ELEMENTS

OF

PATHOLOGICAL ANATOMY,

ILLUSTRATED BY

NUMEROUS ENGRAVINGS.

'IN MORBIS, SIVE ACUTIS, SIVE CHRONICIS, VIGET OCCULTUM, PER HUMANAS
SPECULATIONES FERE INCOMPREHENSIBILE.'—BAGLIVI.

BY SAMUEL D. GROSS, M. D.,

LATE PROFESSOR OF GENERAL ANATOMY, PHYSIOLOGY, AND PATHOLOGICAL ANATOMY,
IN THE MEDICAL DEPARTMENT OF THE CINCINNATI COLLEGE :
AND NOW PROFESSOR OF SURGERY IN THE LOUISVILLE MEDICAL INSTITUTE, KY.

IN TWO VOLUMES. VOL. II.

Recommendations.

[From the New York Journal of Medicine and Surgery.]

" We had been looking forward for some time to the publication of Dr. Gross's work on Pathological Anatomy, feeling assured that, if ably executed, it would confer a great benefit on the profession of this country.

" From the examination that we have already made, we are induced to form the opinion that Dr. Gross is a laborious and careful investigator, an honest, fair-minded man, with sufficient practical acquaintance with the subject to distinguish the true from the visionary. That such a mind should produce a work of the highest value on a subject so much neglected in this country, is what might have been expected. And let it be justly appreciated as an effort far better adapted to our present necessities than the sublimer, but less intelligible efforts of genius could possibly have been. We want a clear and simple statement of the actual knowledge that has been acquired on this subject, by a careful comparison of the best authorities, enlightened by sufficient personal experience to appreciate what is true, and to reject what is false or imperfectly established. This we believe Dr. Gross has accomplished.

" What strikes us as particularly useful, is the concise description of the healthy condition of parts as introductory to the history of the morbid changes they may undergo. Finally, the work is enriched with colored plates and numerous wood cuts, which are very well executed."

[From the Philadelphia Medical Examiner.]

" We have no better evidence of the importance attached to the study of Pathological Anatomy, as an aid to diagnosis and treatment, than the publication of these volumes. The leading characters of the work, taken as a whole, are, that it is clearly written, systematic, correct, and more complete than other work upon the subject. Its accuracy and comprehensive character place it among the most valuable additions to medical literature. The work is illustrated by nearly one hundred excellent wood cuts, a colored engraving of the inflamed mucous membrane of the alimentary canal, and several other colored engravings. The illustrations are, therefore, as abundant as is compatible with a price which would put the book into the hands of the profession in general. It deserves an extended circulation, not only for its own merits, but because no other work now in the hands of the profession can supply its place. We have spoken in high terms of it because it possesses real and desirable excellences. It will rank among the standard productions of medical literature."

[From Bell's Eclectic Journal of Medicine.]

" The appearance of this work is creditable alike to its author and the publishers; — to the first for the ability and industry displayed in its compilation and production; to the second for their liberal venture in a comparatively new department on this side of the Atlantic. The merits of these two parties, on the ground just stated, would entitle them to receive from the medical public prompt and liberal encouragement by a large and ready sale of their book.

" But, happily, another and a stronger motive will be operative in quickening the attention and securing the support of this third party. It is the positive benefit to themselves procurable by a careful perusal and study of the pages of Dr. Gross; and we may as well declare at once, that they will be faithless to their trust if they wilfully shut their eyes to his large collection of facts which are hardly less important by their not constituting a body of doctrine." . . . . . " We ought not to conclude without mentioning the numerous wood engravings interspersed with the text, and which give a clearer knowledge of the author's written descriptions. There is another merit which belongs to the publishers, namely, the full and clear type in which the work is printed, and for which every reader ought to thank them, as we do."

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Recommendations.

"That a convenient work, in the English language, on Pathological Anatomy, adapted to the existing condition of the science, was demanded, will be admitted by all. This desideratum Professor Gross has endeavored to supply; and we can strongly recommend his ' Elements of Pathological Anatomy' to the attention of the pathological inquirer. In manuscript, the production impressed us favorably, and the opinion is sustained, now that it is placed before us in a more tangible form. We trust that the work may see many editions, and we are satisfied that it will be the earnest endeavor of the able and industrious author to keep it a' portée with the existing condition of the science. The student of Pathological Anatomy will find these volumes entitled to his best attention."

"Not many weeks ago, a notice was given of the appearance of this finished and truly splendid production from the pen of Dr. Gross, of Cincinnati. In calling the attention of our many readers to the second examination of the claims which a native work has upon them for patronage, we have no other interest to serve than that of the whole profession, who cannot be indifferent to the progress of any measures which place in their hands, and at their disposal, new powers, new agents, and unlooked for prospects of success in the practice of physic." . . . . .

"This great undertaking of elaborating two volumes, in which the whole field of Pathological Anatomy has been surveyed under the skilful eye of a master, cannot be passed by with indifference, or the work take its rest upon the shelf, before its pages have been most carefully and minutely studied. It is not, indeed, of a character to be easily forgotten." . . . . .

"There is a large amount of matter brought to a focus on every leaf, and where marginal diagrams are interspersed, we feel that Dr. Gross has neglected no attractive method by which the text may be clearly and comprehensively understood in its details." . . . . . . "We are here put in possession of not only a valuable treatise, but a beautifully-executed specimen of copperplate printing, xylography and typography." . . . . . .

"In ostensibly constructing a guide-book for those less conversant than himself with the intricacies of the labyrinth through which he has been travelling, he has raised a monument to his own fame that will transmit his name to posterity, as a bright example of the triumphs of industry; while it will prove that the far west, in the infancy of our country, is a genial region for intellectual attainments, and for the diffusion of useful knowledge."

"It gives me pleasure to add my testimony to that of other medical gentlemen in favor of the value and excellence of Dr. Gross's work on Pathological Anatomy. There are many points connected with this branch of medical science, especially in relation to the diseases of our own country, which are yet far from being fully understood and settled; but the work of Dr. Gross is, on the whole, the best summary of Pathological Anatomy in the language.   ELISHA BARTLETT."

Lowell, July 2d, 1840.

"I have frequently had occasion to consult Dr. Gross's work on Pathological Anatomy, and I should consider it a very valuable accession to the medical literature of this country. Besides the opinions of the best writers on the subject, it contains many original observations which are highly creditable to the talents and zeal of the author, and I hope it may meet with the patronage it deserves.   J. B. S. JACKSON."

Boston, June 25th, 1840.

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PART II.

SPECIAL

PATHOLOGICAL ANATOMY.

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PATHOLOGICAL ANATOMY.

CHAPTER I.

Of the Thymus Gland.

Situation, Weight, Color, and Consistence. — Developement and Decay. — Hypertrophy. — Thymic Asthma. — Scirrhus. — Tubercular Deposits.

THE thymus gland is situated in the anterior mediastinal cavity, being in connection, in front, with the sternum and the sterno-hyoïd and thyroïd muscles ; behind, with the trachea, the pericardium, and the great vessels of the neck. Laterally, it frequently overlaps the lungs, especially the right. In the fœtus and in the new-born infant, it is of a light reddish color, inclining to pink, and reaches from near the diaphragm to the thyroïd body ; but, as life advances, it assumes a yellowish cast, and gradually diminishes in bulk ; so that, about the time of puberty, there is scarcely any of it left. Consisting of two lobes, which give it a forked appearance, the gland is of an irregularly triangular shape, — the broader portion being above, the narrow below. Its ordinary weight, at birth, is about half an ounce. At this period, also, it is much larger, not relatively, but actually, than in the adult. In the normal state, it is about two inches and a half in length, an inch and a half in breadth, and four fifths of an inch in thickness.

Of a soft, fleshy consistence, the thymus is invested by a very thin, delicate capsule, which gives it a smooth, polished appearance, at the same time that it sends a multitude of thread-like processes into its interior, separating it thereby into numerous lobules. Each of these little masses contains several distinct vesicles, which are filled with a viscid, milky fluid, analogous to that of the thyroïd body, and which all open into one general reservoir, which is as large, in proportion to the volume of the gland, as one of the ventricles is to that of the heart. The arteries of the thymus are furnished by the

inferior thyroïd, pericardiac, and internal mammary. Its veins terminate in the thyroïd and the left innominata. Several large lymphatic vessels traverse it ; and its nerves are derived from the inferior cervical ganglia, the phrenic, and pneumo-gastric.

The thymus gland is subject to very few diseases. The principal lesions requiring consideration, are atrophy and hypertrophy, together with the tubercular and scirrhous de-generation. The organ, as was long ago remarked by Dr. Baillie, appears to be very little disposed to common inflam-mation ; abscesses are therefore of very infrequent occurrence, and have been seldom noticed by authors.

The developement and *decay* of this organ have, of late, received much attention from anatomists. It becomes visible during the third month of gestation, and continues to grow until the end of the second year of extra-uterine life. Be-tween this period and the commencement of the second den-tition, the gland remains nearly stationary in its size, under-going, however, certain changes in its structure and consis-tence, by which, whatever be their nature, it is probably rendered unfit for the further performance of its functions. It is only after the evolution of the permanent teeth that the organ begins to experience any decided decrease : it now rapidly diminishes in volume ; its vessels shrink ; its cells are obliterated ; and, as the juice by which it is moistened dries up, its substance becomes hard and shriveled. At a still later period, the gland loses its granular structure, and no longer exhibits any traces of its lobular arrangement, — a soft, dingy, cellular tissue being all that is left, and this, in time, is wholly absorbed. The precise age at which the last traces disappear does not seem to be accurately ascertained : many highly respectable writers, as Hudson, Meckel, Hildebrandt, and Burdach, fixing it at the twelfth year, whilst others, amongst whom is Hœngsted, maintain that it is not completely atrophied until thirty. Caldani and Sir Astley Cooper — the latter of whom has recently published an excellent essay on the structure of this gland — on the contrary, assert that it never entirely disappears ; but that vestiges may always be found, whatever may be the age of the individual. My own dissections would lead me to the conclusion that this organ varies very greatly, in respect to its disappearance, in different persons, being atrophied very early in some, and in others not until very late. In the generality of cases, it is completely

effaced between the twelfth and fifteenth years. Although the changes here described are altogether of a physiological character, there is reason to believe that they are occasionally expedited by accidental circumstances, as the pressure of an enlarged heart, a diseased lung, or an aneurismal state of the arteries at the base of the neck.

