time. Dry heat, best from the electric coil, may be applied for periods of one-half hour to two hours. If the hyperæmia is severe, and especially if there is pain, one or two fluidounces of blood may be taken by leeches or by the artificial leech applied to the temple. Subconjunctival injections of physiologic salt solution may be made at intervals of two or more days. These should be placed rather deeply within the capsule of Tenon. On going out in daylight the eye should be protected by very dark glasses or an opaque shade; but it should not be kept continuously covered by thick dressings.

As in other forms of uveitis, general treatment is of great importance. Mercury should be given freely up to the point of causing tenderness of the gums or other evidences of its poisonous action. At first, calomel may be given until it acts as a purgative, with large inunctions of mercurial ointment twice daily. Later, any form of mercurial that will sustain the mercuric influence without symptoms of poisoning may be employed. Nothing will be gained by carrying the action of mercury beyond the point indicated. But its administration should be continued until all symptoms of inflammation have disappeared.

Next to mercury, the most important drug is sodium salicylate. This should be given in the largest doses that will be tolerated; from twenty to forty grains, three or four times a day, in an adult. But such doses need not be continued more than a few days. Later, it may be given in smaller doses or discontinued. Should this drug cause serious disturbance of the stomach, other salicylates or aspirin may be substituted. For a chronic case or at a later stage, the iodides may be beneficial.

It is very important that the patient should be kept in as good a state of general health as possible. On this account the administration of mercury and the salicylates must be closely watched. The patient must not be confined to a dark room. The use of alcohol in any form should be forbidden. Diet and rest must be carefully attended to, and general tonics, especially iron, may be indicated. After apparent cure the patient should be kept under observation, and should avoid excessive use of the eyes or indulgence in alcoholic drinks for many months.

When the attack of inflammation has been finally subdued, it may leave the pupil closed by exudate, with or without an opaque lens. This condition might require for its relief an operation, but the eye should be allowed to remain quiet for years before any such operation is attempted. If done within a year or two after the inflammation has subsided, it will almost certainly cause a recurrence of the disease. Nothing will be gained by the attempt, and much will be lost.

Prognosis.—Sympathetic inflammation, untreated, ends in blindness; and, if those cases which arise after the enucleation of the exciting eye be excluded, probably less than half can be cured by treatment. The nature of the injury or the violence of the inflammation in the exciting eye has little influence over the prognosis when once sympathetic disease has actually occurred. Attacks beginning with lesions in the fundus show a rather better proportion of cures than those commencing with marked iritis. The first remission must not be mistaken for a cure. But when recurring exacerbations grow less severe and the sight is left no worse by them, an ultimate cure with partial or complete restoration of vision may be hoped for. Not until the eye has been free from inflammation for a year should the case be considered cured.

Sympathetic Irritation, or Sympathetic Neurosis.—This is a condition set up by disease in the fellow-eye and characterized by extreme irritability, photophobia, excessive lachrymation, moderate general hyperæmia, and inability to use the eye, sometimes equivalent to complete temporary blindness.

Cause.—This is disease in the fellow-eye, generally of long standing and marked by very extensive degenerative changes. The exciting eye may show no symptoms of present inflammation, no hyperæmia or tenderness. Its condition may be the result of injury, or it may be the result of disease quite independent of traumatism. Intra-ocular tumor, without perforation of the ocular coats, may cause it. Ossification of the choroid is a quite common cause.

Symptoms.—It begins with inability to use the eyes for ordinary work, photophobia, and increased lachrymation. The symptoms vary in severity from time to time, but tend on the whole to grow worse, until any use of the eyes becomes impossible. On close examination the cornea will be found free from deposits, the pupil small but reacting well, the iris normal; and if photophobia does not prevent an ophthalmoscopic examination, the media are found clear and the fundus is normal. The hyperæmia is quite general, may disappear when the eye is kept quiet in a dark room, but increases rapidly on attempting to use the eyes or even with examining them.

Diagnosis.—Sympathetic irritation has to be distinguished from eye strain and from sympathetic inflammation. Hyperopia, astigmatism, or presbyopia may cause apparent lack of accommodation, excessive irritability of the eye, lachrymation, photophobia, and difficulty with near work. Therefore the refraction and accommodative power should be carefully measured before adopting the diagnosis of sympathetic irritation, even though the fellow-eye presents all the conditions that would make it the cause of this neurosis. By placing the suspected eye under the influence of a mydriatic, eye strain can be excluded.

