plasmodia the first impression on the nervous system is to cause a sudden irritation of the vaso-motor centres and the resultant contraction of the peripheral vessels, and the symptom is a chill more or less severe. The internal temperature, perhaps partly from the toxin, perhaps largely from the obstructed heat loss, rises rapidly and often to a great height, which is sustained until the now superheated skin and over-stimulated sweat glands begin to pour out a profuse perspiration and heat loss first exceeds and then equals heat production, and the normal equilibrium is once more established. A period without fever, the intermittent stage, then follows, its length depending upon the type of plasmodium with which we are dealing.

In the same individual may be found mixed varieties of malarial parasites, maturing at different and at irregular times, and one set so overlapping the other that we have the so-called remittent fever—a malarial fever with remissions but without any marked intermissions. A frequent use of the thermometer, however, will generally show some short period of intermittency.

Our best type of a continued fever, of course, is typhoid. This fever undoubtedly becomes in time a mixed affair. Very soon in the course of this fever, unless laxatives and bowel antiseptics are freely given, fermentation and decomposition occur in the intestines, and we have an increased temperature due to the absorption of toxins from these processes, and the infection is then double.

This same double infection occurs in diphtheria, when added to the mild fever caused by the diphtheria bacillus we have fever from the absorption of the putrefactive products from decomposition of the diphtheritic membrane. The same is true of scarlet fever with decomposing membranous exudation on the tonsils.

In acute colds, follicular tonsillitis, measles, and chickenpox the fever is short-lived unless some complication occurs. The specific germs may so shock the nervous system as to produce the premonitory chill, and this in turn will be followed by a fever which, however, soon terminates unless some focus of pus formation develops, or the secretions undergo putrefaction, or the fæces become impacted.

The hectic fever of chronic tuberculosis is a pus fever, that is, a streptococcus fever, and is not caused by the tubercle bacillus.

Of all irregular and intangible fevers la grippe heads the list. The germs of this disease can cause a typical chill which is followed by a high fever that lasts two or three days and is followed by more or less nervous depression and by catarrhal symptoms; but the vaso-motor system is profoundly affected, often for a long time, and irregular chills, shiverings, hot flashes, and even hemorrhages from the mucous membranes may occur. In no fever is the insomnia so noticeable as in influenza, undoubtedly due to the inability of the blood-vessels of the abdomen properly to dilate and thus relieve the cerebral congestion and produce sleep—in other words, a general vaso-motor ataxia is present.

Fevers are classified as: (1) Continued, (2) remittent, and (3) intermittent, according to the character of the temperature range.

A continued fever is one in which there is but slight deviation in the temperature line. A remittent fever is distinguished by intense paroxysms. In the intermittent type we have paroxysms of fever with absolute intermissions, or periods of apyrexia.

Fevers are also sometimes classed as dynamic or sthenic, and as adynamic or asthenic, in accordance with the tone of the heart and nervous system.

Sthenic fever is characterized by a hard, full pulse, a flushed face, and often active delirium. The crisis in these cases is generally positive and short.

In an asthenic fever the pulse is from the beginning feeble and compressible, the skin is pale and often moist, the respiration troubled, and if there is delirium it is of the low muttering type, and the patient seems to die rather from exhaustion than from the lethal power of the disease.

To study the range of temperature carefully in a given case of fever the thermometer should be used at perfectly regular intervals.

Fevers are often divided into four stages: First, a period of incubation extending from a few hours to a week; second, the stage of invasion; third, the fastigium, or stage of greatest power of the disease; fourth, the stage of declination or defervescence.

The stage of invasion may be ushered in by a chill or by shiverings, and in the case of children often by convulsions, or by vomiting, or by both. The surface of the body, especially the extremities, tip of nose, etc., is cold for a short period, this stage being soon followed by myalgias, constipation, loss of appetite, thirst, and a more or less heavily coated tongue. The stage following is one in which the temperature and pulse become higher and higher. This stage terminates either by crisis or lysis. In crisis the temperature falls in the course of from twenty-four to thirty-six hours to the normal, and the other symptoms undergo a similar decline. Such a sudden decline of the fever may be attended by shock; hence this period is one of considerable danger. At this time we may expect hemorrhages, diarrhœa, profuse perspiration, weak heart, and collapse. The course of a lobar pneumonia furnishes the best example of a fever ending by crisis.

When the declination is by lysis, several days are generally occupied in the process, the morning remissions becoming more pronounced from day to day and the evening rise being less than that of the day before. This is typical of the declination of typhoid fever.

A sudden fall of temperature at an unexpected time in the disease shows that something serious is taking place, and is almost always a bad omen. A sudden rise, on the other hand, generally shows that some complication has occurred, and the case must then be carefully studied.

Before we consider the necessity of treating a fever,—that is, of simply lowering the temperature of the patient's body,—we should analyze its cause and should carefully weigh the danger, if any, which threatens the individual. In the first place, it is a question whether the fever does not represent nature's method of combating the harmful influence of the toxic products of the disease germs. On the other hand, however, there must be taken into consideration the question of how much fever the human body can safely bear. It is permissible to state that the system can sustain for a short time a temperature of 105°, or even 106° F., without danger or damage, while a long-continued temperature of 101° F. or over seriously threatens the integrity of the heart, muscles, and nervous system. With a short-lived fever, as of a malarial paroxysm, or the grippe, or a cold, if the fever is high it may cause some symptoms that are very uncomfortable and may call for some treatment, but the temperature as such requires no treatment.

The symptoms of high fever are myalgia, especially backache, generally localized in the lumbar region, headache, rapid heart action, and quickened respiration. Delirium may or may not occur, according as the patient is or is not susceptible to irritation from cerebral congestion. The tongue is dry, and the mouth and lips are parched, not only from the fever, but from the mouth-breathing that is present if the lungs are much congested by a disturbed circulation. The surface vessels are more or less contracted as shown by the dry skin and the tendency to hemorrhages manifested by the mucous membrane. The internal organs, especially the liver and spleen, generally become congested. The liver thus becomes impaired in its power to produce materials protective against the toxins, and hence is unable either to render the poisons of the specific germs innocuous or to neutralize the effects of the toxins which are absorbed from the intestines.