A not uncommon affection of this gland is *hypertrophy*. This disease, which has recently attracted much attention in Europe, was first accurately described by Dr. Kopp, of Germany, under the name or *thymic asthma*, though it does not seem to have been entirely unknown to other physicians. Indeed, Richa and Verdries, who wrote more than a century ago, distinctly recognized inordinate developement of the organ under consideration as a cause of asthma in children. Since the appearance of the essay of Dr. Kopp, a very able paper on the same subject has been published by Dr. Hirsch, of Köningsberg, and also one by Dr. W. F. Montgomery, of Dublin, besides several others which it is not necessary to specify.

Thymic asthma is an affection peculiar to childhood, and consists, as already intimated, in too great a developement of the gland whose diseases we are contemplating. It generally comes on between the fourth and tenth months, lasts from three to eight weeks, and is characterized by fits of suffocation, during which the breathing is often completely suspended, the countenance being livid, the eyes fixed, the nostrils expanded, the hands cold, and the thumbs clenched. These symptoms usually subside in a few minutes, when the infant gradually recovers its accustomed cheerfulness. The pathognomonic sign of this disease is a short, acute, hissing inspiration, alternating with a weak, croup-like expiration. Males are more liable to it than females; and it is said to be most common in subjects of a scrofulous diathesis.

The thymus gland in this disease is generally enlarged in every direction, but the most of all in thickness. The weight commonly varies from six to eight drachms. In a few rare instances, it amounts to nearly two ounces. When very bulky, the organ compresses the lungs and trachea, inducing that peculiar train of symptoms by which the complaint under notice is characterized. Occasionally, the enlargement is so great as to conceal the heart, and obscure its pulsations. Morbid adhesions are sometimes formed between the gland and the surrounding structures; and the large veins at the

base of the neck are often so much obstructed as to prevent
the ready return of the blood from the brain to the heart.

The substance of the gland may be in a normal state, or
variously altered in color and consistence.   Occasionally,
it is pale, soft, and pulpy; but this, I presume, is rare, as very
few writers make mention of it.   More commonly it is pre-
ternaturally red, and of a dense, fleshy consistence, with nu-
merous vessels running over its surface, and penetrating into
its interior.   On cutting into it, a dirty milk-like fluid some-
times exudes from it.

The thymus is said to be occasionally the seat of *scirrhus*.
This, I very much doubt, for the reason, principally, that the
gland generally disappears long before the individual attains
the age at which the disease in question is apt to be developed.
Small calculi have sometimes been discovered in the thymus;
and, in a phthisical child, fifteen months old, I found it
occupied with numerous tubercles.   They were of large size,
and in a state of partial softening.   The glandular structure
immediately around them was unusually hard, and of a deep
red color, from the great distention of its vessels.   Writers
also mention the steatomatous degeneration of this organ;
but of this I have never seen an instance.

CHAPTER II.

Of the Thyroïd Gland.

Location and Organization. — Acute Inflammation. — Suppuration. — Goitrous Enlargement. — Sanguineous Effusions. — Tubercular Deposits. — Scirrhus. — Symptoms of Diseases of the Thyroïd Gland.

THE thyroïd gland, lying at the anterior part of the neck, extends from the inferior margin of the wings of the thyroïd cartilage to the level of the third piece of the trachea. In front, it is covered by the common integuments and the sterno-hyoïd and thyroïd muscles; laterally by the platysma myoïd, omo-hyoïd, and sterno-mastoïd. Projecting outwards, it overlaps on each side the primitive carotid artery and the internal jugular vein, together with the pneumo-gastric, recurrent, and great sympathetic nerves. These relations of the thyroïd gland should not be forgotten by the student of morbid anatomy, as they will enable him to account for many of the symptoms which attend excessive enlargements of this organ.

Of a dirty reddish color, the thyroïd varies in size, not only in different individuals, but in the same person, at different periods of life : generally, however, it is comparatively larger in children than in adults, and in women than in men. Its average weight is about one ounce. Transversely it measures three inches and a quarter ; vertically, somewhat more than two. Two lobes, united by a thin, narrow *isthmus*, compose this body : they are convex in front, concave behind, and larger below than above, where they slightly approximate each other.

Externally, the thyroïd gland is invested by a very thin, delicate capsule, composed evidently of condensed cellular substance, to which it is indebted for its smooth and polished appearance. The proper parenchyma consists of a number of small irregularly rounded lobules, of a soft, spongy texture, in which are contained many minute vesicles, filled with a colorless, but occasionally thin, oily, yellowish fluid. Some of the older anatomists, as Santorini and Schmidtmüller, sup-

posed that they had discovered an excretory duct, by which
this fluid was conveyed into the trachea; but it is scarcely
necessary to remark that this opinion has not been verified
by any of our best modern observers. I have myself often
searched for it, but have never succeeded in seeing it.

This organ is extremely vascular : it receives two arteries
on each side, one from the laryngeal branch of the external
carotid, and the other from the thyroïd branch of the subcla-
vian. Its veins, which are very numerous, form frequent
anastomoses, and follow, for the most part, the course of the
arteries. The nerves are derived from the pneumo-gastric
and the cervical ganglia: its lymphatic vessels terminate in
the neighboring glands.

There are few organs more exempt from disease than the
one now under consideration. The principal affection to
which it is liable, in this country and in Europe, is broncho-
cele, goitre, or chronic enlargement : it is likewise susceptible
of acute inflammation, suppuration, scirrhus, and several kinds
of degeneration. Gangrene rarely, if ever, occurs.

Acute inflammation of the thyroïd gland may be justly
ranked amongst the rarest affections of our species. Existing
occasionally as an idiopathic disease, it is generally caused
by external violence, local irritants, or lesion of some contig-
uous structure, as the larynx, trachea, or œsophagus. The
anatomical characters are very similar to those which take
place in inflammation of the other organs. The gland is soft
and succulent, considerably augmented in bulk, and of a dark
purple hue, — all its vessels being abundantly loaded with
blood. Sometimes its substance is remarkably tender, yield-
ing upon the slightest pressure of the finger ; and, in a few
rare instances, it is infiltrated with blood, sanies, or pus.
Matter is seldom found as a consequence of acute inflamma-
tion ; still more rarely is it deposited in the form of an ab-
scess. Of this, however, I have recently seen a most inter-
esting example, in a man forty-four years of age, who died of
pneumonitis after an illness of three weeks. On inspection,
Dr. Woodward and myself found the whole gland, with the
exception of a small portion of its inferior extremity, convert-
ed into a thin, delicate sac, containing nearly three ounces of
thick, cream-colored pus. The thyroïd cartilage was com-
pletely denuded, and the matter had burrowed upwards un-
derneath the hyoïd bone on the left side, as far as the root
of the tongue. The most extraordinary circumstance in this

case was, that the patient never suffered the slightest uneasiness in this part during his indisposition, and it was only by accident that the lesion was discovered on the examination.

More frequently the suppuration follows on chronic inflammation. To this description belongs the interesting case recorded by Allan Burns.* The suppuration took place in both lobes : the matter was tardily secreted, and the integuments became gradually distended, until they formed a large pouch, which hung over the sternum, and contained several pounds of pus. By retaining the sides of the cyst in contact, adhesion was at length effected, and the woman recovered. The purulent matter, from the effect of the muscles and cervical aponeurosis, is generally slow in working its way to the surface. In some instances, as in the case mentioned by Baillie, it finds its way into the trachea, and destroys the patient by suffocation. The quantity of fluid is occasionally very great. Alibert saw a patient in the St. Louis hospital of Paris, who had an enormous bronchocele, which was eventually relieved by discharging upwards of five pounds of purulent matter.

Chronic enlargement of the thyroïd gland, constituting what is called *bronchocele, hypertrophy,* or *goitre,* occurs at all periods of life, from infancy to old age ; and, what is remarkable, it is principally observed in the female sex. It is most apt to appear during the first ten or twelve years after birth ; and instances are not wanting, though they are rare, where it was congenital. Of this Foderé, Sterndale, and Consbruch, have each related examples. The disease is not confined to the human subject. It has been noticed in the horse, cow, sheep, dog, and other inferior animals.

There are certain localities in different quarters of the globe in which this disease seems to be much more common than in others, — for what reason is not known. In the United States, it is often observed in the mountainous districts of Pennsylvania, Virginia, New York, New Hampshire, and Vermont : in England, it is very common in Derbyshire, Norfolk, and, Surry ; and, in the valleys of the Alps, Apennines, and Pyrenees, it not unfrequently prevails endemically, almost all the native inhabitants being more or less affected with it. The enlargement is often attended with a stunted developement of the body ; and, in certain parts of Switzerland,

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* Observations on the Surgical Anatomy of the Head and Neck, p. 215. 1823.

Savoy, Lombardy, and the Tyrol, it is apt to occur in combination with cretinism, — a state characterized by great deformity of the head, and entire absence of intellect.

