

the first five years of life, the figures for the first five years are given upon a separate diagram, in which the divisions representing the age periods are increased tenfold.

The preceding tables present the Vital Statistics of the six New England States, for the nine years 1892-1900. The populations which are given for each State, and for the whole district, are the mean annual populations of the nine-year period.

The Tables of International Vital Statistics contain the birth and death rates for the twenty-five years, 1875-'99, and for the year 1900, and the marriage-rates (persons married per 1,000 living) for the year 1900 in the principal countries of Europe.

DATA FOR CONSTRUCTION OF DIAGRAM OF SURVIVORS. TABLE SHOWING SURVIVORS AT DIFFERENT AGES OF LIFE OUT OF 10,000 BORN.

	Sweden—† 1881-90.	England and Wales—* 1881-90.	Massachu- setts— 1893-97.	Massachu- setts—† 1885.	Spain—‡ 1878-82.
0	10,000	10,000	10,000	10,000	10,000
1	8,895	8,536	8,400	8,449	8,083
2	8,586	8,067	8,054	7,733	7,090
3	8,300	7,878	7,896	7,424	6,433
4	8,258	7,758	7,786	7,258	6,151
10	7,882	7,495	7,516	6,873	5,747
15	7,713	7,423	7,394	6,726	5,602
20	7,551	7,281	7,213	6,437	5,413
25	7,388	7,090	6,959	6,100	5,164
30	7,109	6,844	6,674	5,748	4,908
35	6,876	6,550	6,372	5,408	4,596
40	6,628	6,216	6,054	5,073	4,378
45	6,349	5,839	5,721	4,748	4,088
50	6,043	5,405	5,355	4,409	3,765
55	5,687	4,891	4,918	4,022	3,381
60	5,239	4,275	4,390	3,597	2,914
65	4,658	3,534	3,759	3,065	2,327
70	3,900	2,684	3,029	2,475	1,696
75	2,948	1,786	2,207	1,833	997
80	1,872	970	1,411	1,059	485
85	894	388	759	437	149
90	275	100	320	118	40
95	....	14	92	20.5	....
100	....	.9	14	2.2	....

* Fifty-fifth Report of Registrar-General, Supplement, vol. i., p. xiv.; vol. x., part I., p. 75.
† Sixteenth Registration Report, Massachusetts, 1887.
‡ Bulletin de l'Institut international de statistique.

Samuel W. Abbott.

BIBLIOGRAPHY.

Billings, J. S.: The Cartwright Lectures, 1889. Published in Medical Record, N. Y., November and December, 1889.
Bösch, R.: Statistisches Jahrbuch der Stadt Berlin, 1874-1900.
Farr, William: English Life Table, London, 1864.—Memorial volume, London, 1885.—Papers in the Reports of the Registrar-General.
Longstaff, G. B.: Studies in Statistics, London, 1891.
Medizinal-statistische Mittheilungen aus dem Kaiserlichen Gesundheitsamte, Berlin, 1890-1900.
Newsholme, A.: The Elements of Vital Statistics, third edition, London, 1899.
Registration Reports of Connecticut, Maine, Massachusetts, Michigan, New Hampshire, Rhode Island, and Vermont.
Rumsey, H. W.: Some Fallacies of Statistics, London, 1875. Statistisches Jahrbuch der Haupt- und Residenzstadt, Budapest, 1901.
Tracy, R. S.: Article on Vital Statistics in REFERENCE HANDBOOK, Supplement, vol. ix., first edition, 1894.
United States Census Reports upon Vital Statistics, 1880-1900.
The Vital Statistics of Massachusetts for the forty years 1856-95, in 28th Annual Report of the State Board of Health, 1896.

VITILIGO.—This affection of the skin, which is likewise known by the name of leucoderma, consists in the development of whitened areas upon various portions of the body, but especially upon the face, neck, and hands. It is due to localized loss of pigment in rounded or ovoid patches of various size, having sharply defined margins and surrounded by more or less deeply pigmented skin which gradually shades off into the normal. The characteristic features of the whitened spots are, that their border is usually convex, giving the impression that they extend into their darkened surroundings, or that, in their advance, they drive the pigment before them; that there is no change in the structure, sensations, or secretions of the affected areas; and that their tendency is to persist and to increase in extent, being little affected by any treat-

ment. It is an acquired condition which comes on usually in youth or early adult life without previous ill health or prodromes, although in some instances it has been known to follow local injury; and sometimes it develops in the neighborhood of a pigmented mole. The dark-skinned races are rather more subject to vitiligo than those of fair skin and light hair, and it is not so very rarely seen in the negroes of this country, in whom the contrast be-



FIG. 5029.—Vitiligo.

tween the perfectly white spots and the normal skin produces a striking effect. I have seen instances in which much discomfort of mind was occasioned by the fact that the white patches were merging into each other until extensive regions of the body had lost their pigment, and the negro was fearful that he was "turning into a white man." The hair may lose its pigment in the same way as the skin, and rounded or irregular tufts of gray may appear upon the head. In white races the affected regions are often more noticeable in the summer time, when the surrounding pigmentation becomes deeper.