Furthermore, owing to its congested state, the liver will secrete a diminished amount of bile, and thus there will be established a tendency to constipation and to fermentation in the intestinal canal. These changes, coupled with those which follow the diminished production of hydrochloric acid in the stomach, may lead to vomiting and to intermittent diarrhœa.

Aside from the fact that it easily becomes congested we cannot state what effects are produced in the spleen by fever.

From what has already been stated it is apparent that no serious harm can come to the organism provided the fever be short-lived. Hyperæmias give place to normal vascular conditions, toxins are eliminated, and all that we need do is to hasten nature's cure by increasing the loss of heat through the employment of any measures which tend to relax the peripheral blood-vessels and to cause perspiration. It is also possible that, in the effort to secure this result, we may derive some aid from the administration of a cathartic or from cold applications to the head.

If, on the other hand, the fever is a continued one, or even continuous for a few days, then we must analyze the condition. If we decide that this amount of fever is due to the specific germ and its associated local inflammatory conditions, our duty is to keep the patient as quiet as possible. The importance of this becomes apparent when we consider that every excitement causes restlessness, and this in turn means muscle movements through which heat production is increased. Hence it will frequently be necessary to give hypnotics. The bowels should be daily moved, not only for the relief of the liver, but to prevent fermentation, decomposition, and the absorption of all of the products of bowel infection. A carefully regulated ingestion of iced or cold water also tends to diminish the temperature, but if the latter still keeps too high we can, in short fevers, reduce it by means of the coal-tar products, cautiously administered in appropriate doses, or, in long-continued fevers, by cold applications.

If the body-temperature is so high as to be dangerous to life, even though brief in duration, as occurs in insolation, no treatment is as successful as immersion in cold water made gradually colder by ice. If the heart can withstand the previous high temperature, under this treatment the vaso-motor system recovers and heat control is re-established.

If after careful survey of the case we decide that the fever is in excess of that due to the disease *per se*, we must search for the additional cause, and with each disease we know where to seek its local manifestations. In the varied local inflammations such an abnormally high body-temperature generally indicates the formation of pus, as in appendicitis, pleuritis, synovitis, or otitis media. In typhoid fever and dysentery it means ulcerations with decomposing membrane and sloughing, and the absorption of toxins and pus products. In tuberculosis it means some closed up or incompletely evacuated pus cavity,—*i.e.*, streptococcus fever. In diphtheria, in follicular tonsillitis, and in scarlet fever it means a putrid exudation, a decomposing membrane, and a poorly cleansed throat.

While it is good treatment to keep the bowels free from fermentation and putrefaction in all short-lived fevers, it is absolutely essential in typhoid fever, and any treatment that gives free daily movements of the bowels in this disease will favorably modify the course of the fever. In typhoid fever constipation keeps the partially digested milk or other nutriment long in the intestines, and the mucous deposits and ulcerative sloughs long remaining *in situ* become most productive culture grounds for all sorts of bacilli and cocci, and the colon bacillus is often stimulated to migrate. Also fermentation increases, gas is formed, and tympanites, with the danger of perforation and hemorrhage from distention, readily occurs. We then have secondary infection with high fever and cerebral toxæmia.

If every local inflammation that develops in the course of any fever is kept as clean as possible, if the skin is kept in good condition by hot or cold sponging as the case may require, if plenty of water is given to drink, and if the bowels are kept nicely opened, there will be very little call for the use of so-called antipyretics, and the non-use of such drugs will allow a more careful study of the temperature curve, and therefore a better understanding of the case. *Oliver T. Osborne.*

FIBRINOUS BRONCHITIS.—(Synonyms: Croupous, exudative, plastic, pseudo-membranous, bronchitis; Ger., *Bronchialcroup, croupöse Bronchitis;* Fr., *Bronchite pseudo-membraneuse.*)

Definition.—An acute or chronic inflammatory affection of the bronchial mucous membrane characterized by the deposit of plastic matter which becomes detached and is expectorated in the form of moulds or casts of a more or less extensive portion of the bronchial tree.

Classification.—A distinction must be made between true fibrinous bronchitis, a comparatively rare disease, and those conditions in which the expectoration of similar moulds results from (1) an accumulation of clotted blood in the bronchi, as in hæmoptysis, (2) the extension of a plastic formation from the upper respiratory passages, as in diphtheria, or (3) the upward extension of the fibrinous exudate in acute pneumonia. The term bronchial polypus was applied to all these conditions, as well as to the disease under consideration, by many of the earlier writers from Galen[1] down to Laënnec[2] and Cheyne[3]; many indeed regarded the casts as pieces of flesh. Cheyne was one of the first to make a distinction between casts of hemorrhagic origin, mere coagula of blood "moulded into shape by the bronchial vessels," and those due to an inflammatory process.

Strümpell[4] classifies the disease into a true, essential form, or that which attacks persons who were previously healthy, and a secondary, symptomatic form, which occurs in those who have already suffered from some other disease, especially chronic pulmonary affections. An acute and a chronic form are recognized, but, although they differ very obviously, it is not always possible to assign a present case to one or the other class until its full clinical history has been revealed.

Etiology.—No specific etiological factor has been determined. It is quite probable that the exciting cause is not the same in all instances, so various are the conditions under which the disease occurs. It is encountered at all times of life from infancy to old age, but seldom before the tenth or after the fortieth year. Hayn[5] records a case with autopsy in a new-born child, and W. R. Brown[6] saw it in a man of seventy-four years, with recovery. The essential form is not frequent in childhood, many reported cases having been merely complications of diphtheria. Morrill[7] states that of seventy-six cases only eleven occurred in children of twelve years or under. It is about twice as frequent in men as in women, but attacks male and female alike in childhood. More cases have been observed in England, Germany, and Switzerland than in France, Italy, or the United States, and in the late springtime than at any other season (April and May—Beschorner; May and June—Eichhorst). More than one member of the same family has been attacked—Watson's two cases were in brothers,[8]—and Pichini[9] observed three simultaneous cases; but neither hereditary nor endemic influences have been demonstrated. Personal idiosyncrasy is probably a more important factor (Mason[10]). Robust individuals are sometimes attacked, but more frequently those who have been debilitated by some previous illness such as typhoid fever, pneumonia, measles, scarlatina, or other acute infection. The disease has occurred during pregnancy and in the course of typhoid fever, and the menstrual periods have apparently borne some etiological relation to it in some cases. The recurrences in Schnitzler's case of twenty-four years' duration occurred regularly for several years at the menstrual periods, but continued long after the menopause. Its association with such cutaneous affections as impetigo, herpes, and pemphigus has been repeatedly observed. Most of the subjects have been anæmic, and many have been the victims of syphilis, tuberculosis, rickets, or alcoholism. Six of Model's seven cases were tuberculous.[11] Its association with other diseases has no doubt been merely accidental in many in-

stances. The disease is not contagious, and we have no direct evidence that it is infectious. The bacteriological investigations have been too few to aid us in the solution of this question. In some instances it has been attributed to the Klebs-Löffler bacillus, but Escherich [12] failed in his