Hypertrophy usually begins in the form of a small tumor, on one or both sides of the trachea, which, gradually enlarging, at length occupies the whole anterior part of the neck, from the chin to the top of the breast-bone. In some instances, the swelling is of frightful magnitude, extending upwards as far as the ears, and downwards a considerable distance over the chest. In a case mentioned by Alibert, the gland, of a tapering, cylindrical shape, reached to the middle of the thighs; and other examples, not less remarkable, are related by Milltemayer. In the early stage of the disease, the substance of the tumor does not seem to be very materially altered: it is unnaturally vascular, slightly indurated, and still elastic: as the enlargement progresses, however, it becomes more and more firm, until ultimately it acquires the density of a hepatized lung, or even of fibro-cartilage. The hypertrophy, although it usually begins simultaneously in both lobes, seldom proceeds equally, and occasionally it appears to be seated chiefly in the isthmus of the organ, the remainder being but little affected.

The internal substance of the tumor is liable to considerable variety, depending upon its age and progress. When of moderate standing, it is generally of a soft, gelatinous consistence, emitting, on pressure, a ropy, glutinous fluid. In more ancient cases, it is of a pale cinnamon tint, hard to the feel, and interspersed with numerous cysts,* generally not larger than a pea, containing a serous, glairy, or melicerous substance and occasionally pus, fibrin, or even pure blood. Calcareous concretions are sometimes found in such enlargements, either alone, or in union with cartilaginous and osseous productions. On a small goiterous tumor, which I removed from a man fifty years of age, and which is now in my private collection, there are several small steatomatous masses, with a circular nodule of bone, about six lines in diameter. It is of a deep yellow color, very compact in texture, and surrounded by a thin, imperfect capsule. Occasionally the whole organ is transformed into an osseous cyst, filled with various kinds of matter, especially the jelly-like, the suety, and the

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* These cysts are nothing but enlarged cells, which are dispersed through the organ in the natural state.

meliceric.   I have a specimen of this kind in my cabinet :
one of the lobes has almost entirely disappeared, whilst the
other is converted into a firm, solid capsule, as hard as bone,
though scarcely a line in thickness.   On sawing through this
osseous tumor, which does not exceed the volume of a hen's
egg, I found it filled with a white, curdy, friable substance,
not unlike semi-concrete cheese.

The thyroïd arteries are commonly much enlarged, and,
in some cases, the goiterous swelling seems to consist almost
wholly of a congeries of varicose veins.   Under such circum-
stances it is by no means unusual to meet with considerable
sanguineous effusions, in various stages, so to speak, of mat-
uration, — some being quite fluid, some semi-concrete, and
others of a dense, firm consistence, like old apoplectic depots of
the brain.   The blood is commonly poured into the enlarged
vesicles, but occasionally it finds its way into the connecting
cellular substance, which is, at the same time, more or less
lacerated.   In some instances, it may be traced directly to a
ruptured vessel.

In the early stage of the disease, the skin over the affected
gland is perfectly natural, both as regards its color and
mobility ; but, by and by, as the hypertrophy increases, it
becomes dark, dense, vascular, and irregularly adherent.
The enlargement is usually very slow and gradual, years
often elapsing before it attains much bulk.   Occasionally,
the gland, after having become partially hypertrophied, re-
mains stationary for a while, and then goes on increasing ;
or suppuration sets in, and the substance of the organ is ab-
sorbed, nature thus effecting a sort of spontaneous extirpation.
Of this, some interesting cases are given by Petit, Hevin, and
Alibert.

Of the remote cause of goitre, nothing satisfactory is
known.   By many it has been attributed to the use of impure
water, to innutritious diet, to the repulsion of cutaneous dis-
eases, and a variety of similar circumstances equally hypotheti-
cal, and, for aught we know, unfounded.   Concerning the
proximate cause of this singular malady our knowledge is of a
more positive nature.   Some of the older writers supposed
that it arose immediately from an obstruction of a certain
number of passages which they imagined to lead from the
thyroïd gland to the trachea; but, as no such openings exist,
the opinion must of course fall to the ground as untenable.
But, even granting that there were actually such apertures of

communication, and that they were liable to be blocked up in the manner alleged, still the circumstance could only be viewed in the light of an exciting, not in that of a proximate, cause; which invariably consists in inflammatory irritation of the thyroïd tissue, pursuing a slow, chronic march. That this is the fact, is at once indicated by the morbid alterations which this organ experiences during the progress of the enlargement, and which can only be explained on the ground which has been here assumed.

The thyroïd gland is sometimes partially *atrophied.* In several instances, I have found it less than one third the ordinary bulk, having been reduced to a soft, spongy, dirty-looking mass. The wasting, which is more common in men than in women, is observed chiefly in advanced life. The vessels supplying the atrophied gland are usually very much diminished in volume, and many of the smaller branches appear wholly obliterated. The nerves are also abnormally delicate.

Tubercles are rarely found in the thyroïd gland; and the same remark may be made concerning encephaloïd, so common in some of the other viscera. The organ occasionally becomes scirrhous; but this, too, is very rare. When thus affected, the gland seldom attains much bulk; it is of a light grayish tint, and cuts like an unripe pear, from the intersection of fibrous filaments. The cells of the thyroïd are said to have been filled, occasionally, with hydatids; but this is probably an error, arising from confounding such appearances with the sero-albuminous collections so common in goiterous and other enlargements.

Of the *symptoms* of these different affections, little need be said in this place. Acute inflammation is commonly attended, it may be supposed, by pain, and tenderness on pressure, with more or less constitutional disturbance, especially when it passess into suppuration; yet, that these are not invariable results, appears sufficiently from the case which I have already cited of thyroïd abscess, where the patient did not evince the slightest uneasiness in any part of the throat. When the quantity of matter is considerable, a pendulous tumor will gradually form in the region of the affected organ, presenting a distinct fluctuation, on the application of the finger, accompanied with hectic fever, and difficulty in breathing and swallowing. Owing to the thickness and firmness of the covering of the abscess, an early incision should always be

made ; otherwise its contents may work their way into the œsophagus, or, what is worse, into the trachea, or the larynx.

Goiterous enlargements are always easily recognized, their situation and history being commonly sufficient for determining their diagnosis.   They prove troublesome chiefly by their mechanical pressure on the windpipe, impeding respiration, deglutition, and the return of the blood from the head.   In this manner may be induced headache, giddiness, apoplexy, aphony, diseases of the heart and lungs, and, occasionally, even death.

Scirrhus generally occurs in advanced age, and is characterized by occasional darting pains in the region of the affected part.   It may be further distinguished by its great hardness, and by the fact that it rarely attains much magnitude.

CHAPTER III.

Of the Respiratory Apparatus.

SECTION I.

Of the Air-Passages.

I. THE *larynx* is liable to inflammation, œdema, abscess, ulceration, ossification of its cartilages, and polypous growths.

Preternatural vascularity, and redness of the lining membrane, either diffused or in patches, with tumefaction of the mucous follicles and the secretion of a clear limpid fluid, constitute the anatomical characters of *acute laryngitis* in its earlier stages. By degrees, the redness increases in intensity, and extends, on the one hand, down into the trachea, and, on the other, up into the fauces, affecting, in some instances, the tonsils, soft palate, and even the root of the tongue. Various are the changes observed in the epiglottis. In some cases it is thickened, infiltrated, and so erect as to leave uncovered the mouth of the larynx ; in others, it is highly vascular, clotted with lymph, and studded with enlarged follicles. Within the larynx itself, the tumefaction is seldom very conspicuous, except sometimes in the ventricles ; and it almost always terminates at the junction of the trachea, though, as was before mentioned, the redness often extends

beyond it. In the progress of the disease, the natural secretion becomes much altered: it is no longer thin, sparse, and watery, but thick, tough, abundant, and of a yellowish tinge.

Acute laryngitis, usually runs its course in from three to five days. It is characterized by high inflammatory fever, dyspnœa, cough, hoarseness, more or less pain, and expectoration of thick, viscid mucus, often streaked with blood. The disease almost always occurs in the prime of life, between the years of puberty and forty-five, in which respect it differs remarkably from croup, which, as will be presently seen, is most common in young children.

It has been already intimated that one of the effects of acute laryngitis is the effusion of serum into the submucous cellular tissue. The infiltration, which is occasionally very great, is always most abundant around the edges of the glottis, which are frequently elevated into white, glossy, pendulous bags, resembling the gelatinous effusion which we sometimes see under the epidermis, after the application of a blister. This constitutes that form of the disease which was so ably described by the late Dr. G. L. Bayle, under the name of *œdema of the glottis*, in a memoir published at Paris in 1819.* From the interesting cases recorded by this distinguished writer, the affection would seem to be much more common in adults, after the age of thirty-five or forty, than in early life. Its progress is usually very rapid, and its termination almost uniformly fatal, death being preceded by great anguish, and symptoms of suffocation. Out of seventeen cases of this disease, mentioned by Bayle, only one recovered. The difficulty of breathing in this affection appears to result, not so much from the absolute constriction of the chink of the larynx, as from the manner in which the tumid and infiltrated lips of the glottis are drawn in by the air, as it rushes from the mouth into the lungs.

Occasionally, purulent matter is found in the larynx ; and, in a few cases, small abscesses have been detected, situated either in the ventricles of Morgagni, between the mucous membranes and the muscles, or between this organ and the pharynx. Bayle mentions several instances of this kind, in each of which there was a discharge of half an ounce of thick, creamy pus.

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* See Nouveau Journal de Medicine, de Janvier, 1819. Also the Medico-Chir. Rev. for September, 1823, p. 452.