The diagnosis of vitiligo is not difficult, although it is liable to be confounded with morphea, chloasma, tinea versicolor, syphilitic pigmentations, macular leprosy, and albinism. One chief point by which it is distinguished from other conditions is the normal condition of the skin, apart from its loss of pigment. In morphea there are structural changes. In tinea versicolor the patches are inflammatory and itchy, and from them there can be scraped scales which show, under the microscope, the characteristic groups of spores, although, when circumscribed areas of healthy white skin are enclosed in the brownish patches of this disease, vitiligo may be closely simulated; but the margins will be found irregular instead of clean-cut. In chloasma there is increased pigmentation of the patch itself and the circumference is the part which appears white. The distinction has been made that in vitiligo the margin of the white area is convex toward that which is pigmented, while in chloasma it is concave; but in some instances the patches run together in such a way that this distinction becomes more theoretical than apparent. Syphilitic pigmentations, especially about the neck in women, may persist after other manifestations have disappeared and may, in some instances, be mistaken for vitiligo. In the macular form of lepra the patches of white skin have an irregular outline, not so abrupt as in vitiligo, and the tinge is rather grayish than dead white; then, too, the skin is either thickened or atrophied and anæsthesia or impaired sensation is present. Finally, in albinism we have, as in vitiligo, an absence of normal pigment, but in the former it is a congenital defect and the whole surface of the body, including the hair and eyes, may be devoid of pigment.

The pathology of vitiligo is obscure. Leloir has described a parenchymatous neuritis in which the axis cylinder had disappeared, the myelin sheath had broken down, and the nerve fibre had become transformed into an empty primitive sheath, whose nuclei had proliferated. The affection begins as a hyperpigmentation in areas which run into one another and assume a polycyclic character, the pigment becoming absorbed from the centre and deposited in excess in the marginal epidermis, the connective-tissue cells, and about the vessels and hair follicles.

The etiology of vitiligo is not well understood, but the cause of the condition is usually ascribed to perverted innervation. It is probable that the disappearance of the pigment from one spot and its increased deposit in a neighboring part is due to atrophy in the former and to hypertrophy in the latter, both changes being effected through the agency of the sympathetic nervous system. Sometimes, though rarely, the proper proportion of pigmentation is spontaneously restored, but in the majority of instances the affected areas tend to increase in extent and the condition to assume marked chronicity. When large areas of surface are involved the term leucoderma becomes appropriate.

The treatment is unsatisfactory. Some reports of success from electricity have been made. Local applications for the removal of surrounding pigmentation are resorted to with the view of rendering the white regions less noticeable. The internal administration of nerve tonics, especially strychnine and arsenic, has been advised. Blistering the patches to excite a deposit of pigment has been tried, but the results are not brilliant. If the spots are located upon the face or other exposed part, artificial staining may be employed, and dyes used to restore the color of the hair.

Charles Warrenne Allen.

VITREOUS BODY OR HUMOR.—ANATOMY.—The vitreous body is a transparent, semifluid, colorless mass, of soft gelatinous consistency, subglobular in form, which fills the posterior four-fifths of the interior of the eyeball; it is bounded by the optic-nerve entrance and retina behind, by the retina on each side, and in front by the lens and its suspensory ligament which fit into a depression known as the patellar fossa. It serves as a support to the tunics of the eyeball, and, of lesser importance, as a clear refractive medium; its index of refraction is slightly greater than that of distilled water. Chemically, it consists of 98.5 per cent. water and 1.5 per cent. solids.

There has been much discussion regarding the structure of the vitreous. When the fresh substance is thrown upon a muslin filter, the greater part passes through as a watery liquid, a very small proportion remaining behind—demonstrating the existence of a supporting framework and a fluid portion. It is quite generally held that there is a very delicate fibrillar reticulum, in which are scattered a few round or branched cells of the connective-tissue type, most abundant in the periphery, and often a variable number of migratory leucocytes. The cells are known as vitreous corpuscles; they are often difficult to recognize; they are peculiar in exhibiting large vacuoles which push the nucleus to one side, and in presenting a number of budlike swellings (Fig. 5030).

The vitreous body is enclosed in a delicate, structureless, glassy membrane, the hyaloid membrane, which lies in close apposition with the entire inner surface of the retina; it can be readily separated from the latter, except posteriorly where the retinal vessels of foetal life have entered, and anteriorly at the patellar fossa. At the ora serrata, the hyaloid membrane splits into two layers: the first, the hyaloid membrane proper, exceedingly delicate, which is continued over the anterior surface of the vitreous body; and the second, which blends with the posterior layer of the suspensory ligament of the lens.

