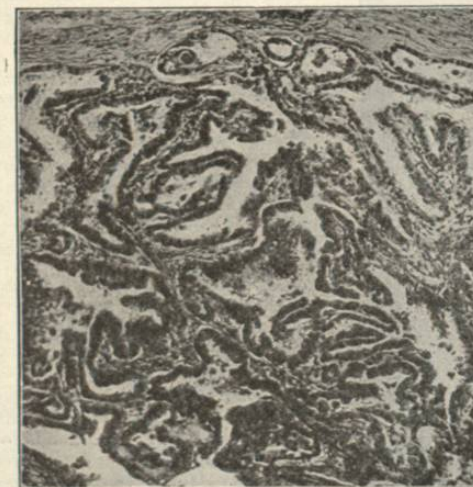


FIG. 2332.—Papilliferous Adenoma of the Thyroid. Branching processes, consisting of a connective-tissue framework covered with columnar epithelium, lying within a cyst. (× 73 diam.)

uation. Lücke reported two cases in which there was typical bone formation with bone corpuscles and medullary spaces.

Extensive amyloid infiltration of the vessels has been observed by Friedreich, Virchow, and others. The entire tumor may assume a waxy appearance, hence the term *waxy goitre* applied by Beckmann.

*Fetal Adenoma* (Fig. 2331).—The structure resembles

that of the fetal thyroid. The cells are arranged in solid columns and in circles surrounding small spaces.



FIG. 2333.—Papilliferous Adenoma Developing from the Wall of a Thyroid Cyst. (Natural size.)

There may be a few vesicles, but there is little if any colloid. Occasionally the tumor is not sharply circumscribed, but usually it is provided with a definite capsule. The stroma is generally scanty, but is sometimes moderately abundant, and may be the seat of a mucoid



FIG. 2334.—Papilliferous Adeno-cystoma Successfully Removed by Dr. F. B. Lund at the Boston City Hospital. (Reduced in size.)

degeneration (*Adenoma myxomatousum*, Wölfler). In size fetal adenomas vary from a few millimetres to four or more centimetres, and are usually multiple, grayish-