In other cases, together with the inflamed condition of the mucous lining, there is found an exudation of lymph, either in dots, in patches, or in the form of a continuous lamella. In simple laryngitis, this deposition is extremely rare ; but, in that variety of the disease which is known by the name of croup, nothing is more common.   In this affection, which differs further from ordinary inflammation by its being almost exclusively confined to infancy and childhood, the effusion is often very rapid, and moulds itself accurately to the shape of the organ, to the walls of which it sometimes adheres with considerable pertinacity.   Although it is occasionally limited to the larynx, yet the membrane usually passes into the trachea and bronchiæ, becoming gradually softer and more delicate, until finally, in the binary and ternary divisions of these tubes, it appears like a thin, mucous film.   Upwards, it sometimes extends over the fauces into the mouth, and even into the nasal cavities.   Such instances, however, are rare, and it has never occurred to me to meet them.

Varying in thickness, in different cases, the membrane seldom exceeds the third or fourth of a line, though in some instances it is the eighth or tenth of an inch.   It is of a light grayish color, is composed chiefly of albumen and fibrin, in combination with carbonate of soda and phosphate of lime ; and is generally much stronger, more tenacious, and more firmly adherent in the larynx than in the trachea and bronchial tubes, in the latter of which it is often loose or even floating.   The mucous coat beneath this lining is usually highly injected, inflamed, and unnaturally rough, from the projection of its mucous follicles.   In slight cases, the color is of a light red, and occurs in patches, streaks, or points : in more severe ones, it is scarlet, brownish, or purple, and uniformly diffused.

To the presence of this plastic production, together with the tumefaction of the lining membrane of the trachea and bronchiæ, which so often accompanies the disease, is to be imputed, in great measure, the impediment to the respiration in croup.   Sometimes portions of it are detached, and, by sticking in the air-passages, cause suffocation.   In other instances, it is coughed up, either piece-meal, or in the form of a dense, inspissated cylinder, and the patient recovers.   The organization of this membrane is admitted rather from analogy than from any positive observation.   The occurrence, if possible, must be extremely rare.

Laryngitis sometimes becomes *chronic,* or it may have a

disposition to assume this type from the very beginning. Such an alarming degree of prevalence has this form of the disease assumed among our clergy, that it may almost be viewed in the light of an epidemic. The inflammation is confined exclusively to the mucous lining of the larynx, and its peculiar characteristic is to terminate in ulceration. Slow and insidious in its attacks, the first symptoms often are merely slight hoarseness and cough, scarcely sufficient to attract notice, which gradually increase, and, unless arrested by treatment, destroy life, by inducing hectic fever, emaciation, and general prostration. Often do we see the uvula elongated, the tonsils and soft palate ulcerated, and the vocal cords so much thickened as to encroach upon the glottis. The lining membrane of the larynx is usually tumefied, its glands enlarged, and its vessels engorged with dark blood. In this way have perished, in the prime of life, some of the brightest ornaments of the American church.

Inflammation of the larynx sometimes terminates in *ulceration*. This is very common in persons who are cut off by tubercular phthisis. Of one hundred and two patients, M. Louis found the epiglottis ulcerated in eighteen, and the rest of the organ in twenty-three. The erosions in the former of these structures were nearly always seated on the inferior surface ; and, although they were generally superficial, yet they sometimes extended into the substance of the cartilage, destroying it partially in four cases, and completely in a fifth. In the larynx, properly so called, the ulcers were usually deep, from one to two lines in diameter, and of an irregularly circular shape, with pale grayish-looking edges, occasionally indurated and brittle. Their most frequent seat was, first, at the junction of the vocal cords ; then these cords themselves ; next, the base of the arytænoid cartilages ; and, finally, the interior of the ventricles of Morgagni. Sometimes the vocal cords were partially destroyed, and the arytænoid cartilages stript of their natural coverings. A fact worthy of notice, in connection with this subject is, that ulcerations of the epiglottis were remarked twice as often in men as in women.*

The textures in the immediate vicinity of these erosions are seldom much altered, either as respects their color or their consistence. When the symptoms which precede dissolution are denotive of high inflammatory action, the

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* On Phthisis, p. 47.   Boston, 1836.

mucous membrane is apt to be reddened and slightly soft-
ened; but, in most cases, it is of a grayish hue, moderately
dense, or even indurated.

The signs, during life, of ulcerated larynx, vary, as might
be expected, according to the part that is affected, and also
according to the extent, depth, and number of the erosions.
When the vocal cords, the ventricles, or the arytænoïd car-
tilages are implicated, hoarseness, alteration of the voice,
pain, sense of heat and pricking, followed often by complete
aphony, are the ordinary and almost invariable manifestations.
The pain sometimes is quite severe, pungent, and lancinating,
the cough excessively distressing, and the patient dies, gradu-
ally worn out by hectic fever.

I have never seen the cartilages of the larynx ulcerated,
but this condition has been noticed by others, though the
instances wherein it has been found are rare. In the affec-
tion with which it usually occurs, in connection with ul-
ceration of the mucous membrane, it occasionally leads to
perforation, the symptoms which precede dissolution resem-
bling those of phthisis. The diseased cartilage is slightly
tumefied, and softened around the ulcers, the edges and base
of which are rough, and of a light brownish color. The
perichondrium commonly participates in the mischief, being
injected, dark, thickened, ragged, and bathed in unhealthy
looking pus. These ulcerations are most frequent in venereal,
mercurial, and phthisical affections, in which large portions
of these cartilages, or even entire pieces, are sometimes dis-
charged.

More frequent, perhaps, than ulcerations are the *osseous
transformations* which we sometimes meet with in the
laryngeal cartilages. The pieces in which this change, which
is natural in the aged, is most apt to take place, are the
thyroid and cricoïd, of each of which I have seen a consider-
able number of specimens. When thus affected, these bodies
are usually very brittle, containing a considerable quantity
of thin, reddish, oily fluid. I have seen them, however, in a
few instances, quite hard and firm, like the most perfect bone.
Of ossification of the arytænoïd cartilages and epiglottis, I
am not aware that any examples have been recorded by
writers. The *epiglottis* may be affected, without the rest of
the larynx participating in the lesion. The simplest form of
disease is thickening of its mucous membrane, with ulcera-
tion of its inferior surface. The abrasions are generally

small, superficial, and irregularly circular, their base, for the most part, being formed by the submucous cellular texture, though occasionally they extend into the substance of the fibro-cartilage. Sometimes, indeed, this body is entirely destroyed. Occasionally, the epiglottis is remarkably shriveled and contracted, or singularly thinned and elongated, its form being altered so as to represent the shape of a battledore, the narrow extremity being at the mouth of the larynx. This condition usually coexists with ulceration, and constitutes what Professor Stokes has proposed to call the *leaf-like expansion* of the epiglottis.*

The *muscles* of the larynx are also sometimes diseased. In some cases, they are infiltrated with tubercular matter; but more commonly, perhaps, they are atrophied, and thus cause various alterations of the voice, being no longer capable of producing proper tension of the fibro-elastic structure of the organ. The vocal cords, as they are termed, are occasionally affected. Andral says that he has seen them converted into a soft, inorganic pulp; and he refers to cases in which they had entirely disappeared, leaving the thyreo-arytænoïd muscles bare. In chronic inflammation, it is very common to find the ventricles of the larynx contracted; so that, in the advanced stages of the disease, they are merely represented, as it were, by a superficial, transverse groove. This narrowing seems to arise from hypertrophy of the mucous and submucous textures, by which the edges of the cavities are gradually approximated.

Polypes are occasionally found growing within the larynx, of the same nature as in other parts of the body. Formations of this kind, although quite rare, have been noticed by different observers. Two cases are recorded by Lieutaud; † and the celebrated Dessault also met with them on several occasions. Other examples are mentioned by Pelletan, Trousseau, Andral, and other writers. An instance, in which a firm, elastic, whitish tumor of this kind adhered to the root of the epiglottis, and finally produced suffocation, is related by Mr. Mayo, of London. Tubercles and hydatids are also sometimes found in the larynx; the latter are very rare, and the former generally coexist with pulmonary phthisis.

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* On Diseases of the Chest, in Dunglison's American Medical Library, No. 14, 1837.

† Historia Anatomico-Medica, lib. iv. ob. 63.

II. The diseases of the *trachea* may be classed under the heads of inflammation, ulceration, ossification, and structure.

Trachitis exhibits the same anatomical characters, in a great degree, as inflammation of the larynx. The lining membrane is crowded with multitudes of minute, florid vessels; its follicles are enlarged and unusually distinct, and its surface besmeared with thick, ropy mucus. Purulent fluid is occasionally found; and, in some instances, as in croup, the whole tube is lined with a layer of adventitious membrane. Softening is seldom or never present, either in this affection, in laryngitis, or in inflammation of the bronchiæ. In chronic cases, the redness is less, though the vessels seem occasionally to have a varicose arrangement; and the mucous tunic often presents several small ulcers, or is much thickened and indurated.

Ulceration of the trachea is very frequent in tubercular phthisis, M. Louis having noticed this lesion in thirty-one patients, out of the one hundred and two, who died of this disease under his care. More common in the inferior than in the superior half of the tube, and behind than in front, or at the sides, the ulcers are generally of a circular shape, sometimes oval or oblong, and from the twelfth to the sixth of an inch in diameter, with flat, reddened edges, as if they were scooped out of the subjacent cellular tissue. In some instances, the erosions are so small, close, and numerous, as to give the whole of the inner surface of the trachea a sieve-like aspect. Of this an interesting case is mentioned by Andral. When large and deep, the ulcers may denude the cartilaginous rings, invade their substance, and finally, destroying them, lead to perforation. In a few instances, there is a complete removal of the mucous lining over nearly the whole of its muscular structure, which, in such cases, is always much thickened and indurated.