The central portion of the vitreous body is penetrated by a channel (hyaloid canal, canal of Stilling, canal of Cloquet, central canal); this is filled with fluid, is limited by a wall of extremely delicate homogeneous membrane, and extends from the disc to the posterior pole of the

lens; it is about 2 mm. in diameter, with a slight dilatation at both ends. This canal conveys the hyaloid branch of the central artery to the lens during foetal life; in the adult it forms part of the posterior lymph passages of the eyeball, having its outlet in the lymph spaces of the optic nerve.

The adult vitreous has no blood-vessels, its nourishment being received from the surrounding structures, particularly the uvea; hence diseases of the retina, choroid, and ciliary body almost always implicate the vitreous. Vitreous humor is never regenerated after loss; the diminution in volume is compensated for by the addition of aqueous. If the escape of vitreous is small, no injurious effects follow; if large, the consequences are serious—the globe softens, shrinkage results, and sight is lost.

DISEASES OF THE VITREOUS BODY.

CONGENITAL ANOMALIES.—1. *Persistent Hyaloid Artery.*—During foetal life the hyaloid artery, a branch of the central artery of the retina, passes through the central canal of the vitreous from the optic-nerve entrance to the posterior pole of the lens; it usually begins to shrivel during the sixth month and has generally disappeared at the end of foetal life. Sometimes this process of obliteration fails, and a greater or lesser remnant of the artery persists during life. This can be seen with the ophthalmoscope as a grayish cord or thread which arises from the optic disc and stretches into the vitreous for a variable distance; it may terminate by a free extremity in the vitreous, or may traverse the latter and be attached to the posterior pole of the lens, the attachment to the lens being marked by a small opacity (congenital posterior polar cataract); or the thread may be attached to the lens with its free end floating in the vitreous; or the vestige may be represented by an irregular, minute deposit of connective tissue upon the disc. In rare instances the persistent artery continues to carry blood. Vision is generally good, but sometimes such eyes are amblyopic or present other congenital defects.

2. *Opacity of the Walls of the Hyaloid Canal.*—In unusual instances the walls of the hyaloid canal are abnormally opaque, causing some interference with central acuteness of vision; this anomaly is visible with the ophthalmoscope as a grayish, tubular cord extending from disc to lens.

HYALITIS (Inflammation of the Vitreous).—This term includes two types: first, a purulent inflammation (suppurative hyalitis), and second, a form characterized by the occurrence of opacities in the vitreous. As will be

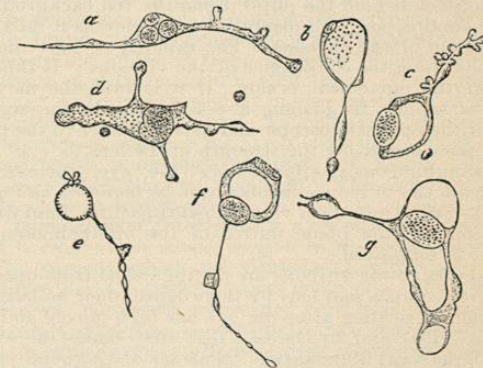


FIG. 5030.—Cells of the Vitreous Humor. (Schwalbe.) a and d without vacuoles; b, c, e, f, g, vacuolated.

readily understood by considering the avascular and almost structureless nature of this tissue, inflammations of the vitreous are rarely primary; they generally accompany or are the result of inflammation of the retina and uveal tract.

Suppurative hyalitis is an infective inflammation of the vitreous, which is generally merely part of a purulent choroiditis or panophthalmitis. It is caused by infection, the result of a penetrating wound, a foreign body, or an iridochoroiditis following an operation upon the globe; it may arise in the course of the exanthemata, erysipelas, relapsing fever, meningitis and cerebro-spinal meningitis, infective blood diseases, and lengthy debilitating fevers; it may follow metastatic choroiditis after inflammation of the cord in the newly born child.

Since the affection is generally secondary to inflammation of other structures, symptoms of the primary disease will be present, such as posterior synechiae and other evidences of iridocyclitis. If the media are clear, the purulent exudate is readily seen as a yellowish reflex shining through the pupil, and the ophthalmoscope detects the presence of an opaque mass which may be circumscribed, but is usually diffuse.

When it is more or less circumscribed, the condition presents appearances which are very much like those of glioma of the retina, and as a matter of fact it is known as *pseudoglioma*. It can generally be distinguished from a true glioma by the history of the case, by the presence of the signs of iritis or uveitis, and by the diminished tension. The disease tends to run a chronic course. In rare instances, when circumscribed, and especially when of traumatic origin, purulent hyalitis may leave a more or less useful eyeball. But in the great majority of cases, and in every instance in which panophthalmitis exists, sight is lost; the retina becomes detached, the soft eyeball shrinks, and an atrophied globe results; enucleation then becomes necessary, especially if the shrunken organ menaces the safety of the other eye. No method of treatment will prevent such a result. If, during the course of a debilitating fever, suppurative hyalitis is detected early, it may be possible to save some vision in the affected eye by vigorous supporting treatment of the general condition. Intra-ocular injections of chlorine water have been recommended (Berry).