To differentiate between sympathetic inflammation and sympathetic irritation is often of great practical importance. Their chief points of difference may be contrasted as follows:

Inflammation.	*Irritation.*
1. Follows perforation of the sclero-corneal coat, usually by traumatism, especially if the wound is in the ciliary region or if a foreign body is lodged in the eye.	1. Follows extensive degeneration of the fellow-eye, with or without traumatism, especially if the eye contains a foreign body or new-formed bone.
2. Occurs at from three weeks to six months after injury; is rare after one year.	2. Occurs usually many years after injury, or disease, of the exciting eye.
3. The exciting eye is almost always red or sore before the outbreak.	3. The exciting eye may be entirely quiet and free from irritation.
4. There are deposits on the posterior surface of the cornea, the iris is discolored, its reaction impaired. There are posterior synechiæ; the vitreous is hazy; vision is permanently diminished.	4. The cornea is free from deposits, the iris normal; the vitreous clear, and the eye may for a short time be capable of normal vision.
5. There are always marked organic changes.	5. There are no organic changes.
6. There are relapses at intervals of many days, weeks or months.	6. The severity of the symptoms may vary from hour to hour.
7. It terminates in slow recovery under treatment; or, more frequently, in complete blindness.	7. It tends to continue indefinitely; but ends in immediate restoration to normal after removal of the exciting eye.

The differential diagnosis is only difficult at the outset before the organic changes of sympathetic inflammation have had time to occur.

Pathology.—No anatomical changes occur, and the morbid influence is undoubtedly transmitted from the exciting to the sympathizing eye through the ciliary nerves.

Prevention is of little importance. The only effectual preventive measure is removal of the eye that is liable to cause it, and this is equally efficient after the condition of sympathetic irritation has actually developed. And since a degenerated eyeball may be retained many years without causing sympathetic irritation, the possibility of that event at some future time does not justify enucleation.

Treatment.—This is enucleation of the exciting eye or one of the substitutes for enucleation. Where sympathetic irritation alone is to be feared, probably evisceration or even optico-ciliary neurotomy will be as efficient as the removal of the eyeball. If preferred by the patient or operator, resort to one of them, preferably evisceration, in place of enucleation, is entirely proper. If

the patient strenuously objects to operation and the case is clearly not one of sympathetic inflammation, palliative measures may be tried. Avoidance of close work and keeping the eye under a mydriatic, as atropine sulphate 1, distilled water 100, instilled twice a day, will often give partial or temporary relief. The internal administration of bromides is also useful. In a few cases freedom from irritation is thus secured, and it may last for months or years. But in nearly all cases the return of the symptoms, and the continual annoyance and disability which they cause, will in time overcome the strongest objections to operative treatment.

Prognosis.—Without treatment the irritation continues or recurs indefinitely. With removal of the exciting eye the prognosis is entirely favorable. Donders reported a case in which the patient had believed himself entirely blind for two years, but was proved to possess normal vision two hours after the removal of the exciting eye.

Edward Jackson.

SYMPHOROL-SODIUM, SYMPHOROL-LITHIUM, and **SYMPHOROL-STRONTIUM** are the respective caffeine sulfonates of these metals. They are white, odorless, and bitter, are readily soluble in water, except the sodium salt, and are insoluble in ether, benzol, or chloroform. These salts are strongly diuretic in dosage of 1–4 gm. (gr. xv.–℥ i.) a day, and are claimed to retain the diuretic effect of the caffeine without its stimulating action on the heart and nervous system. The sodium salt is in common use under the simple term "symphorol."

W. A. Bastedo.

SYMPHYSEOTOMY. See *Obstetric Operations* and *Pelves, Deformed.*

SYNCOPE. See *Brain Diseases: Anæmia.*

SYNCYTIOMA.—(Synonyms: Deciduoma malignum, Sarcoma uteri deciduocellulare, Chorionic epithelioma, Choriocarcinoma, Syncytioma malignum, and Carcinoma syncytiale.)