Ulcers of the trachea sometimes heal. Of this, an instructive case is mentioned by Mr. Porter, in his Surgical Pathology of the Larynx. The patient recovered under the use of mercury, and, after enjoying good health for upwards of a year, died of another disease.

The signs of trachitis, whether simple or complicated with ulceration, are often remarkably obscure. Pain, tightness, and a sense of burning, just above and behind the sternum, are occasionally the chief symptoms; in general, however, there are superadded embarrassment of breathing, accom-

panied with a peculiar mucous rhoncus, severe cough, and copious expectoration of muco-purulent matter. The pain is sometimes highly distressing, and is increased both by pressure and by inspiration. The voice is seldom much altered. Occasionally, the disease is almost completely latent ; and cases occur in which the pain and uneasiness are entirely referred to the larynx, the patient feeling no distress whatever in the trachea, the actual seat of the disease.

The rings of the trachea, being of a fibro-cartilaginous texture, seldom *ossify.* When this deposition is found, it usually takes place in small points, which, by coalescing, may at length embrace the entire ring. Of this, I witnessed an example, not long since, in a man seventy-five years of age. The different tissues of the tube were remarkably dense, inelastic, and brittle, requiring only slight traction to tear them. All the rings were completely ossified. The trachea is liable to become contracted by thickening of its lining membrane from chronic irritation, forming a sort of *stricture* several inches in length.

III. *Acute bronchitis,* although it may exist as an independent disease, yet in most cases it is united with inflammation of the trachea, the larynx, or pulmonary tissue, of which it forms so important a component. The mucous coat is found, on dissection, to be deeply injected, and of a bright crimson, lilac, or purple color, diffused, or in patches of various sizes. Rarely is it much thickened or softened ; but sometimes it it is considerably augmented in firmness and density, so as to tear no longer with the same facility as in health. Purulent matter is occasionally observed ; and, in violent cases, it is not unusual to find the smaller tubes filled with bloody serosity, blended with froth or globules of pus. In the early stage of this disease, there is always a suspension of the natural secretion. In a short time, however, it is reëstablished ; and it is then found to be thin, transparent, and somewhat acrid. As the inflammation advances, it becomes thicker and more abundant, assumes a yellowish color, with a slight greenish cast, and adheres with so much firmness and tenacity to the bronchial tubes, as to be expelled with great difficulty. Obstruction is thus created in the air-vesicles of the lungs, and hence, on opening the thorax, these organs seldom collapse.

In *chronic bronchitis,* a disease of very frequent occurrence in this country, the color of the mucous tunic is usually

several shades darker, verging more on livid, violet, or ma-
hogany. Not unfrequently, however, the membrane is of a
light grayish tint, or even much whiter than in the normal
state. The thickening and augmentation of density are car-
ried much further than in acute bronchitis; and the natural
secretions are usually very copious, opaque, of a deep yel-
lowish color, and almost always puriform. With these signs
of disease, we frequently find small ulcers, hypertrophy of
the mucous and other textures, and dilatation of the bronchial
tubes. Softening is rarely present, and never to any very
great extent.

The respiratory murmur, in this disease, is diminished in
intensity; but the sonorousness of the chest is not sensibly
impaired, except in cases embracing a large extent of surface.
The cough, at first, dry, loud, and hoarse, becomes gradually
moist, loose, and more frequent; the breathing is accompa-
nied with a mucous
rhoncus, most distinct
at the base or poste-
rior margin of the
lungs; and the spu-
ta, which before were
thin, saltish, and
slightly glutinous, are
now opaque, yellow-
ish, and ropy. Occa-
sionally, they are
marked with dots of
blood, or mixed with
pus. In chronic bron-
chitis, the expectora-
tion is generally puri-
form, and sometimes
of a greenish, dirty
grayish, or brownish
color, from the ad-
mixture of black, pul-
monary matter. In
neither of these com-
plaints are the sputa
much offensive; in
most cases, indeed,
they are perfectly in-
odorous.

Fig. 49.

Ulceration of the bronchial mucous membrane is less frequent than that of the trachea, and still less than that of the larynx. Louis, in the whole of his researches, only met with seven cases of this disease. From the observations, however, of Hastings and Andral, it would appear that the lesion is more common than is usually supposed. The ulcers are generally small, clean, superficial, and of a dirty grayish color, with somewhat tumid and reddened edges. They seldom extend beyond the mucous and submucous textures, and are rarely met with in the small bronchial tubes.

The symptoms of ulcerated bronchiæ differ little from those which have been enumerated as characterizing trachitis. There is, in general, however, more difficulty of breathing, more deep-seated pain, more emaciation, and more hectic fever.

Dilatation of the bronchiæ is frequently met with in old asthmatics, and in children after severe attacks of hooping-cough. The affection was first described by Laennec, who has given a number of interesting examples in illustration of its pathology. It presents itself under two varieties of form. In the first, (Fig. 49,) the dilatation is uniform throughout, and may attain the diameter of a goose-quill or even of a finger. Sometimes several branches of the same trunk are thus affected, each terminating in a sort of cul-de-sac. In other cases, the dilated tube regains its normal caliber, and ends in the usual way. In the second variety, (Fig. 50,) the bronchia presents a nodulated appearance, like a varicose artery, or an absorbent vessel, forming a series of globular swellings, on each side of which the canal is of the natural size. Occasionally, there is only one such dilatation, which may attain the magnitude of a cherry-stone, a marble, or a walnut.

Fig. 50.
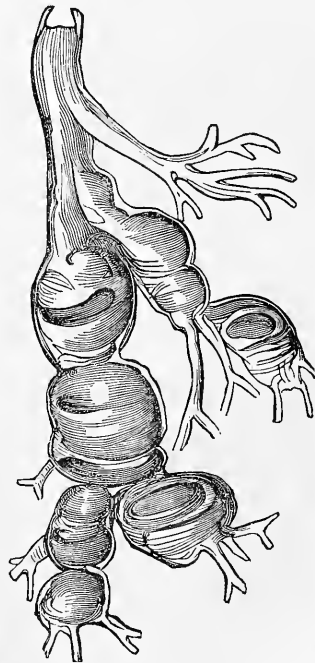
Various are the appearances of the mucous membrane in this affection. In the generality of cases, it is thickened, injected, and indurated, with its surface covered with dense, inspissated mucus. In others, especially in the second variety of the disease, the membrane is transparent. and so extremely attenuated, as to look like a shining vesicle. Occasionally, again, all the component tissues are in a state of hypertrophy, or they are indurated, rigid, and almost of a fibro-cartilaginous consistence. Cases also not unfrequently occur in which the mucous tunic is softened, and convertible into a grayish, pulpy substance. When the dilatations are considerable, and embrace a large number of tubes, the intervening pulmonary tissue is hardened, probably from the effects of chronic irritation, imperfectly crepitant, and of a much lighter color than natural.

This lesion is said to be most common in the upper lobes of the lungs : rarely is the entire organ affected. It is usually dependent upon chronic inflammation, and is sometimes produced with much celerity. In whooping-cough, it has been known to attain a very considerable size in the course of a few months. A frequent, forcible inhalation of the air, when the bronchiæ are enfeebled by disease, and obstructed with thick, ropy mucus, seems to be the immediate cause of this dilatation. It occurs at all periods of life, and, according to Guersent, is occasionally congenital.

The physical signs of this affection are, bronchial respiration, loud mucous or gurgling rhoncus, and dulness on percussion, from the condensation of the pulmonary tissue. Seldom is there much dyspnœa ; the emaciation is not great ; and the cough and sputa are similar to what we observe in chronic bronchitis, which the dilatation so often accompanies or succeeds.

There is another species of alteration of the air-tubes, the reverse of that just described, which has of late attracted the special notice of pathologists ; I mean *obliteration* of the bronchiæ. The first account of this singular lesion was given a few years ago by Monsieur Reynaud, in a highly interesting monograph, in the fourth volume of the Memoirs of the Royal Academy of Medicine of Paris.* It would appear,

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* An able translation of this paper, by my friend Dr. John W. Warder, of this city, will be found in the Western Journal of the Medical and Physical Sciences.

from the researches of this distinguished physician, that narrowing and obliteration of the air-tubes are much more common than has hitherto been supposed by writers on thoracic diseases ; but what the probable proportion is, in a given number of subjects, is a circumstance which has not been determined.

This lesion affects principally the smaller bronchiæ, especially when it is produced by inflammatory irritation, accompanied with the effusion of plastic lymph. In such cases, the contraction is liable to be mistaken for an obliterated vessel. When, on the other hand, it is caused by the pressure of an external tumor, it occasionally involves the larger-sized branches, or even one of the primitive trunks. Hypertrophied lymphatic ganglions sometimes give rise to an obstruction of this kind, followed by a gradual wasting of the corresponding lung. The lesion under consideration is most common in the superior lobe of the pulmonary organs, — a circumstance which is easily explained by the great frequency of tubercular disease here, with which it often coexists. The number of tubes that may be thus effected is variable ; occasionally, only a single one is obliterated ; at other times, the lesion is observable in three or four ; and, in a few rare cases, all the branches of an entire lobe are implicated.