OPACITIES IN THE VITREOUS may be fixed, but they are usually movable. They vary in size from fine dust-like deposits (*hyalitis punctata*) to large masses. They may have any shape: dust, specks, threads, flakes, bands, or irregular membranous masses. They may be entirely free or may present one or more attachments to enveloping tunics. In the great majority of instances the affection is secondary to diseases of neighboring structures.

The opacity causes an impairment of the transparency of the vitreous. It can be detected with the ophthalmoscope held at a distance, the patient moving the eye in various directions and then fixing it. Under such circumstances the opacity, if movable, will be seen as a dark object behind the pupil, upon the red background of the fundus, and will disappear from view as it falls to the bottom of the vitreous. The rapidity of movement depends upon the consistence of the vitreous. If this is normal, the movement is slow; if it is fluid, the movement is rapid. By placing a +4 D. lens in the sight hole of the ophthalmoscope and getting closer to the patient, then increasing the strength of the lens to +16 D. and simultaneously approaching the eye, successive depths of the vitreous chamber can be focussed and explored. With minute or very delicate opacities, faint illumination and the plane mirror of the ophthalmoscope should be employed.

Opacities of the vitreous are distinguished from opacities of the cornea and lens by their depth, their mobility, the gradual settling after the eye has been moved and is then steadied, and by the fact that they cannot be seen by oblique focal illumination. Patches of choroidal pigment are differentiated in like manner by dissimilarity in shape, and by difference in depth as measured by their refraction.

If the symptoms due to disease of the surrounding structures be excluded, the subjective manifestations of opacity of the vitreous are the occurrence of one or more spots in the field, and more or less impairment of vision, the degree of the latter depending upon the size, situ-

ation, and density of the opacity; patients may merely complain of motes but slightly more pronounced than the muscae volitantes of normal eyes, or the vision may be almost or completely abolished. When the opacity is situated deeply in the vitreous, the annoyance of the patient is increased by the shadow which the opacity throws upon the retina. Very often the patient will cast the opacity out of the line of vision by a sudden movement of the eyes or head, and thus obtain unobstructed vision for a moment; in other cases vision will be improved after the eyes have been kept quiet for a time, thus allowing the opacity to settle. The disease must not be confounded with muscae volitantes; the latter are described below.

Opacities in the vitreous are very common. In most instances they depend upon some disease of the choroid, ciliary body, or retina. They are frequently found in high degrees of myopia associated with choroidal disease, and are then often seen as flakes and threads. They are not uncommon in syphilitic chorioretinitis and cyclitis, in such cases being usually dustlike, with or without threadlike or shredlike additions. They result from hemorrhages into the vitreous, and when thus produced they may constitute membranous masses; occasionally the latter are attached to the retina and are accompanied by the formation of new blood-vessels, constituting *retinitis proliferans*. In some cases errors of refraction are found in the eyes which are the seat of opacities of the vitreous; but there is no evidence that the two anomalies bear any etiological relationship except in myopia. Very often the condition results from retinal or choroidal disease, depending upon some disturbance of the general health, of which the following are the most common examples: Disturbances of menstruation, disorders of the liver, debilitating diseases, endarteritis, gout, malaria, and the effects of the prolonged use of arsenic. Finally, it is not uncommon to find opacities of the vitreous, of various shapes and sizes, in apparently normal eyes of healthy individuals; in such cases no cause can be assigned. *Asteroid hyalitis* is the name given by Benson to a very rare condition, probably congenital, in which the vitreous is filled with minute, light-colored spheres.

Treatment consists in an attack upon the causative disease. In syphilitic cases the usual treatment of this infection, especially if the mercury be given hypodermically, will often cause a clearing up. Disturbances of the system should be corrected by appropriate means. High myopia requires proper correction with glasses, and careful attention to general and ocular hygiene. Where no cause can be assigned, good results sometimes follow the use of iodides, with or without mercury in small doses. Small quantities of jaborandi or pilocarpine, or larger hypodermic doses of the latter, are useful, followed by hot baths, so as to produce diaphoresis, if the patient is able to tolerate such vigorous treatment. Abstraction of blood from the temples and the local application of the galvanic current have been reported of benefit.

Large membranous deposits that persist after every other method of treatment has failed, may sometimes be divided with a narrow knife or a knife-needle, providing no active disease of neighboring parts exists and there is no blood-vessel formation. The instrument is inserted in front of the equator of the eyeball, just below the lower border of the external rectus muscle. In some cases the result of this operation has been to cause a shrinking of the opacity and an improvement of vision.