Under syncytioma are to be considered those new growths which consist largely or in part of syncytium such as is found covering the chorionic villi. In order to understand clearly the relation and origin of this class of tumors, it is necessary to have a knowledge of the placenta and its development. Of especial importance in this relation is the development of the chorionic villi. The villi are at first clothed with fœtal ectoderm, which, we have reason to believe, becomes two-layered in early embryonic life; the inner layer, the "cell layer" of Langerhans, being composed of separate individual cells with large vesicular nuclei and reticular protoplasm; the outer, or "syncytial" layer, being composed of a continuous mass of dense, deeply stained protoplasm containing smaller nuclei than the preceding layer. The syncytium resembles not a little a huge giant cell. In tumors of this group both the syncytium and the cell layer of Langerhans are usually represented in varying proportions. The origin of the syncytium has long been a matter of dispute, some observers maintaining that it is derived from the epithelium of the uterine mucosa, while others believe that it arises by delamination from the ectoderm covering the ovum. A study of preparations of developing placentas furnishes convincing evidence that the uterine mucosa takes no part in the formation of the syncytial layer. The close relation of the syncytium to the cell layer of Langerhans and the presence of transitions between the two make it clear that the syncytium arises from the fœtal ectoderm.

From the above observations it would appear that a syncytioma is to be regarded as a malignant form of new growth originating from fœtal ectoderm. In the discussion of these tumors the term "syncytium" applies only to a special tissue, identical with or closely resembling the so-called syncytial layer of the chorionic villi. Syncytia other than this special form have no relation to the tumors in question.

Syncytiomata may be divided into two groups:

1. Certain rare cases of teratomata in which a syncytium develops.

2. Those tumors arising in the uterus after pregnancy to which the terms "deciduoma malignum," "syncytioma malignum," etc., have been applied.

Several teratomata of the testicle have been recently described in which a portion of the growth resembles in every respect a true syncytioma of the uterus. Such growths are described by Carey, Wlassow, and Schlagenhaufer. The syncytium in these teratomata represents one of the many lines of tissue differentiation found in these neoplasms, and, from morphological characteristics as well as on theoretical grounds, it may be considered as homologous to the true chorionic syncytium. Teratomata in which the syncytium forms a large portion of the tumor appear to possess a considerable degree of malignancy; for example, metastases have been described as well as a tendency of the growth to infiltrate surrounding tissues. On account of the rarity of syncytial growths associated with teratomata, and since they comprise only a portion of these neoplasms, they are here given but brief mention. Concerning the further characteristics and the theories of origin of teratomata, one should consult monographs on that subject.

Deciduoma Malignum.—*Historical.*—The term deciduoma malignum was first applied by Sänger in 1888 to a peculiar malignant growth of the uterus with metastases following an abortion. Although this term is considered to be a misnomer, it is generally deemed advisable, on account of the multiplicity of terms, to retain, for clinical usage at least, Sänger's original terminology. Sänger believed that the tumor in his case consisted of decidual cells, and he placed it among the sarcomata. Following this and quite independently of Sänger, Pfeiffer described a case and also applied the term deciduoma malignum. In 1893 Sänger published a monograph which comprised all that was then known of this subject. In 1895 Williams and Marchand published monographs. Williams, after reviewing the literature, came to the conclusion that in the various cases reported there is some variation in the nature of these tumors, that is, that some consist for the most part of decidual cells and are thus of maternal origin, others consist of tissue analogous to the syncytium and Langerhans' cell layer and are of fœtal origin, while it is not improbable that others are of both maternal and fœtal origin.

Marchand believed that both the syncytial and the cellular portions of these tumors are of fœtal origin. A great many cases have been reported since the publications of Williams and Marchand. Ladinski, in 1902, was able to collect one hundred and thirty-two cases. Such is the comparative frequency of their occurrence that they are worthy of consideration to the clinician in cases of uterine hemorrhage.

Occurrence.—Deciduoma malignum may occur at any time during the child-bearing period. That it may not be discovered until after the menopause is shown by a few cases. It is always associated with pregnancy, appearing after a full-term labor, an abortion, or the expulsion of a hydatidiform mole. It is evident that in certain cases the tumor has begun to develop before the expulsion of the mole. The frequent association of this tumor with vesicular moles is to be noted. Dorland, in a series of fifty cases of deciduoma malignum, found that twenty-two cases (43.3 per cent.) gave a history of the expulsion of a mole at some time prior to the appearance of the growth.