FIG. 2092.—Fibrinous Casts Photographed by the Author from Specimens Obtained from a Case Coming under his own Observation. (Three-fifths natural size.)

attempts to demonstrate this bacillus in the bronchial mucus or to inoculate animals successfully with the membrane. Pichini cultivated three varieties of bacteria, and reports that by the injection of pure cultures of them into the tracheas of animals he succeeded in producing a condition very similar to bronchial croup. Various micrococci found in the secretions by other investigators probably bore no relation to the disease, although Sokolowski [13] reported four acute cases which he considered due to the presence of the Staphylococcus albus and aureus.

PATHOLOGY.—Hyperæmia and swelling of the bronchial mucous membrane have been found in most of the cases examined after death, but the autopsies have been few. In some instances the epithelium was intact, in others it had been lost. Casts when present were more or less firmly adherent to the bronchial walls or lay detached within their lumen. In acute cases there was often evidence of extensive inflammation reaching from the trachea to the terminal bronchioles, while in most chronic cases the disease had been confined to one or more isolated regions.

The casts (Fig. 2092), pure white or of a cream color, sometimes streaked with blood, are firm and very elastic in consistence. They correspond in size and contour to the lumen of the bronchial tree, branching dichotomously, and extending, as a rule, to the finest branches. They vary in length from 5 to 15 cm. The main stem is cylindrical, from 0.5 to 1.5 cm. in diameter, and corresponds to the second or third subdivision of the bronchus. It is either patulous or is filled with mucus. The smallest branches are generally compact, those of intermediate size contain air. From the presence of small masses or nodules at the extremities of the terminal branches or along their sides (Fig. 2093) it has been inferred that the plastic formation had extended into the infundibula. Transverse sections of the largest branches have to the naked eye a lamellated appearance, and the microscope reveals superimposed layers of a delicately fibrillated substance. In the meshes of this tissue various cellular elements are found—epithelium, leucocytes, oil globules, and sometimes red blood corpuscles. In the smaller branches Charcot-Leyden crystals and Curschmann's spirals are sometimes seen. Klebs [14] attributes the formation of casts to increased transudation into the alveoli arising from dilatation of blood and lymph vessels, and Eppinger [15] thinks that they are due to the escape of blood serum rich in fibrin into the bronchial tubes.

The chemical structure of the casts has not been definitely determined, although they have generally been regarded as composed of fibrin. Strümpell found that the Weigert fibrin stain had no effect upon them. Beschorner [16] reports two cases examined by Neelsen, in which they were composed chiefly of mucin; Grandy [17] found mucus alone, and Herzog [18] proved them to be definitely fibrinous by the characteristic fibrin stains and particularly by the peptic test. From these different results and limited personal investigation it seems probable that the casts are not always the same in chemical composition, or that they are composed of a substance closely related to both fibrin and mucin, but not identical with either of them.

SYMPTOMS.—The acute form may have a sudden, severe onset, with high fever, chill, dry cough, dyspnœa, and constriction of the chest, but in most cases it begins as a simple acute bronchitis, with cough, scant expectoration of clear mucus, and possibly a slight elevation of temperature. In children it is often preceded by malaise. Much difference is noted in the severity and abruptness of the initial symptoms in different cases. A chill may mark the transition from the simple to the fibrinous form. The pulse rate is accelerated, partly perhaps as a result of interference with the bronchial circulation. With the development of casts the cough becomes more harassing and paroxysmal, and the dyspnœa and substernal constriction become more pronounced. A more or less profuse hemorrhage sometimes accompanies or follows their expulsion. A most gratifying relief follows the removal of the obstruction, but it is transitory and the paroxysm may recur within a few hours. The casts are sometimes extensive. Niemeyer [19] records the case of a girl fifteen years old who for several years expectorated almost daily an entire cast of the left bronchial tree. In severe cases digestion becomes impaired, nutrition is interfered with, and great nervous irritability may be exhibited. Recovery takes place by a gradual subsidence of the symptoms; the casts no longer appear, the temperature, although high, rapidly declines, appetite and strength return. Fatal cases generally terminate in from three days to two weeks, sometimes suddenly by suffocation.

The chronic form generally follows a more or less protracted bronchial catarrh. Its course is one of exacerbations and remissions. Paroxysms of cough, dyspnœa, and constriction occur, to be followed by temporary relief when the casts are expelled. The paroxysms may be of short duration, but they recur at longer or shorter

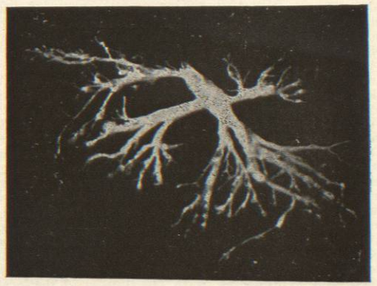

FIG. 2093.—Fibrinous Cast from Case Represented in Fig. 2092, and Showing Nodular Masses Supposed to have Come from Infundibula. (Three-fifths natural size.)

intervals for weeks, months, or years. Walshe [20] records a case of seven years' duration, Schnitzler [21] one of twenty-four years, and Kisch [22] one that lasted twenty-five years. Every grade of severity is seen in the recurrences, and months or years of perfect health may intervene. Only a limited area of the bronchial system is involved in most cases, and the casts that are coughed up from day to day may be almost identical in size and form. The temperature rises, if at all, during the exacerbations and does not generally reach so high a degree as it does in the acute form.