While in syphilitic cases, in examples of hemorrhages of small size, and in a few others in which the opacities are of limited extent and of delicate consistence, complete absorption takes place after some months, in most of the instances of this condition disappearance is incomplete or the opacities are permanent. There exists also a tendency to recurrence after complete or incomplete absorption. Not uncommonly, when extensive opacities are attached to surrounding structures, shrinkage takes place, the retina becomes deprived of its natural support and becomes detached.

MUSCÆ VOLITANTES (*Myodesopsia*) are the black specks or motes often seen in the field of vision, especially when the eye is directed toward the light or a bright surface. They are most often complained of by myopes. They are caused by the shadows which the cells and migratory leucocytes of the vitreous cast upon the retina. These shadows usually have the shape of dots or small bubbles, isolated or collected into strings or clusters; less frequently they are of larger, fantastic shapes. Any movement of the eye sets them in motion. After the eye ceases to move, they continue to float across the field, gradually settling out of the line of vision. This phenomenon may be produced entopically by partially closing the lids or by looking through a small opening in a card, and by facing the light or a white surface. It is often seen while looking into the tube of a microscope.

Muscae are not true opacities of the vitreous, and consequently cannot be detected with the ophthalmoscope. They are normal phenomena, occurring in healthy eyes, perfectly transparent, and not disturbing to vision. Present in all eyes, they are usually disregarded. When noticed they cause annoyance and often anxiety, which is apt to be aggravated by the habit of the patient of searching for them. Neither must they be confounded with scotomata, which are blind spots in the field of vision, due to a loss of function of certain portions of the retina.

Many of the patients who complain of muscae have some error of refraction. The correction of the latter often gives relief. In any case the patient should be assured that the occurrence is devoid of significance. He will then cease to look for the shadows, and in consequence will no longer be annoyed by them.

Blood-vessel Formation in the Vitreous (Retinitis Proliferans).—Occasionally we observe dense grayish or bluish-white membranes, provided with new blood-vessels, which have no apparent connection with the retinal vessels, attached to the retina in the situation of the optic-nerve entrance, projecting into the vitreous, and hiding a portion of the fundus. These represent the sequels of previous pathological processes—either hyalitis, or hemorrhages, or chronic retinal inflammation. Examples of the last cause have been associated with general disease (syphilis, nephritis, diabetes, gout). The pathology is obscure. There is interference with vision, the degree depending upon the density, size, and position of the membrane. The tissue is incapable of absorption.

HEMORRHAGES INTO THE VITREOUS.—These are usually due to rupture of some of the vessels of the ciliary processes or of the choroid, less frequently to a break in the retinal vessels, in consequence of injury, vascular disease, or alterations in the blood. Anæmia, nephritis, diabetes, arteriosclerosis, myopia, glaucoma, and menstrual disturbances are predisposing factors. There are also some examples, generally in young male adults, in which hemorrhage into the vitreous occurs *spontaneously*, and often repeatedly. Such cases have been attributed to irregularities of the circulation and to gout.

If the hemorrhage be recent and slight, a bright red reflex is seen with the ophthalmoscope; if greater, dark red masses are observed, which may appear red at the margins; if considerable, a large part or all of the vitreous chamber is filled, and no fundus reflex is obtained. There is always impairment of vision, but the degree varies with the amount and situation of the extravasation. With large hemorrhages sight is immediately reduced to perception of light.

Small hemorrhages are often absorbed after some weeks or months with restoration of good vision. Not infrequently, however, the process of absorption is incomplete and opacities remain. Large extravasations usually leave dense membranous opacities which cause serious impairment of vision. Such hemorrhages necessarily produce considerable disorganization of the vitreous structure, followed by fluidity, and not infrequently by detachment of the retina.

If these hemorrhages are seen early, treatment consists in absolute bodily rest with the head in an elevated posi-

tion, cold compresses on the closed lids, the administration of cardiac sedatives and ergot, and abstraction of blood from the corresponding temple. Subsequently small doses of potassium iodide and mercury, pilocarpine, sweat, saline cathartics, hot compresses to the closed lids, and subconjunctival injections of saline solution may be used to promote absorption. Attention to the general health, avoidance of the stooping posture, and rest of the eyes are also indicated. Large membranous, non-vascular opacities may be cut with a knife-needle or a narrow knife after all inflammation has subsided and no tendency to recurrence of hemorrhage appears to exist.

DEGENERATIONS OF THE VITREOUS comprise: (1) Synchysis; (2) sparkling synchysis; (3) fatty degeneration; (4) detachment; (5) ossification.

Synchysis (fluidity of the vitreous) is a softened or fluid condition of the vitreous. This can be diagnosed with certainty only when vitreous opacities exist and move with undue rapidity during motions of the eyeball. The condition is often accompanied by tremulousness of the iris; but this symptom may exist without fluid vitreous, and is no proof of the existence of synchysis. It is merely an evidence that, owing to relaxation or rupture of the suspensory ligament, the iris has been left without the support of the lens upon which it usually depends. The tension of the eyeball is commonly diminished, but it may be normal, or even increased, as in certain cases of glaucoma.