Obliteration of the air-passages presents itself under two varieties of form. In the first, (Fig. 51,) which is by far the most common, the tube is uniformly contracted throughout its entire length, being converted into a firm fibro-cartilaginous cord, from the sides of which, numerous processes are detached, which

Fig. 51.
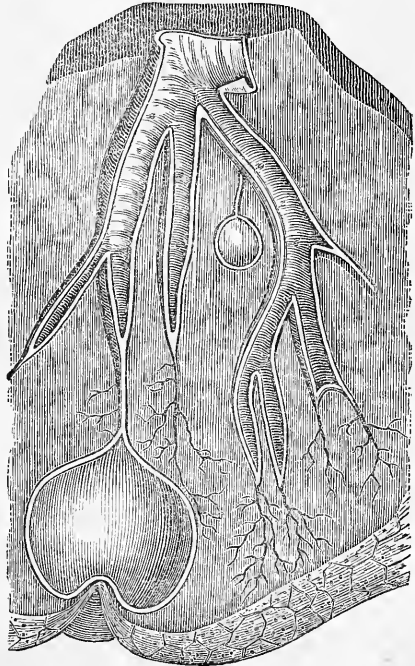
ramify in an arborescent manner, and the diameter of which scarcely equals that of a bristle. This variety, which may be said to resemble the continuous stricture of the urethra, usually affects the smaller divisions of the bronchiæ, and is almost always complicated with dilatation, the caliber of the tube above the constriction being seldom perfectly natural.

In the second variety, (Fig. 52,) the obliteration occupies only a very small portion of the tube, and is observed principally in bronchiæ of the second and third order. The affected part rarely exceeds half an inch in length; generally, indeed, it is not near so long, and not unfrequently it presents the appearance as if the tube had been compressed by a narrow tape or ligature. In this variety, the diameter of the bronchiæ above and below the obliterated point may be natural, diminished, or, as is more commonly the case, increased. Several tubes may present this species of contraction in the same lung.
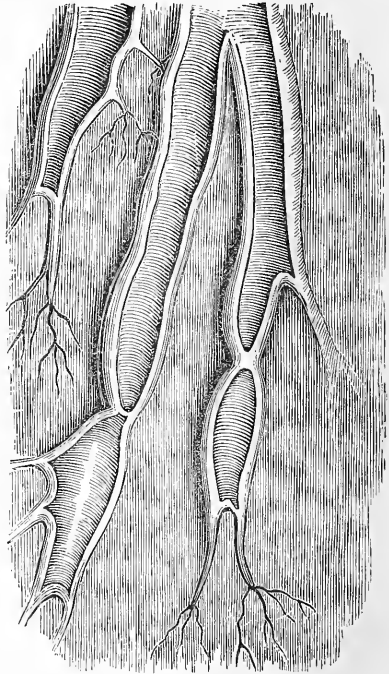
The causes under the influence of which this lesion takes place are various, but may all be referred to the following heads: 1. the formation of fibrinous concretions; 2. thickening of the mucous membrane; 3. external pressure; 4. the existence of accidental products within the tube. Of these, the first and second are by far the most common, and are both the immediate result of inflammatory irritation. The principle on which the one acts is similar to that which obtains in the production of contraction and obliteration of the arteries: the type of the other is to be found in the formation of stricture of the urethra, the nasal duct, œsophagus. Let us be understood. It is well known that the bronchial tubes are liable to inflammation, followed not infrequently by

Fig. 52.

an effusion of plastic lymph.   The substance thus poured
out being permitted to remain, it gradually contracts adhesions
with the mucous membrane ; and, in this way, an effectual
barrier is formed, by which the ingress of the air is perma-
nently interrupted.   Thus the function of the tube is an-
nulled ; and, in progress of time, it is converted into a firm,
fibrous cord, like an artery that has been tied with a ligature.

Thickening of the mucous membranes is observed in all
parts of the body in which these structures are found ;
and it is therefore not at all surprising that it should occa-
sionally produce narrowing and obliteration of the bronchiæ.
In the urethra, as is well known, it is a frequent cause of
stricture ; and, in the nasal duct, there is reason to believe it
a very common source of lacrymal fistula.

The third cause which has been enumerated, as liable to
produce obliteration of the air-passages, is external pressure.
This may be occasioned, as already stated, by a tuberculated
lymphatic ganglion, an aneurismal or other tumor, or, as
more generally happens, by pleuritic effusions, exerting a
permanent influence.

Lastly, obliteration of the bronchiæ is occasionally caused
by the presence of inspissated mucus, by deposts of tubercular
matter, or by the inhalation of particles of foreign substances.

The mucous membrane, near the point of obliteration, may
be normal, thickened, or attenuated : in some instances, it is
unnaturally red, softened, or incrusted with plastic lymph.
In the majority of cases, as was previously stated, the lesion
is associated with dilatation, either of the same, or of the
neighboring tubes.   This is particularly apt to happen when
it implicates the larger trunks.   The parenchymatous sub-
stance itself is variously altered.   Frequently it is remarkably
emphysematous, or even rarefied ; as, on the other hand, it is
sometimes quite dense, solidified, and impermeable to the air.
The adjoining vessels are seldom much affected, except when
the obliteration occupies a large extent of surface ; in which
case, the smaller branches are often very much diminished in
size, plugged up with fibrinous concretions, or transformed
into dense, thread-like cords, which are easily distinguished
by their dark grayish color.

The consequences of obliteration of the bronchiæ are ex-
ceedingly variable, and can only be pointed out in a very
general manner.   When of limited extent, the lesion does not
produce any marked difficulty ; as the neighboring tubes, under

such circumstances are always rendered sufficiently large to compensate for the loss sustained by the affected part. Should it, on the contrary, be more considerable, the effects will of course be more serious. The corresponding portion of the lung, for example, being deprived of air, will gradually fall into a state of atrophy, its surface will become puckered, and its substance rendered abnormally dry and dense, almost like a piece of liver. Dulness, on percussion and diminution of the respiratory murmur, will probably be found, when this lesion shall have undergone more thorough investigation, to be the principal physical signs of its existence.

The bronchiæ are liable to *ossification*, by which many of the more minute, and even some of the larger branches are occasionally converted into hard, solid pencils, perfectly impermeable to the air. Andral gives a singular example of ossification of these tubes. In dissecting the body of an old man, he found the lung full of hard masses, which were composed of an infinite number of bony spicules, arranged in a beautiful arborescent form, with a cavity in each so small as scarcely to admit a hair.* Laennec and some others speak of having met with polypous growths in the bronchiæ; but the occurrence of these bodies in this situation is by no means established.

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SECTION II.

Of the Lungs.

I. THE lungs are two soft, spongy bodies, and occupying the lateral parts of the thoracic cavities, which they fill in such a manner as to leave no space whatever between them and the surrounding structures. Separated from one another by the heart and mediastinum, they are attached below to the diaphragm by means of a fold of the pleura, and are retained in their situation chiefly by the trachea and pulmonary vessels, from the former of which they appear as if they were suspended. In their shape, the lungs are somewhat conical, the apex being above, and the base, which is cut off from before,

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* Pathological Anatomy, vol. ii. p. 308.

backwards, and from above downwards, resting on the diaphragm. Their *volume* always accurately corresponds with that of the thorax and heart. Hence the quantity of air which they are capable of containing must of course vary considerably in different individuals, being greater in those whose pulmonary organs are well developed than in those in whom their growth has been impeded. The average amount, however, has generally been computed at one hundred and forty-five cubic inches, of which one fifth is probably renewed at every inspiration. In a grown-up person, of ordinary stature, the *weight* of the lungs is about three pounds, or, as compared with the rest of the body, as one to forty-five.

If the lungs be artificially inflated, it will be found that they differ a good deal in *size*, — the left being narrower, but longer than the right, owing to the fact that the diaphragm, from the obstruction caused by the liver, does not descend so low in the latter as in the former direction. Each organ is divided into several lobes, by a deep fissure, which runs obliquely downwards and forwards, commencing on a level with the fourth dorsal vertebra, and terminating at the anterior magin of its base : the upper lobe of each is thus rendered conical in its figure, whilst the inferior, which is also the larger, is nearly quadrilateral. The left lung has only two lobes, whereas the right has three,— the third being intermediate, in size as well as in situation, between the other two.

The *outer surface* of each lung is smooth and convex, especially behind : it accurately corresponds with the walls of the thorax, with which it is always in contact, so that no air can intervene between them ; and it is, moreover, perpetually bedewed with a serous exhalation, which enables the organ to move freely and easily upon the surrounding parts. In consequence of disease, however, causing effusion of plastic lymph, adhesions often exist in this situation, which are sometimes so strong and extensive as to impede, in a very serious manner, the free exercise of the pulmonary tissue. The *inner surface*, which is slightly concave, particularly that of the left lung, rests against the pericardium and mediastinum, and receives, a little above its middle, the insertion of the bronchial tubes and the pulmonary vessels, forming, by their aggregate, what is called the *root* of the lungs. The entrance of these structures takes place considerably nearer the posterior than the anterior border of the inner surface, and their position is such that the pulmonary

artery is above, the two veins below, and the bronchiæ behind and between them. This fact is of no little importance, especially in reference to the aerial tubes, and should not be overlooked when engaged in sounding and ausculting the chest.

The *anterior margin* of the lungs is thin and rather sharp, and inclines obliquely downwards and forwards, covering, in great measure, the pericardium, together with the organ which it envelopes : that of the left side is slightly excavated, towards the lower part, for receiving the point of the heart, which is always exposed at this situation, even during the most thorough distention of the air-cells. The *posterior margin* is thick, rounded, and lodged in the groove formed between the dorsal vertebræ and the heads of the ribs, its direction being nearly vertical.