The physical signs are exceedingly variable in both types of the disease and depend for the most part upon the presence or absence of casts in the bronchi at the time of examination. Retraction of the intercostal spaces and diminished respiratory excursions on the affected side have been noted. In acute cases we may find all the evidences of an acute bronchitis; in the intervals of quiescence there may be no adventitious signs. Percussion is usually negative; if, however, a considerable portion of the lung has undergone collapse as a result of the plugging of its bronchi, corresponding dulness will be elicited. A tympanitic tone has been more frequently noted, and is to be expected over the other parts of the lung in the presence of atelectasis. The results of auscultation are equally uncertain. Every variety of râles, from the sonorous and sibilant to the fine subcrepitant, may be heard, and blowing, rasping, rattling, and flapping sounds have been described. Over a collapsed area the normal vesicular murmur is replaced by bronchial breathing, and the vocal resonance is intensified. Flint [23] regarded the subcrepitant râle, confined to a limited area and not diffused as in capillary bronchitis, of value in the diagnosis. Escherich was able to see the fibrinous coating of the trachea surrounded by a hyperæmic and swollen area of mucous membrane in the laryngoscopic mirror, but as a rule the diagnosis rests solely upon the expectoration of the characteristic fibrinous moulds. To recognize these the sputum must be dropped into water where they unfold from the mass of mucus in which they are usually embedded. It is possible that the disease is sometimes overlooked from failure to make this test or when, as often happens with children, the sputum is swallowed.

PROGNOSIS.—A guarded prognosis should always be made in acute cases. Strümpell places the mortality at twenty-five per cent. If, however, those cases are excluded in which the disease is merely a complication of another, perhaps more serious, disorder, neither the acute nor the chronic form can be regarded as in itself extremely dangerous. Recovery is the rule in chronic cases, but the duration of the immunity is uncertain. Much depends in either type upon the physical condition of the patient. The prognosis is, therefore, much more favorable in the primary form than in the secondary. High temperature is always to be regarded with suspicion if it persists through the intervals between the paroxysms, as it may indicate the development of pulmonary complications. There is at all times a possibility of accidents even in the most hopeful cases. The plastic membrane may quickly extend upward into the trachea, or a capillary bronchitis may develop. Oppolzer and Fagge each report the fatal termination of a case through plugging up of the glottis or trachea by a large cast after it had become detached. Death has occurred before casts had been expectorated. The danger is always greatest in the extremes of life. And there is no means of prognosticating the course of the chronic form, its recurrences and remissions, for each case has its own peculiarities.

TREATMENT.—No uniform method of treatment has been adopted. Many remedies have been tried with more or less benefit, but it is difficult to estimate the results, since so few cases have come under the care of any one observer. Potassium iodide has been employed more extensively than any other medicine with a view to hastening the detachment of the fibrinous deposits. It has been given in large or small doses, alone or with the alkaline carbonates, but its effect has not been uniformly satisfactory. Ammonium chloride, ipecacuanha, senega, benzoic acid, apomorphine, and other expectorants have been recommended for the same purpose. Emetics may be employed in robust individuals to assist in the expulsion of the casts after they have become detached. Apomorphine administered hypodermically in the dose of gr. $\frac{1}{10}$ has given the best results. Mercurial inunctions are recommended by Eichhorst [24] and Strümpell, but are condemned by others, except in syphilitic cases. N. S. Davis, Sr., [25] obtained prompt benefit from sodium salicylate in a rheumatic subject. In the writer's case prompt recovery followed the administration of creosote carbonate in fifteen-drop doses. [26] Steam and various medicaments have been recommended for use by inhalation, but it does not seem probable that any remedy can be applied to the smaller tubules by this method in sufficient quantity to be of real benefit. Stewart and Gibson [27] find steam of undoubted utility. Lime water and solutions of the alkaline salts, lactic acid, carbolic acid, or trypsin have been employed by atomization. Schnitzler suggests the employment of papayotin in this manner, and Ewart recommends the intratracheal injection of oil.

Every effort should be made to improve the general condition of the patient by such measures as are advisable in cases of chronic bronchitis. In this way only is there a hope of preventing future attacks. Residence in a dry, bracing, atmosphere (Oliver [28]), proper clothing, good food, exercise especially directed to the development of the respiratory muscles, proper bathing, with the administration of the bitter tonics, arsenic, iron, and malt preparations, or cod-liver oil, are worthy of trial. In many cases the treatment of the underlying condition must to a great extent take precedence over that of the disease itself.

James M. French.

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FIBROMA.—DEFINITION; SYNONYMS; GENERAL CHARACTERISTICS.—A fibroma is a tumor composed of fibrous connective tissue, *i.e.*, of cells, fibrillæ, and vessels. It is known also under the name of fibroid, desmoid, and, in certain positions, polypus. The term "fibroma" is applicable only to circumscribed new growths of connective tissue, and does not include the diffuse connective-tissue hyperplasia seen in elephantiasis, nor the connective-tissue stroma entering into the composition of other sorts of tumor. In this connection it is to be observed that the application of the term "fibroid" to the common tumor of the uterus is incorrect, since this tumor consists primarily of smooth muscle, and is therefore a myoma. The fibroma is a member of the connective-tissue or histoid group of tumors, and is co-ordinate with the lipoma, the chondroma, the myoma, etc. It is non-malignant, although not always sharply to be distinguished from certain forms of sarcoma. It is widely distributed, and may occur in any part of the body containing fibrous connective tissue.

GENERAL MORPHOLOGY. VARIETIES.—Fibromata occur as rounded, sometimes lobulated, masses, often

sharply circumscribed, and varying in size from a few millimetres to many centimetres in diameter. One variety of this form of tumor, the keloid, presents a more diffuse and less circumscribed character than is typical of the fibromata as a class. Fibromata originating in the subcutaneous and in the submucous tissues may present a papillary form and constitute certain sorts of so-called papillomata and polypi. According to their consistence and in a measure to their histological structure, fibromata present two general morphological types: (1) Hard; (2) soft.