Synchysis occurs with high degrees of myopia, with or without complicating choroiditis and posterior staphyloma; with extensive vitreous opacities; after ocular injuries with extensive hemorrhage into the vitreous; and with degenerative processes of the eye in general. In such cases the loss in consistence depends upon an impairment of nutrition. Advanced age is a predisposing factor. Fluid vitreous is not infrequently present in eyes that have never suffered from any disease, and in which no definite cause can be assigned.

No treatment is of any avail. Recognition of the condition is of practical importance when an operation upon the globe, such as cataract extraction, or iridectomy for glaucoma is contemplated, since it forms a complicating circumstance and increases the liability to loss of vitreous.

Synchysis scintillans (sparkling synchysis) is the name given to a fluid vitreous which presents numerous small crystals of cholesterol and tyrosin. These are seen to move rapidly whenever the eye moves, reflecting the light of the ophthalmoscope, and giving rise to a beautiful picture which resembles a shower of brilliant sparks. These crystals are supposed to represent a degenerative change of blood effused into the vitreous at some previous period, or else decomposition of the wandering cells. The condition is not of common occurrence. It is usually found in old persons, and is said to be more common among alcoholics, in those suffering from some general disease of nutrition, and in choroiditis. But clinically it is met with most frequently in eyes which are apparently healthy in other respects. There is usually little or no reduction of vision if the eye is otherwise normal. Such individuals sometimes complain of seeing glittering flashes when the eye is moved. The condition is not amenable to treatment.

Detachment of the vitreous is a serious condition which, if it ever exists alone, cannot be recognized clinically. The support which the vitreous usually gives is withdrawn, and the retina becomes detached. This condition follows traumatism, especially perforating wounds, also cataract extraction, choroiditis, intra-ocular hemorrhages, intra-ocular growths, high degrees of myopia, and extensive staphylomata. After loss of a considerable portion of the vitreous from any cause, there is shrinkage, detachment of the hyaloid, followed by that of the retina. Detachment is not amenable to any form of treatment. If the eye remains quiescent, no interference is called for. If symptoms of irritation, pain, or sympathetic disease set in, enucleation is indicated.

Fatty degeneration of the vitreous is occasionally met

with as an evidence of senile decay. The patient complains of muscæ volitantes, and the ophthalmoscope reveals numerous white glistening spots evenly distributed through the vitreous and having a very limited amount of motion when the eye is moved. There is some reduction in the acuteness of vision. The condition does not call for any special treatment.

Ossification of the vitreous has been described by Wittich and Virchow as a rare form of degeneration, always associated with phthisis bulbi following a suppurating process or hyalitis. The vitreous body changes into a solid fibrous mass of cord-like shape, enlarged at either end. The osseous tissue is developed in the anterior end of this cord. The occurrence of this change is doubted by many authorities.

PARASITES IN THE VITREOUS.—The presence of entozoa in the vitreous is exceedingly rare except in north Germany. In nearly every instance the parasite has been the *cysticercus cellulosa*. The filaria sanguinis hominis has been seen in the vitreous, with certainty, in only a single instance. The parasite found in the vitreous is the scolex of the *tænia solium*, the eggs of which enter the circulation from the stomach, and are deposited in the eye between the choroid and the retina. Perforating the latter it escapes into the vitreous.

When still situated between the choroid and the retina it can be seen with the ophthalmoscope as a bluish-gray opacity resembling detachment of the retina. After entering the vitreous, if still alive, it appears as a pale bluish or bluish-gray cyst from which there projects a short white neck and a head. The latter is provided with minute suckers, which can sometimes be seen to move. When this picture is found, particularly when the head is observed to move independently of motions of the eyeball, the diagnosis can be made with certainty. Very often, however, opacities of the vitreous are present and render the diagnosis more difficult. After the death of the parasite it becomes covered with lymph and thus hidden from view with the ophthalmoscope.

Unless removed while still beneath the retina, there is gradual loss of sight and finally destruction of the eyeball. When discovered early, before the entozoon has escaped into the vitreous, it may be removed by forceps through an incision in the sclera. Quite a number of such operations have been successful and have resulted in the preservation of good vision. After the parasite has entered the vitreous it may also be removed, but then the preservation of sight cannot be hoped for. If the attempt at removal be unsuccessful, enucleation is indicated. *Charles H. May.*

VIVISECTION.—According to the definition given in the Century Dictionary, vivisection is the "dissection of a living body; the practice of anatomizing alive, or of experimenting upon living animals for the purpose of investigating some physiological function or pathological process which cannot well be otherwise determined. Vivisection strictly includes only cutting operations; but the term is extended to any physiological experimentation upon living animals. . . . Vivisection in competent and humane hands, under proper and reasonable restrictions, is fruitful of good results to the sciences of physiology and pathology."