Gross Appearances.—Metastases of the growth are often found in the vaginal wall. They appear as soft, vascular nodules, friable, often necrotic and ulcerated, and sometimes protruding from the vulval orifice. The cervix is usually soft and enlarged from the preceding pregnancy. On opening the uterus the primary growth will usually be found bulging from some part of the uterine wall. It varies in size and form, is reddish in color, sometimes mottled with gray. The primary growth is often necrotic and is always soft and friable. The uterine

wall may be infiltrated. Metastases in other organs are of similar character.

Histological Appearances.—In all cases that are to be regarded as syncytiomata the growth consists essentially of tissue identical with the syncytium and the cell layer of Langerhans. The relative proportion of these two varieties of tissue varies in different tumors and in different portions of the same tumor. In four cases from the collection of the Pathological Laboratory of the Massachusetts General Hospital the appearances agreed closely with Williams' descriptions and plates. The growth consisted of irregular masses of large cells, in every instance associated with syncytium. Both the syncytium and the cellular portion were identified by comparison with chorionic villi derived from an early pregnancy. The cellular masses are almost invariably surrounded by layers of syncytium, that is, the syncytium presents itself at the growing surface of the tumor. It is vacuolar over certain areas (see central portion of Fig. 4585). Some

FIG. 4585.—A Section of Syncytioma which has Infiltrated the Uterine Wall. The tumor is made up of two sorts of tissues, a portion consisting of syncytium (to the right of the central portion of the figure), the remainder of separate cells corresponding to the cellular layer of Langerhans. There is no stroma in the structure of the tumor.

cells of the cellular portion attain a large size. Mitoses are numerous and atypical multipolar mitoses are not uncommon. There is no stroma and no blood-vessels are present, although blood is found free between the tumor cells. Large portions of the growth are necrotic, and a fibrinoid change is present, similar to that occurring normally in the placenta. In one case the growth is composed of villus-like masses. No mesenchyma and no decidual cells were found in these cases. The uterine muscle was infiltrated in each case. Metastases present the same histological appearances.

Theoretical Considerations.—As in other tumors, it is impossible here to arrive at an explanation of the causal agency of deciduoma malignum. It is not possible to ascertain whether the fœtal tissues for some unknown cause take on abnormal activity or whether the maternal structures are unable to resist the normal growth of this tissue. When, however, it is considered that these growths in all recorded cases follow pregnancy, that they arise at the placental site, and that they are composed of tissue derived from the fœtal ectoderm, their origin is clear. Whether there exist tumors agreeing clinically with these, but consisting of both fœtal and maternal tissues or consisting wholly of maternal tissue, as Sänger claimed, is a matter of dispute. Assuming, for the time being, their existence, they are not to be considered under syncytiomata.

MALIGNANCY AND METASTASIS.—The malignancy of deciduoma is striking, symptoms usually appearing during labor or within four weeks of that time. In a large percentage of the cases death occurs within six months after the appearance of the first symptoms. As a rule, metastases are abundant. In Dorland's series of 52 cases, metastases occurred in the lungs in 78.37 per cent., in the vagina in 54 per cent., in the kidneys, spleen, and ovaries in 13.5 per cent., in the pelvis and in the broad ligament in 10.8 per cent. respectively, and in the brain in 5.4 per cent. In a small number of cases the vaginal metastases have occurred where no primary growth could be found.

Clinical History.—The first symptoms noted are repeated and profuse uterine hemorrhages, while in the later stages there may be foul watery discharges. There is usually pelvic pain. Metastases may appear in the vagina with vulval œdema. The patient becomes cachectic, there is anæmia, and hæmoptysis may take place from pulmonary metastasis. Slight fever and occasional rigors arise from the absorption of septic material.

Diagnosis.—The possibility of deciduoma malignum should always be borne in mind after the expulsion of a hydatidiform mole or upon the appearance of profuse hemorrhage or obscure symptoms following delivery. In such instances curettage should be resorted to and the diagnosis made from the uterine scrapings. Vaginal metastases may be the first indication of the growth. Microscopical diagnosis is made by the appearance of syncytium in the growth.

Treatment.—If microscopical examination of the curettings reveals the presence of deciduoma, immediate hysterectomy should be performed and the metastases excised wherever they are accessible. The chances for ultimate recovery are, however, slight, so great is the rapidity of metastasis-formation.