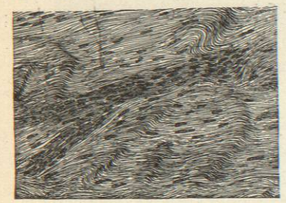

Fig. 2094.—Section of a Fibroma of the Ovary. (From Councilman.) The tumor is dense and compact; the cells are few in number; in several places on the section bands are seen in which the cells are more abundant. × 75.

I. Hard Fibroma (F. durum.).—(*a*) *Anatomical Characteristics.*—This type occurs usually as a mass varying in size from that of a pin's head to that of a cannon ball, the smaller tumors rounded, the larger often lobulated; sometimes encapsulated; of white or pink color, and of very firm, tough consistence. Upon section the tumor creaks under the knife, and presents a dry, white or grayish-white, rather refractive surface, marked by striæ traversing it in various directions, sometimes forming concentric lamellæ or whorls. The surface of section in some cases presents a small amount of fluid resembling that found in synovial cavities, or is marked by red points corresponding to divided blood-vessels. The physical properties of the tumor may be uniform throughout its entire extent, or may vary in different localities.

(*b*) *Histological Characteristics.*—The constituents of this type of fibroma are analogous to those composing the dense fibrous connective tissue of the tendons, the fasciæ, and the periosteum. They consist essentially of connective-tissue cells, variable in number, but usually few, and fibrillæ closely compacted and running in various directions. The cells ("connective-tissue corpuscles") possess but little protoplasm and are recognizable chiefly by means of their nuclei, which are rather small, deeply stained, and spindle- or rod-shaped, sometimes curved; when cut transversely, the nuclei appear round. In a fibroma which is growing rapidly the cells are relatively numerous, large, and rich in protoplasm. The number of the cells is of no special significance, provided that they present the characteristics of the normal connective-tissue cell. The fibrillæ (intercellular substance) occur in compact, more or less wavy, refractive bundles between which may be seen the nuclei of the cells. In some instances the fibrillæ are indistinct and appear to be merged into homogeneous lamellæ. Besides the ordinary fibrillæ, the intercellular substance may include a variable amount of elastic fibre. In addition to these histological elements, the hard fibroma presents blood-vessels and a variable number of leucocytes and of lymphoid cells, the last named occurring usually in the form of perivascular groups which may be regarded as small lymph nodules (Ribbert). The blood-vessels vary both in number and in size; ordinarily they are few and poorly developed. In occasional instances the veins are of abnormally large size (F. telangiectaticum, F. cavernosum; angio-fibroma).

According to their situation, hard fibromata may embrace yet other constituents, and thereby present a more complex structure than that which is characteristic of simple fibroma, and one which in some instances warrants the classing of the tumor with other sorts of new growth. Thus fibromata arising from epithelial structures and from nerves, or occurring in their vicinity, by including such structures within them, may acquire special and distinctive characteristics (adeno-fibroma; neuro-fibroma; papilloma). Again, the development of fibromata from periosteum and from perichondrium may result in the presence, in such tumors, of bone or of cartilage (*vide infra*).

II. Soft Fibroma (F. molle; F. areolare).—(*a*) *Anatomical Characteristics.*—The soft fibromata occur as circumscribed, round, or lobulated masses, often of very large size, of a pale yellow color, and of soft, inelastic consistence. Upon section, they present a slightly transparent, grayish-white surface, showing a fine meshwork of fibres, sometimes large cystic spaces, filled with a variable amount of clear, watery fluid which flows freely from the cut surface, and allows the tumor to collapse. Occasionally the surface of section is traversed by broad, fibrous bands running in various directions.

(*b*) *Histological Characteristics.*—The structural elements of this form of fibroma correspond to those seen in the areolar type of fibrous connective tissue. They consist essentially of cells and fibrillar intercellular substance. The cells in general are of the type common to mature connective tissue. Together with these are larger, round, oval, or stellate cells. As in the hard fibroma, nodules of lymphoid cells are frequently present. The intercellular substance is relatively scanty, and the fibrillæ are delicate and arranged in small bundles. Elastic fibres occur frequently, and in some cases are so abundant as to form a large part of the tumor. The fluid content of the tumor upon microscopic examination presents but few cellular elements, and therein differs distinctly from the opaque, milky fluid, rich in cells, which may be expressed from malignant, highly cellular tumors.

The distinction between these two types of fibroma is not absolute; every gradation between the hard and the soft varieties occurs, and not infrequently both sorts are represented in the same tumor.

III. Keloid.—Included amongst the fibromata is a connective-tissue new growth of somewhat variable character and known by the name of keloid (cheloid). It differs from other fibromata in manifesting a less circumscribed mode of growth, in presenting a close resemblance to scar tissue, and in being devoid of elastic tissue (Aschoff). The keloid develops in the corium of the skin as a dense mass of connective tissue often of considerable size, situated usually just beneath the epidermis and smoothly covered by it. It may remain as a scar-like band, or by its weight become flattened and polypoid. The growth is not always sharply defined, and may not seem to possess the physical properties of a tumor. Histologically the keloid consists of dense fibrous connective tissue closely resembling scar tissue and containing thick, refractive bundles of fibrillæ. In its earlier stages of development, or when growing rapidly, the tumor is very cellular. It often is connected with underlying parts by fibrous prolongations, which render its complete extirpation difficult. Two types of keloid may be recognized, according to the origin of the tumor: (*a*) Cicatricial; (*b*) spontaneous.

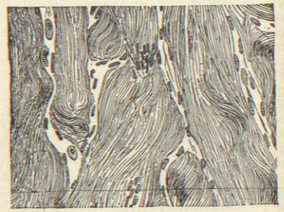

Fig. 2095.—Section of a Spontaneous Keloid from the Ear of a Young Negro. (From Councilman.) × 75.

(*a*) The *cicatricial keloid* occurs after injuries to the skin as an hypertrophy of the resulting scar, with more or less tendency to recurrence after removal. This form

of keloid is more apt to develop in the scar following burns than in that consequent upon other sorts of injury. It is said to be more common in tuberculous and in syphilitic subjects than in others. Keloids developed from cicatricial tissue resulting from an infected wound of the skin may be transitory (Aschoff).