The necessity for resorting to this mode of experimentation depends on the fact that physiology, pathology, therapeutics, and bacteriology deal with the phenomena of life, and in order to study them successfully the necessary investigations must be made during the life of the animal upon which experiments are made.

The valuable results which have been attained by such experiments constitute a large share of the actual knowledge now possessed in these departments of medical science. The study of the functions of circulation, respiration, digestion, the nervous system, the investigation of infectious diseases, the reproduction of bone, the action of drugs and poisons and their uses and antidotes have all been greatly facilitated by means of vivisection.

The discovery of the true nature of rabies, of anthrax,

glanders, tuberculosis, the Texas cattle fever, and of hog cholera, is due very largely to the assistance afforded by animal experimentation. In the production of a constant supply of diphtheria antitoxin (which has saved thousands of human lives), animal experimentation must necessarily be resorted to. At a hearing before a legislative committee in 1901, which was considering the propriety of legislation to restrict this practice, a witness said: "No father whose child had been saved by such means would care how many lives of animals had been sacrificed in the discovery. We cannot use the rabbit as a unit in estimating the value of our children's lives."

In a lecture before the Royal Society of England, Huxley stated "that the discoveries made by Pasteur alone by means of experimentation upon living animals would have sufficed to pay the war indemnity paid by France to Germany." By means of inoculations practised as the result of Pasteur's experiments, the loss from anthrax in France alone had diminished from ten per cent. in sheep and five per cent. in cattle to less than one per cent. in sheep and one-fourth of one per cent. in cattle.

Galen, Harvey, John Hunter, and others made use of this method in early times, but it has come largely into use in the last half of the nineteenth century.

Like very many practices vivisection is liable to abuse, but, as Bishop Lawrence, of Massachusetts, stated before a legislative committee in 1900, the subject "can be left, with perfect confidence on the part of the community, to a profession that has shown itself worthy of such confidence in its attitude toward humanity, as well as toward the lower animals."

Within the past thirty years vigorous opposition has been made, either to prevent vivisection or to restrict it by law. Scarcely a year now passes in which such restrictive legislation is not proposed in some form or other in one or more States of the Union.

In order to obtain an expression of opinion with reference to the practice of vivisection, a circular was issued by the American Humane Association in 1895, and sent to many prominent physicians, clergymen, educators, and others, and the replies from these sources were classified as follows:

REPLIES FROM PHYSICIANS.

	Total number.	Per cent.
For vivisection without restriction	220	19.1
For vivisection restricted by utility	513	44.6
For vivisection without pain	186	16.2
For total prohibition of vivisection	207	18.0
Obscure or evasive	24	2.1
Total	1,150	100.0

REPLIES FROM OTHER PROFESSIONAL MEN.

	Clergy-men.	Edu-cators.	Authors, editors, etc.	Per cent.
For vivisection without restriction	0	34	4	4.7
For vivisection restricted by utility	189	84	63	41.2
For vivisection without pain	116	49	26	23.5
For total prohibition of vivisection	144	52	30	27.7
Obscure or evasive	6	16	2	2.9
Total	455	235	125	100.0

Thus far, while much legislation upon this subject has been proposed, not very many laws have been enacted. After a parliamentary investigation in England a law was enacted in 1876 entitled "An Act to Amend the Law Relating to Cruelty to Animals" (Chapters 77, 39, and 40, Victoria). This act has twenty-two sections, and prohibits the performance of painful experiments on animals except under restrictions; with penalties of not over £50 for the first offence and not over £100 for the second offence.

By Section 3 of this act it is provided that:

1. The experiment must be performed with a view to the advancement of science by discovery of physiological knowledge, or of knowledge which will be useful for the saving or prolonging of life or of alleviating suffering.
 2. The experiment must be made by licensed persons.
 3. The animal must be under the influence of an anæsthetic.
 4. The animal must be killed if pain is likely to continue, or if serious injury is done to the animal.
 5. The experiment is not to be performed in illustration of lectures.
 6. It is not to be performed for the purpose of attaining manual skill.
- By Section 4 the use of urari is prohibited.
By Section 5 restriction is made as to experiments upon dogs, cats, horses, mules, and asses.
By Section 6 public exhibition of such experiments is made illegal.

Other sections relate to the registration and licensing of persons desirous of making experiments and the method of instituting legal proceedings.

The provisions of the act do not apply to invertebrate animals.

By several definite exceptions the restrictions in Section 3, clauses, 1, 3, 4, and 5, are very much modified.

In a recent suit for libel, in England, it was shown that Dr. Bayliss, professor of physiology at London University, was charged by Hon. Stephen Coleridge with cruelty in the conduct of certain physiological experiments. Dr. Bayliss was licensed to perform such experiments under the English act here referred to. Dr. Bayliss sued Mr. Coleridge for libel, won his suit, and was awarded £2,000 damages (*Boston Medical and Surgical Journal*, November 26th, 1903).