The *base* of the respiratory organs is somewhat concave, and rests on the upper surface of the diaphragm, whilst the *apex* forms a rounded, narrow prominence, which ascends between the scaleni muscles, the trachea, and the last cervical vertebra. When the subject lies on the back, with a block under his shoulders, it will be found, as a general rule, that this portion of the organ ascends as high as an inch above the level of the first rib, and occasionally, indeed, even twice that distance. This is more particularly the case when one lung, in consequence of disease of the other, is obliged to perform as it were a double function. This arrangement, a knowledge of which is of no little importance in reference to the lesions of the pulmonary tissue, has not been sufficiently dwelled upon by anatomists ; in fact, very few seem to be aware even of its existence. How far it influences the production of tubercles, which are so frequently observed in the superior lobes of these organs, is a topic concerning which we are still, in great degree, in the dark.

With respect to their *color*, the lungs vary not only in the different periods of life, but also under different circumstances of health and disease. Hence it is rarely that we find them precisely alike in any two cases. In the fœtus, anterior to respiration, the color of the lungs is of a uniform brownish red. After this process has taken place, they acquire a light florid complexion, which generally continues until about the period of puberty, when it gradually passes into a grayish red, intermixed with small lilac-looking patches. In progress of time, as the individual grows older, the color is converted

into an iron gray, with narrow streaks of a still darker appearance. These streaks here referred to are frequently quite black; and they appear to depend upon the deposition of a peculiar pigment, which, as it is most abundant between the lobules and their connecting cellular tissue, generally imparts to the surface of the lung a singularly variegated aspect, — some of the figures being triangular, some square, some hexagonal, and some lozenge-shaped. The matter in some instances is poured out in small rounded spots, separated by intervals of healthy tissue, and varying in diameter from that of a mustard-seed to that of a five-cent piece. It is seldom observed before the thirty-fifth or fortieth year; and, notwithstanding what Laennec has said to the contrary, can be easily distinguished from melanosis, both by its color, and by the peculiarity of its arrangement. It also imparts its tint much less readily to linen and other articles than the latter of these substances.

It is worthy of remark, that, in general anemia, the lungs usually participate in the exsanguine condition of the system. I have repeatedly examined the lungs of persons who had lost an immense quantity of blood, either by the lancet or otherwise, during their last illness; and, in such cases, I have invariably found them of a pale, blanched appearance; nor did they emit, on being incised, more than a few drops of fluid. The pulmonary organs of the victim of the guillotine have been said, by the French writers, to be unusually white; and the same phenomenon is generally observable in animals that are bled to death, as I have convinced myself from personal observation. It is also deserving of notice, that, no matter what may be the disease of which the individual dies, the posterior part of the lungs is almost always of a much deeper color than the rest, owing to the natural tendency which the blood has to accumulate in the more dependent situations of the body. The engorgement, which gives rise to this difference of complexion, frequently commences during the last struggles of life, and is probably not completed, in the majority of instances, until a few hours after dissolution, or until the blood is partially coagulated. Conjoined with this state there is occasionally an œdematous appearance of the pulmonary tissue, arising from the effusion of frothy serosity. This phenomenon has been confounded with the infiltration of the first stage of pneumonitis, from which, however, it is easily distinguished both by its situation, which is always in

the most dependent portion of the lung, by the want of inflammatory redness, and by the absence of fibrin.

The *consistence* of the lungs, like their color, varies according to the period of life, and according to the kind of death. Generally speaking, they have very little density, and hence they may be very easily compressed, so much so, indeed, that they will only imperfectly resume their original condition. In the fœtus, before respiration has taken place, they are hard and firm, like the substance of the liver; but, after birth, they are soft, flexible, and elastic; air-bubbles may be pressed out of them; and, when cut into, they distinctly crepitate. Their specific gravity is likewise increased; and, on being placed in water, they readily float on its surface. Their texture, however, notwithstanding these properties, possesses such a degree of tenacity as to render it by no means easy to tear it.

The parenchymatous substance of the lungs being essentially composed of the ultimate ramifications of the bronchial tubes and the pulmonary vessels, it will be necessary to describe these parts before we proceed to contemplate its minute structure. Externally, each of these organs is invested by a reflection of the pleura, a delicate serous membrane, whilst its interior is lined by a prolongation of the mucous tunic of the wind-pipe.

Behind the arch of the aorta, opposite the third dorsal vertebra, the trachea divides into two branches, called the *bronchiæ*, which incline laterally towards the inner surface of the lungs, being separated from each other nearly at a right angle. The right tube is larger but shorter than the other: it is directed almost horizontally outwards, and enters the corresponding organ on a level with the fourth dorsal vertebra: the left, which is more oblique, is about an inch longer than the right, and has therefore to descend somewhat lower before it can reach the left lung. On arriving at its place of destination, the right bronchia divides into three, the left into two branches; and these, again, resolve themselves into smaller tubes, so that, by continuing this division through five or six successive stages, numerous canals are formed, which pervade the pulmonary organs, in every possible direction, diminishing regularly in size as they augment in number. An interesting fact with regard to the difference of the natural sound of respiration between the two lungs has been recently pointed out by Dr. Gerhard, of Philadelphia.

He has ascertained that the peculiar blowing noise, observable at the right superior lobe, is owing to the greater caliber of the corresponding bronchial tubes, which is nearly double that of those on the left, where there is no such sound.

The bronchiæ and their primitive divisions are made up of the same textures as the trachea, of which they may be regarded merely as so many prolongations. As their ramifications, however, become more frequent, the cartilaginous rings gradually lose their annular form, and degenerate into small irregular lamellæ, which, succeeding each other less rapidly than formerly, are placed in different parts of the circumference of the canal, so as still to preserve its cylindrical shape. The pieces thus by degrees become more and more scattered and imperfect, until they at length completely disappear. The other structures, however, are continued on to the ultimate ramifications of the bronchiæ; and, though, with the exception of the mucous membrane, they can be no longer discerned, even with the aid of the microscope, there is every reason to conclude, both from analogy and from the natural resiliency of the lungs, that they still exist. The mucous lining in this situation is extremely delicate, smooth, and polished, being reduced to a thin, transparent film. By means of a good glass, longitudinal folds may be seen on its free surface, which is also studded with hundreds of minute follicles. With regard to the tubes themselves, they spread out in different directions, with a caliber scarcely large enough to admit a common bristle.

The lining membrane of the bronchiæ, as it passes from the larger to the smaller ramifications, is supposed by some pathologists to be transformed from the mucous to the serous texture, or at any rate to undergo very important modifications of structure. Such, amongst others, is the opinion of Monsieur Reynaud, of Paris, and of Dr. Stokes, of Dublin. How this notion originated it is difficult to determine, for it is by no means necessary, I conceive, that, because these tubes are occasionally the seat of plastic inflammation, they should be lined with a serous membrane. The mucous textures are not, it is true, very prone to this species of irritation; still the formation of fibrinous concretions is sufficiently common, even in them; and the effusion of lymph in the minute bronchial ramifications should not therefore be a matter of greater surprise than in the larynx, œsophagus, nasal duct, uterus, or bowel. That the lining membrane is

somewhat modified in these situations I do not feel disposed to deny, but that the change is so complete as is contended for by certain writers, seems to me to be unfounded in fact, and unsupported even by analogy.

The *lymphatic vessels* of the lungs are exceedingly abundant ; and here, as elsewhere, they are divided into two sets, the one being superficial, the other deep-seated. In front of the inferior extremity of the trachea, as well as around its primitive divisions, are a considerable number of black, dirty-looking bodies, called, from their situation, the *bronchial glands*. In their size, they vary between a pea and a hickory-nut, and most of them are of a rounded, flattened shape. Their dark color would seem to be derived, according to Vauquelin, from a deposition of pure carbon. They are evidently nothing but lymphatic ganglions, which undergo various changes during the progress of life, and which, in old age, almost always contain some earthy matter, either in a soft or solid state.

The lungs are supplied with blood from two sources, the pulmonary and bronchial arteries. The first is a short, stunted vessel, about two inches in length, which arises from the base of the right ventricle of the heart, and proceeds obliquely upwards towards the left side of the chest, dividing opposite the second dorsal vertebra into two large trunks, one for the right, the other for the left lung, the former being the larger and longer. On reaching the parenchymatous substance, these two trunks separate into innumerable ramifications, which accompany those of the bronchial tubes to their final termination in the air-cells, on the delicate walls of which they become capillary, being spread out upon them in the form of a beautiful net-work. These vessels have nothing to do with the nourishment of the lungs : they are designed simply to convey dark venous blood from the right side of the heart, in order that it may be subjected to the influence of the atmosphere ; and, having derived this benefit, the fluid is sent, by means of appropriate veins, to the left cardiac chambers, from whence it is transmitted to the different parts of the body. Imperfect valves are said to exist in these veins ; but of the truth of this assertion, recently made by professor Meyer, of Bonn, I have not been able to satisfy myself.

The work of nutrition is delegated to another set of arteries, called the *bronchial*. These vessels, which are ex-

tremely small in comparison with the volume and weight of the respiratory organs, are generally two in number, one on each side ; but sometimes there are three, four, or even five. In the majority of cases, they arise from the aorta, either separately or by a common trunk ; but occasionally the right is given off by the first intercostal or internal mammary artery. Soon after their origin, they send some minute twigs to the œsophagus, the pleura, and the pericardium ; and, on reaching the root of the lungs, each divides into four or five branches, which follow the ramifications of the bronchial tubes, and freely anastomose with the pulmonary arteries. The bronchial veins, which return the residual blood, unite into several small trunks, which pass out at the root of the organ, and open into the azygos and pulmonary veins : occasionally, some of them terminate in the superior cava, or in the œsophageal, or first intercostal veins, or even, as has been observed by Winslow, Haller, and Hildebrandt, in the left auricle of the heart.