(*b*) The *spontaneous keloid* ("true keloid") occurs independently of trauma. It consists of dense connective tissue. Like the cicatricial keloid, and owing to the difficulty of complete extirpation, it possesses a marked tendency to recurrence. It appears most often in persons who live in tropical climates, and gives rise to intense itching in stormy weather.

Mode of Growth.—Fibromata, from the fact of their dense consistence and relative paucity in cells, in the course of their development present no tendency to invade surrounding structures nor to produce metastases, and are thus essentially benign tumors. Increase in size is by central growth; surrounding structures either are pushed aside or undergo atrophy. In many instances the fibroma is enclosed by a capsule composed of dense tissue, which separates it sharply from surrounding structures. Others are less sharply defined, and bands of fibrous connective tissue pass from the tumor into adjoining parts; this may be true even of the pedunculated forms. The total extirpation of such a tumor is difficult and at times almost impossible. This fact probably accounts for the recurrence of fibromata in certain instances after operation. Leucke states it as a general rule that when operation for removal is complete there will be no recurrence. In other instances, supposed fibroma may have been a fibro-sarcoma. Virchow mentions a case, however, in which a large primary fibroma of the uterus was associated with metastatic secondary tumors in the mesentery and the omentum. There seems to be no tumor which under certain circumstances may not become malignant.

The course of development of the fibroma is slow but continuous, and the size to which it may attain indefinitely great. The direction of growth is always in that of least resistance, but in certain positions fibromata may exert considerable pressure and thereby injure surrounding parts. Fibromata developed in the skin and in the mucous membranes, if of sufficient size, may push upward, carrying the covering epithelium before them, and so give rise to warty or papillary tumors sometimes pedunculated and polypoid.

Occurrence.—Special Morphology.—The occurrence of fibromata is not associated with any special locality, but tumors of this class may originate in any part of the body which contains fibrous connective tissue. They develop most frequently from the skin, the subcutaneous tissue, the periosteum, the intermuscular septa, the submucosa of certain mucous membranes, and the nerve sheaths; also from the serous membranes, the retroperitoneal tissue, the perichondrium, and from the connective-tissue stroma of such organs as the breast, the kidney, the spleen, the ovary, and the uterus. The tumor presents distinctive morphological characteristics dependent upon its locus of occurrence.

1. *Skin.*—The skin is very commonly the seat of fibromata. They here may be of either variety, but are usually of the soft type; may originate either in the corium or in the subcutaneous tissue; and are often multiple. The multiple fibromata do not possess genetic unity, but may arise in various ways. The more common form of fibroma of the skin, and one frequently multiple, is that designated by Virchow as

(*a*) *Fibroma molluscum.* This develops from the subcutaneous areolar tissue of the face or of the back, sometimes of the entire body, as a rounded, dependent, often pedunculated outgrowth, at times no larger than a pea, often attaining an enormous size, and presenting a soft, almost fluctuant consistence. The tumor is sometimes broad, and when pendulous from its weight is attached to the body by a wide fold of skin. Such a tumor is known as *cutis pendula.* Histologically, this sort of fibroma is rich in cellular elements, many of which are spindle-shaped. Another mode of occurrence, in the skin, of multiple fibromata is seen in

(*b*) *Neuro-fibroma.* This form of tumor presents itself in the form of multiple, hard, spindle-shaped masses varying in size from that of a small pea to that of a walnut, and distributed along the course of a single nerve, or of all the nerves of an extremity or even the whole body. They originate from the connective tissue of the nerve sheaths, and usually contain within their substance a certain number of nerve fibres included by the tumor in the course of its development.

(*c*) *Multiple fibromata* of the skin of the hard type have been shown (von Recklinghausen) to originate also from the connective-tissue sheaths surrounding the sebaceous glands, the sweat glands, the hair follicles, and the vessels of the corium.

2. *Mucous Membranes.*—Fibromata of the mucous membranes develop from the submucous tissues, appear in the form of polypi, and are often multiple (Ribbert). In the nares they occur as soft, pedunculated, often œdematous masses, constituting one of the varieties of nasal polyp. In the larynx fibromata are common, and appear as polypi situated usually upon the vocal chords or in the fossa of Morgagni; the tumor may be of the hard type, originating from the perichondrium. Fibromata sometimes occur in the alimentary tract, especially in the large intestine.

3. *Periosteum.*—Periosteal fibromata are frequent; they contain not infrequently bone, which in amount may exceed that of the fibrous connective-tissue elements; and they present the appearance of firm, hard masses easily mistaken for either chrondroma or osteoma. An important example of periosteal fibroma is seen in one of the varieties of nasal polyp, viz., that occurring in the naso-pharynx. The tumor here originates from the periosteum of the base of the skull, extends downward and laterally into the pharynx, and forward into the nares, and is remarkable for the destructive energy of its growth, which may suffice to force apart the bones of the face, giving rise to the characteristic "frog-face." It is usually lobulated. Histologically, it is characterized by a dense fibrous structure, although at times large vessels are present, and in other instances the cells are relatively numerous and indicate by their protoplasmic character rapidity of growth. The vascular character of certain of these tumors renders considerable the hemorrhage incidental to their removal. The naso-pharyngeal polypi contain as a rare constituent occasional islands of cartilage. Periosteal fibromata not infrequently occur as small masses upon the maxillæ of old people.

4. *Parenchymatous Organs.*—In the mammary gland the fibroma appears as a firm, circumscribed, encapsulated tumor, which may be multiple; and also as a more diffuse growth; the latter can with difficulty be differentiated from the fibrous induration consequent upon chronic inflammation. The fibroma of the breast frequently originates in the periglandular connective tissue; in this case there is usually associated hyperplasia of glands. Pressure exerted by the tumor upon the glands and their ducts may lead to cystic dilatation, and into the resulting spaces papillary projections of the tumor may extend, carrying upon their surface the glandular epithelium. Certain of these projections may grow for a considerable distance into the lumina of the glands and of their ducts, giving rise to variable and complicated histological appearances. Anatomically, such a tumor upon section presents clefts or irregular fissures, with occasional small cysts containing clear, viscid fluid. When the cyst formation is extensive, the major part of the tumor may project into the cavity, and upon section appear as a large, irregular polypus. This form of tumor belongs to the class of adeno-fibroma.