Although legislation has been proposed in many States, there are but three in which the statutes contain any reference to vivisection. These are New York, New Jersey, and California. The law of New York respecting cruelty to animals runs as follows:

"If any person shall torture, torment, deprive of necessary sustenance . . . or needlessly mutilate or kill, or cause or procure" the same to be done, to "any living creature, every such offender shall for every such offence be guilty of a misdemeanor."

Following this section there is a paragraph relating to vivisection:

"Nothing in this act contained shall be construed to prohibit, or interfere with, any properly conducted scientific experiments or investigations, which experiments shall be performed only under the authority of the faculty of some regularly incorporated medical college or university of the State of New York."¹ In California the law is substantially the same.²

Construing these sections together, according to a familiar legal principle, the law in New York and California regarding vivisection may be stated as follows: Vivisection is lawful when performed under the authority mentioned and when "properly conducted." If improperly conducted, that is, with the infliction of needless or unjustifiable suffering, the offender would be guilty of a misdemeanor, which is punishable in New York by fine or imprisonment, or both, the maximum penalty being one year in the county jail, including thirty days of solitary confinement, and a fine of \$250. In California, also, fine and imprisonment may be imposed for this offence. Vivisection undertaken without the authority prescribed in the statutes is punishable in like manner.

In New Jersey the law and the penalty are substantially the same, except that the authority under which vivisection may there be performed, if "properly conducted," is that of any "incorporated medical society of the State."³

In all the other States, with few exceptions—and the exceptions, doubtless, will soon disappear—there are laws against cruelty to dumb animals. In these States, therefore, vivisection—at least such vivisection as is performed without the use of anæsthetics—might or might not be

adjudged to come within the statute. In each case there would be a question whether suffering had been inflicted needlessly or cruelly, and each case would be decided according to its own circumstances and to the views of the particular tribunal before which it came. In the interest both of the medical profession and of dumb animals, it is to be hoped that the statute of New York will be copied by all the States, and it would be well if the law were somewhat extended. In Great Britain the buildings in which vivisection may be performed are licensed, and there is an inspector to see that the provisions of the statute are carried out. In this way, additional precautions are taken. It is scarcely necessary to point out that such regulations do not hamper the competent and conscientious surgeon, and that they tend to make vivisection legally possible everywhere, because they render it free from objection in the view of the people generally.

Henry Childs Mervin.
Revised by *Samuel W. Abbott.*

BIBLIOGRAPHY.

- ¹ Revised Statutes of New York, vol. iii., p. 2526.
 - ² Derrig's Annotated Codes and Statutes, vol. iv., p. 460.
 - ³ Revision of Statutes of New Jersey, p. 28.
- Memorial from a Joint Committee of the Medical and Other Scientific Societies and Educational Institutions of the District of Columbia, protesting against the Proposed Legislation Embodied in Senate Bill 1552, entitled "A Bill for the Further Prevention of Cruelty to Animals in the District of Columbia," and Presenting their Views on the Same. Senate Document 31, Washington, December 21st, 1896.
- Animal Experimentation. A Series of Statements Indicating its Value to Biological and Medical Science. Boston, 1902.
- Unlicensed Anti-Vivisection. Editorial in Medical News, November 30th, 1895.
- Report of the American Humane Association on Vivisection in America, September 26th, 1895, Fall River, Mass.

VOICE AND SPEECH. See *Larynx, Physiology of.*

VOLITION, DISORDERS OF. See *Insanity.*

VOLVULUS. See *Colon (Surgical) and Intestinal Obstruction.*

VOMITING. See *Emetics, and Stomach, Diseases of.*

VOMITING OF PREGNANCY.—By way of introduction it may be assumed that no more common source of discomfort, distress, and even danger besets the condition of pregnancy than the symptom which serves as the subject of this article. It may be asserted, also, that very few who have not experienced it have any adequate idea of how distressing it may, and often does, become. It is doubtless a fact that the nausea accompanying, or at times taking the place of, the actual vomiting is of such intensity, is of such a sickening and depressing character, is so much worse than the ordinary and commonplace nausea due to other causes, as to be to many the hardest to bear of all the trying experiences of the process of maternity.

At other times, it must be admitted, the vomiting is easy, accompanied by little if any nausea, and it is a noticeable fact that even in some cases in which vomiting has been frequent and persistent for months the patients have held their flesh and strength to a wonderful degree. In these latter cases the body must hold its own with a very meagre supply of food, for to a casual observer it would appear that none is retained.

It has been customary to draw a line of demarcation between the slight and the severe cases, or between those which are rebellious to treatment and threaten life and those which do not. The former have been called the "physiological" or "simple" vomiting of pregnancy; the latter the "pernicious," or "incoercible," or "uncontrollable" vomiting of pregnancy. The correctness of these descriptive terms will be called in question elsewhere.

On the other hand, Dr. Graily Hewitt has very properly pointed out the important distinction which exists between the vomiting of pregnancy and the vomiting dur-