Neumann claims to have obtained early evidence of the appearance of deciduoma through the examination of hydatidiform moles. He found among the cases which he examined certain moles in which the syncytium invaded the villi in a manner very suggestive of malignancy. The most marked of these cases afterward developed deciduoma. From his results it would seem justifiable to curette the uterus following the expulsion of a hydatidiform mole, in order to examine the scrapings histologically for the presence of deciduoma and for the purpose of removing the same. Hysterectomy is not justifiable on the evidence of a vaginal tumor, but should be performed only after a positive diagnosis from the curettings, for in certain instances the vaginal tumor exists without uterine involvement and its removal has been followed by complete recovery.

Ernest Edward Tyzzer.

SYNOVITIS, ACUTE.—(Synonyms: Hydrops articulorum acutus, Acute serous synovitis, Arthro-meningitis, Sero-synovitis; French, Synovite aiguë; German, Die Synovitis.)

ANATOMY.—Synovial membranes approach so closely to the serous membranes that they are often classified with them. But, although structurally much the same, they differ from the serous membranes in secreting a peculiar fluid, synovia. In all joints where motion takes place (diarthrodia) a lubricating fluid is necessary, and this fluid is furnished by the so-called synovial membrane. Every diarthrodial joint is lined with a layer of synovial membrane, except in the places where the articular cartilages are in contact. Here there is no membrane, except at the edge of the cartilages, which the synovial membrane may overlap for 2 or 3 mm. before merging into the cartilaginous structure. Fasciculi and folds of the capsule, the internal ligaments, and fatty

internal protrusions are all covered by the membrane. The limits of the synovial membrane are most easily made out in inflammation, when a red collarette is seen surrounding the white cartilages.

Synovial membrane is thin and elastic. Externally it merges into the tissue of the joint capsule, while its inner surface is smooth and moist. Histologically the structure is a basement tissue of elastic and connective-tissue fibres, upon the inner surface of which lie endothelial cells. In gross, the inner surface of a joint presents a smooth and shining surface, interrupted, especially where the membrane folds to pass from one surface to another, by the synovial fringes (plicæ synoviales)—villous structures of varying size and length, somewhat resembling intestinal villi, the largest being perhaps 1 cm. long. They are richly supplied with blood-vessels, for each villus contains the convoluted twig of an artery. Some of the fringes, however, are merely hernia-like protrusions into the joint of small masses of fat covered by synovial membrane; these fill up unoccupied spaces. The nerves are derived from the same nerve trunks that supply the muscles of the limb. The nerve filaments terminate in small plexuses, unequally distributed, under the synovial membrane. Coloring matter injected into the joint disappears very quickly, to reappear in the lymphatic channels of the limb.

Synovia is a clear, alkaline fluid, much like the white of egg in general appearance; when rubbed between the fingers it imparts an oily sensation. It is largely secreted by the cells which cover the synovial fringes. In composition it contains albumin, mucin, some fat, leucocytes, and epithelial cells. A fluid identical in composition with synovia can be produced by rubbing up a portion of the epidermis in a weak alkaline solution. This fact suggests that most of the mucin is derived from the endothelial cells soaking in the weak alkaline fluid secreted by the fringes, and this view is strengthened by the fact that, when joints are quiet, the synovia in them contains only half as much mucin as when they are in motion.[1]

PATHOLOGY.—The classification of acute inflammations of the synovial membranes is best made according to the character of the effusion: (1) Serous; (2) serofibrinous; (3) purulent.

(1) Acute serous synovitis is the most common of all. The pathological process is simple; for some known or unknown cause a joint, most frequently the knee, becomes the seat of an inflammation which is manifested in the usual way. There are hyperæmia of the vessels of the membrane, an increased rapidity of the blood current, and then dilatation of the capillaries, with stasis. Migration of the white corpuscles from the vessels follows, and a profuse serous secretion is poured out from the dilated vessels into the perisynovial tissues and into the joint. The endothelial cells are very rapidly produced, and are cast off, half formed, into the joint. This process, carried far enough, constitutes "catarrhal synovitis," a purulent form. To the naked eye the surface of the membrane is seen to be bright red, from the dilatation of the surface capillaries; it is not so shiny as usual, and has ordinarily a boggy, softened, œdematous appearance, from infiltration, which is most noticeable in the synovial fringes. Here and there, especially in the more acute cases, may be seen a patch of extravasation, where a distended blood-vessel has burst. The fluid in the joint is often colored more or less red by these extravasations. The cartilages in an inflammation of this grade are not affected, but are seen to be of a clear bluish-white color, and surrounded by the sharply marked line of inflamed synovial membrane.