In the kidney a curious form of fibroma is met with. It appears as a pearly white, firm nodule, situated usually near the base of a pyramid, and histologically presents the characteristics of a circumscribed interstitial nephritis.

Retrograde Metamorphoses.—Retrograde changes

of every variety occur in the fibroma, usually after prolonged duration of the tumor.

1. *Mucoid degeneration* is the more frequent, and is characterized by the formation of large cysts containing thick, viscid fluid. The process begins with an increase in the cellular constituents of the tumor, associated with a mucoid degeneration of the intercellular substance which thereby undergoes softening and is reduced to a fluid state. The cells in the degenerated area then disappear, the resulting space being occupied by the fluid. This degeneration may readily be confused with

2. *Œdematous infiltration*, a condition due to disturbances of circulation within the tumor; here the ground substance of the growth becomes soaked with fluid, the fibrillæ are pressed apart, and the tumor becomes soft and spongy, upon section presenting the appearances seen in gelatinous infiltration of the skin or in the umbilical cord.

3. *Fatty degeneration* occurs infrequently in the central part of the larger fibromata; the region involved becomes yellow, soft, and ultimately may be converted into a cavity filled with fatty detritus. Such an area of softening, if it extend to the surface of a fibroma situated near a free surface, may lead to ulceration.

4. *Calcification* is sometimes seen, at first in small and circumscribed areas, latterly in perhaps a large part of the tumor. The capsule of the tumor may be in great part calcified.

5. *Ossification* is common in fibromata developed from the periosteum, and occasional in those originating elsewhere.

Combination with other Tumors.—The fibroma is frequently in combination with other members of the connective-tissue group of tumors. It is most often seen in association with *sarcoma* in the form of a tumor parts of which are made up exclusively of spindle cells and parts of fibrous connective tissue, with elsewhere intermediate gradations; such a tumor is known as a *fibro-sarcoma*. Another combination often met with is the *myxo-fibroma*, which is a more common tumor than simple fibroma; here, in addition to fibrous connective tissue, the tumor contains myxomatous tissue consisting of branched and stellate cells embedded in a mucoid matrix. Association of fibroma with *hæmangioma* is seen in fibrous connective-tissue tumors containing large, intercommunicating venous sinuses; and with *lymphangioma* in such tumors of that class as show marked development of their connective-tissue elements. Combination with *myoma* is seen in the common tumor of the uterus; connective-tissue formation is here usually subsequent to the hyaline degeneration of portions of the primary constituents of the tumor. (For Neuro-fibroma, see *Neuroma*.)

Etiology.—Fibromata may develop at any time of life, and are sometimes congenital; they occur more frequently after the twentieth year than during childhood, but are not common in old age. The fibromata of the breast, like myomata of the uterus, occur most frequently between the thirtieth and the fortieth years; they are as common in nulliparous women as in those who have borne children.

As to the cause of this class of tumors there is little to be said. Irritation is often supposed to stand in causal relation with the origin of fibromata, but there are no better grounds for regarding mechanical injury as a factor in the development of this than of any other tumor. One of the forms of keloid, the cicatricial, is consequent upon injury to the skin, but that fact does not explain why the scar tissue in which it develops should become hyperplastic. It is possible that a predisposition to tumor formation may in this case exist in the skin, which becomes manifest as a weakening of the physiological resistance of the surrounding tissues toward the growing reparative tissue, or in a tendency on the part of the connective tissue to assume this special mode of growth. There is some evidence of a family predisposition to keloid formation (Aschoff).

Diagnosis. — Clinical Significance.—The clinical diagnosis of fibroma in a majority of instances presents little difficulty. The hard fibroma offers distinguishing characteristics in its circumscribed form and in its dense and homogeneous consistence. From the *sarcomata* as a class it may be differentiated by its relatively slow rate of growth. From *scirrhous carcinoma* it is usually distinguishable; save in those instances in which the fibroma is so situated as to cause pressure, by the absence of pain, by the mobility of the tumor, and by freedom from involvement of overlying skin. The differentiation of hard fibroma from *fibrous induration* of glands offers more difficulty, and is often attended with error. In such cases an important aid to diagnosis lies in the clinical history of a previous inflammatory process. The soft fibromata, or such of the hard type as have undergone degeneration with subsequent softening, may easily be mistaken for *lipomata* or for *cysts*.

Histological diagnosis offers little difficulty save when the tumor presents an appearance intermediate between fibroma and sarcoma, or when there is a question of fibroid induration, or of scirrhous carcinoma containing but few epithelial elements.

The clinical significance of the fibroma is comparatively slight. An essentially benign tumor, it is harmful only when its position is such as to result in pressure upon surrounding and possibly vital parts, or in the obstruction of important natural canals. Fibromata of the skin, from their exposed situation, are liable to trauma, and if injured may become the seat of ulceration.

George Burgess Magrath.

FIG.—Ficus. "The fleshy receptacle of *Ficus Carica* L. (fam. *Moraceæ*) bearing fruit upon its inner surface" (U. S. P.). This fruit can scarcely be regarded as a medicinal substance, though nutrient, and, like most sugary fruits, slightly laxative. It is retained in the Pharmacopœia merely because of its entering into the *Confectio Sennæ*, but it seems likely that both it and the latter little-used remedy will shortly be dropped. Figs are commonly combined with purgatives. One method is to turn them inside out and stuff them with senna leaves, the mass being then chewed and swallowed. Figs grow upon a large shrub or small tree, natives of the Orient, but cultivated in all warm countries, being hardy, with slight protection, as far north as Philadelphia. The dried fruit consists of nearly two-thirds its weight of sugar, some fat and gum, and small amounts of laxative salts. It is decidedly nutritious and has been known, in the fresh state, to constitute the chief food of armies for short periods. Besides the varieties distinguished by the names of the places from which they are exported, as Smyrna, Turkey, Greek, Marseilles, etc., figs are imported in two forms, known as "pulled" and natural. The former are rolled and kneaded until their structure is broken up and they have become soft and pliable; the solidly packed, layered, flattened figs are of this sort: the others are simply dried in the natural condition. These are oblong, rounded, and longitudinally wrinkled.

Henry H. Rusby.

FIGWORT. See *Scrophulariaceæ*.

FILARIA MEDINENSIS; FILARIA SANGUINIS HOMINIS. See *Nematodes*.

FILMOGEN (Liquor adhæsivus) is a solution of soluble cellulose nitrate in acetone, with the addition of a little castor oil. It is transparent, adhesive, and impervious to water, and resembles flexible collodion in its appearance and uses.

W. A. Bastedo.

FISSION.—(L. *fissio*, a cleaving, from *findere*, to split.) Fission is a process of multiplication in which the parent organism divides into two daughter organisms approximately equal in size and development; as distinguished from budding, in which the parent remains intact and the daughter organism is a new individual formed by a small outgrowth upon the parent. (See article *Budding*.)

Ordinary cell division is a process of fission, and, consequently, this is the usual method of reproduction among the unicellular organisms. The yeasts and some of the Protozoa, however, reproduce by a process more accurately described as budding. But the Bacteria, Protophyta, and nearly all of the Protozoa mutiply by fission and often with almost incredible rapidity. In the simpler forms there are no preparatory changes other than those ordinarily associated with cell division in these groups. But in the more highly differentiated Infusoria provided with permanent oral funnels, ciliated bands, etc., these structures may be duplicated in the two new individuals previous to their separation, a process analogous to what takes place in many multicellular organisms.

The multiplication of individuals by fission is unknown among plants above the very simple Schizophyta.

Among the Metazoa, on the other hand, this method of multiplication is common in some of the lower orders and may occur abnormally in so high a group as the vertebrates.

In a few cases fission occurs without any previous preparation. The adult animal tears its body apart by its own efforts. A wound is formed by the rupture of the tissues with a loss of the fluids of the body. This wound heals, and from its surface the missing parts of each of the new individuals are regenerated. The method has been observed in the genus Hydra, in two annelids, Lumbriculus and Ctenodrilus, and in certain star-fishes and ophiurans. In the latter the plane of fission passes through the disc dividing the mouth and the stomach, while to one part of the disc three arms remain attached, to the other, two; and each half regenerates the missing parts. But in one family of star-fishes, the Linckiidæ, the process is somewhat different. Here the five arms separate from the disc and then the disc regenerates five new arms, and each detached arm regenerates a disc and four new arms. Delage relates that he observed once the division of a sea anemone, *Anthea cereus*. The two parts of the body were extended as if trying to crawl in opposite directions. The intermediate portion became much constricted and finally ruptured. The whole operation occupied about two hours.

On the other hand, in most animals in which fission is a normal process of multiplication, it is preceded by preparatory changes which result in each of the new individuals being provided with a full complement of organs before separation takes place.

According to Parker, fission in the common sea anemone of the coast of New England, *Metridium marginatum*, is a slow process occupying many months. It begins with the division of the mouth and oral disc accompanied by the formation of new septa, and proceeds gradually toward the base. The final separation has not been observed, however.

In many worms fission takes place in what may be regarded as a larval stage, before the development of eggs and spermatozoa. This, according to Mensch, is the case with Autolytus, and it seems to be so with most of the worms in which fission occurs. In Antolotus and its allies an area of embryonic tissue appears at about the thirtieth segment, dividing the young worm into two parts. On the posterior part there is developed a new head. The tissues just in front of the head undergo degeneration, and by their own movements the two individuals are broken apart.

Among the jelly-fish of the group Scyphomedusæ fission is associated with the metamorphosis from the larval to the adult form. In Cassiopea, for example, the scyphistoma larva is a graceful little creature shaped like a wine glass and lives attached by its base to some solid body. When fully developed this larva becomes divided into two portions by a horizontal constriction. It is then called a strobila. The upper part of the strobila becomes transformed into a medusa, while new larval tentacles and the rudiment of a proboscis are developed on the lower part. Finally the narrow isthmus connecting these two parts undergoes degeneration and is at length ruptured by the violent swimming movements of the young medusa.

Fission may take place in an early embryonic stage of development. According to Kleinenberg this occurs normally in one of the earth worms, *Lumbricus trapezoides*, in which the embryo divides into two shortly after the gastrula stage and both develop into normal individuals. This has been observed to occur under abnormal conditions in the trout and the chick. If hen's eggs be incubated at a temperature slightly above normal a large proportion of the embryos will be found to show a tendency to the formation of double monsters and occasionally the area embryonalis will be found to contain two distinct embryos. A similar division of the embryo may occur in man. If incomplete, it will give rise to a double monster or to such cases as the Siamese twins and Millie-Christine. If the separation be complete the result will be a pair of twins of the same sex. In every case of fission all the individuals produced from a single ovum are of like sex.

In some of the lower forms of animal life fission may be normally incomplete, as in some corals, in which the individuals remain in organic union forming a colony, or cormus.

There are some animals in which a form of fission occurs in the fully mature adult, which does not serve to multiply the individual but for a more favorable dispersal of the sexual products. The formation of proglottides by the common tapeworm is an example. Another example is the palolo worm of Samoa, an annelid that burrows in the coral rock. When mature the posterior portion of the body, distended with eggs or spermatozoa, is separated off and swims on the surface of the water, where the sexual products are discharged. They occur at certain times in great abundance and are gathered by the natives, who relish them greatly as an article of food.

The relation between fission and budding is a very close one, so much so that Bock has argued that they are simply two forms of one fundamental process. In many sea anemones, for example, small fragments of the foot become detached and subsequently develop a mouth and tentacles and become complete individuals. Such cases make it difficult to draw a sharp line between fission and budding. In forms like Autolytus, mentioned above, the two processes are closely associated. For, after the original posterior part of the body is separated off, the embryonic area on the end of the anterior portion, or parent stock, may give rise to any number of new individuals by a continuous process of budding. Nevertheless in most cases the distinction between fission and budding is a clear one and is useful in practice.

Robert Payne Bigelow.

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In the articles mentioned above references will be found to other literature on the subject, and reviews of recent articles are given from time to time in *L'Année Biologique*, Paris, Schleicher Frères, beginning 1895.

FIXED OILS. See *Active Constituents of Plants*.

FLAG, BLUE.—Iris. "The rhizome and roots of *Iris versicolor* L. (fam. *Iridaceæ*)" (U. S. P). This is a very common swamp plant of eastern North America, erect,