The joint at this stage is more or less distended with an abnormally large amount of synovial fluid, at first thinner than usual, on account of the copious effusion of serum into the joint, then becoming more or less opalescent as the endothelial cells are cast off into it and become macerated, and as the leucocytes increase in number. The amount of fibrin in the fluid varies greatly; in severe acute attacks the amount is generally so large that the fluid is glairy and sticky, and, on standing, distinct flocculi separate out and float around. When there is so much fibrin in the joint fluid that it consolidates on the synovial surfaces, the case belongs rather to the class of serofibrinous effusions. At this stage, unless it become chronic, the inflammation subsides or goes on to the formation of a purulent exudation. If it subsides, the blood supply diminishes, the newly formed capillaries are obliterated, the distended ones resume their normal calibre, the cell proliferation ceases, the cells already thrown off furnish mucin to the synovia, the excess of fluid is absorbed, and everything returns to a normal condition. The synovitis is cured.

(2) Acute synovitis of the serofibrinous type may be manifested more in the synovial tissue than as an effusion. In such cases the swelling is more dense than fluctuating. Thickening of the capsule may be prominent. The joint is filled with a yellowish fluid, and the synovial membrane is bluish-red in color and the surface is smooth but irregular. Adhesions between opposing surfaces occur very early. Microscopically, more leucocytes are found in the tissues than in the serous form, and extravasations of blood are frequent in the capsule. A layer of fibrin adherent in places is to be found, and in parts the joint surfaces seem to have degenerated into fibrinoid tissue. The likelihood of the growing together by adhesions of parts of the joint which are in contact must again be mentioned as the most striking and most dangerous characteristic of the affection.

(3) Synovitis with purulent effusion (empyema articuli; katarrhale Gelenkeiterung, von Volkmann) may be a continuance of the serous form or may originate *de novo*. In the catarrhal or more superficial form[2] the pus is secreted by the surface layers of the synovial membrane and no deep-seated lesion necessarily results. In a severer grade, spoken of sometimes as suppurative synovitis, in contradistinction to the term purulent synovitis as applied to the catarrhal form, the deeper layers of the joint membrane are involved. In synovitis with purulent effusion cell proliferation and the migration of leucocytes become a prominent part of the process; and besides, where there was formerly serum there is now a seropurulent or purulent fluid. The synovial surface becomes velvety in appearance, and the cartilages become yellowish-white and their surface is indistinct and covered with lymph and flocculi of pus. Pyogenic cocci are present. In some cases the destructive process seems localized, and ulcerations of synovial tissue, and even of cartilage, take place, while the surrounding parts show only a moderate grade of inflammation. From this it is easy to see how any amount of mischief may result. The whole synovial membrane may become granulating tissue, the cartilage is perhaps eroded also, the bone is bare, and the periarticular tissues become the seat of abscesses as soon as the capsule breaks, perhaps before. It is hard to set a limit to so destructive a process as this.

Recovery from purulent synovitis may be complete, and no trace of the mischief may be left behind. Generally, however, recovery from suppurative synovitis means a joint impaired by adhesions. On the other hand, as we have seen, there is no limit to the destructive possibilities of suppurative synovitis; complete disorganization of the joint, dislocation of the bones, and, worst of all, systemic infection are only too apt to follow.

SYMPTOMS.—In few pathological conditions are the four classical symptoms of inflammation more marked than in acute synovitis. Pain, heat, redness, and swelling comprise a large part of all that can be said of it.

Pain.—In simple acute synovitis, a few hours after the receipt of a wound or blow, some wrench, some exposure, or overexertion of a joint, commonly the knee, an uneasy, hot feeling is noticed, and before long it becomes a positive pain. This is associated with a tense, burning feeling and a sense of helplessness in the affected limb. Any motion adds to the discomfort, and manipulation of the joint, if carried to extreme flexion or extension, causes pain; sometimes any motion at all is painful. The feeling of distention that accompanies the height