The lungs are furnished with *nerves* from the pulmonary plexus, which are made up chiefly by the par vagum, assisted by a few branches from the great sympathetic. Some of these nerves penetrate the parenchymatous substance in company with the divisions of the bronchiæ, whilst the others form an inextricable interlacement on their outer surface. It was formerly supposed that the branches of the sympathetic were appropriated exclusively to the bronchial tubes, and those of the par vagum to the pulmonary vessels ; but the recent researches of Reisseissen, and other anatomists, clearly show that this opinion is erroneous.

The sources whence the lungs derive their nervous supply are worthy of being borne in mind, as they enable us to explain many of their sympathetic derangements. Indeed, there are no organs in the body which are so prone to suffer in this way as the pulmonary. In cerebral affections, especially such as are characterized by symptoms of compression, the lungs are almost always greatly oppressed; performing their functions in a tardy and imperfect manner ; and every body knows how much they are involved in diseases of the stomach, liver, and bowels. In chronic gastritis they often become the seat of the most distressing cough ; and the sympathetic irritation thus induced is frequently carried so far as to give rise to the developement of tubercular phthisis. The mere mention, however, of these connections must

suffice. The subject is one of deep interest to the practitioner ;
and, for a more ample account of it than our limits will enable
us to furnish, we beg leave to refer the reader to the writings
of Dr. Philip* and Dr. Todd,† of England, in which he will
find much valuable and instructive information.

The different structures here described, as entering into
the composition of the pulmonary viscera, are united together
by cellular tissue, and so disposed as to form a series of small
lobules, of an irregularly angular figure, which, when care-
fully inspected, are found to consist of clusters of minute
cells, scarcely the hundredth part of an inch in diameter.
These cavities are of a spherical shape, and may be con-
sidered as the ultimate terminations of the bronchial tubes,
to which they are appended like bunches of little buds.
Their parietes, which are of great tenuity, and which Haller
has estimated as being about the thousandth part of an inch
thick, are probably formed exclusively by the mucous mem-
brane of the bronchiæ, and naturally lie in close contact with
each other. Over their outer surface are scattered, in im-
mense profusion, the delicate capillaries of the pulmonary
vessels, and here, during life, the blood is constantly sub-
jected to the influence of the atmosphere, so as to be con-
verted from venous into arterial, which appears to be the
grand object of the respiratory function. Internally, the air-
cells are bedewed with a thin, mucous exhalation, the quan-
tity of which, in the twenty-four hours, including that of the
trachea and mouth, has been variously estimated from six to
twenty ounces.

It would appear, from the recent researches of Professor
Horner, ‡ that the air-cells of the individual lobules, contrary
to the general opinion of anatomists, freely communicate with
each other laterally, precisely like the cavities of the bones,
or those of a sponge. The vesicles of different lobules, how-
ever, have no such connection, the intercourse between them
being established solely through the ramifications of the bron-
chial tubes. This arrangement is easily shown by distending
the air-cells with tallow, which, after the lungs have been
dried, is to be removed with spirits of turpentine. By this
process, their natural size is preserved, and they are seen to
communicate freely with each other. The aggregate of the

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* On Indigestion, 1821.
† Cyclopædia of Practical Medicine, article *Indigestion*.
‡ Special Anatomy, vol. ii. p. 143. Fourth edition.

internal surface of the pulmonary vesicles is immense. Dr.
Monro * supposes that it is nearly thirty times greater than that
of the whole external area of the body ; and this evaluation is
probably not far from the truth, especially if there are, as he
conjectures, upwards of half a million of these little cavities
in every cubic inch of parenchymatous substance.

The parenchymatous structure, then, is composed of a
great variety of tissues, which are cemented together by
cellular substance. This substance is remarkable for its great
softness and delicacy. It is perfectly destitute of fat, but
often contains, as was previously intimated, a considerable
quantity of black pigment, which is generally most conspicu-
ous on the surface of the lungs, and which appears to be
simultaneously deposited with that of the bronchial glands.
It was formerly supposed that the interstices of this tissue
communicated with the air-cells ; but more careful observa-
tion has demonstrated that this is not the case.   Externally,
the lungs are enveloped by a reflection of the pleura, which
is united to them by the same kind of cellular substance as
that which pervades the interior of these organs, — a circum-
stance which accounts for the fact that inflammation of one
of these structures seldom exists long without involving the
other.

It only remains that we should make a few remarks on the
natural sounds of respiration, with reference to auscultation,
which closely connects itself with the present topic.

The entrance of the air into the respiratory passages pro-
duces a peculiar sound, which varies in its characters in the
larynx, the trachea, the bronchiæ, and the pulmonary vesicles.
In the latter, the sound is somewhat soft and silky, and con-
stitutes what is called the *respiratory* or *vesicular murmur.*
In the other situations, the sound is more dry, and destitute
of that crepitating nature which accompanies the expansion
of the air-cells.   This is the *bronchial* respiration of Laennec
and other writers.

Although the respiratory murmur may be recognized at all
points of the chest, yet there are some situations in which it
is much more distinct than at others.   Thus it is particularly
loud in the arm-pits, in the space comprised between the
collar-bone and the trapezius muscle, below the mammary
gland, and at the inferior two thirds of the back part of the

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* Elements of Anatomy, vol. ii. p. 93. Second edition. Edinburgh, 1831.

chest,— regions where the thoracic parietes are naturally very thin, and the lungs therefore comparatively superficial. Age also exerts a considerable influence upon the energy of the breathing murmur. It is always remarkably strong in children, so much so as to have received the name of *puerile respiration*, — a character which it sometimes retains nearly throughout the whole of life. Towards puberty, the sound in question gradually diminishes in intensity ; and, in old age, it is often comparatively feeble. It is likewise more faint in the corpulent than in the emaciated, and in men than in women ; though, as respects the latter, the difference is usually very slight.

The cause of the vesicular murmur is probably the rustling of the air against the sides of the pulmonary vesicles, as it passes in to fill the vacuum created by the elevation of the ribs and the descent of the diaphragm. In expiration, the fluid is expelled in a very gentle, uniform manner, without harshly impinging upon the delicate reservoirs which embrace it ; and hence the sound is always very different from that of inspiration, being short, feeble, and of a blowing character.

The *bronchial respiration* is entirely free from the crepitation which distinguishes the breathing murmur, and gives the idea of air passing along capacious tubes. In the normal state, it is only heard at the anterior and lateral parts of the neck, except in very thin persons, in whom it may also be perceived towards the top of the sternum, and in the interscapular interval. In the minute bronchial tubes, it is confounded with the respiratory murmur, to such a degree as to render it impossible to discriminate between them.

The number of respirations varies in different individuals, and also in the same person at different periods of life. An adult breathes about eighteen times in a minute ; an infant, about thirty-six times. At puberty, the number of respirations is about twenty. In decrepitude the function is performed in a more hurried manner, as well as with less regularity, — the intervals between the respirations being at one moment short, and at another long. In general, women breathe a little more frequently than men, and individuals of an irritable temperament, than those who are naturally tranquil or not easily excited. Healthy respiration is effected with ease and freedom, in which there is nearly an equal elevation of the ribs and depression of the diaphragm : each side of the thorax is expanded to the same extent ; and there

is no sensible difference observable in regard to the intervals
of time occupied by the inhalation and expulsion of the air.

II. The pathological phenomena which are displayed in
the lungs, may be arranged under the following heads : 1.
acute inflammation ; 2. abscess ; 3. gangrene ; 4. chronic
inflammation ; 5. œdema ; 6. emphysema; 7. apoplexy ; 8.
encephaloïd ; 9. melanosis ; 10. serous cysts ; 11. hydatids ;
12. calcareous concretions ; 13. hypertrophy ; 14. atrophy ;
15. tubercular phthisis.

Inflammation of the pulmonic tissue, now usually denomi-
nated *pneumonitis*, (from πνεύμων, the lung,) is a very com-
mon and fatal disease in cold climates, prevailing not unfre-
quently epidemically. Commencing with all the symptoms
of an ordinary catarrhal affection, it is soon followed by more
or less pain in the chest, difficult respiration, and convulsive
cough, with expectoration of a thick, ropy mucus, always
streaked, in bad cases, with blood. If the patient succumb,
as often happens in spite of the best directed efforts of the
physician, the anatomical characters will be found to vary
according to the extent of the inflammation, its severity, and
the length of time it may have existed. In this respect, the
disease may be considered as being divisible into three stages,
each of which had some features peculiar to itself. In the
first stage, the pulmonic tissue is marked by excessive en-
gorgement of blood ; in the second, it is dense, and hepa-
tized ; and, in the third, it is infiltrated with purulent matter.
Each of these pathological states will require brief consid-
eration.

In the first stage of the disease, the inflammation appears
to be wholly confined to the parenchymatous texture, the
only change observable in the bronchial tubes being the pre-
ternatural vascularity of their lining membrane. The lung
is externally of a dark, livid color, pits on pressure, and has
an unusually heavy and solid feel. With these changes, the
natural crepitus and elasticity are impaired ; and hence, on
opening the chest, the organ seldom completely collapses.
The internal structure exhibits various shades of color, from
crimson red to livid black, occurring either continuously, in
large patches, or in small circumscribed spots, according to
the extent of the disease. When cut, blood freely issues
from the incision, mixed with white frothy matter ; the inter-
vesicular cellular tissue is infiltrated with a large quantity of
serosity ; and all the vessels, both arteries and veins, are in

a state of the utmost engorgement. The lung, in this condition, still floats in water, owing to the fact that it still contains air, and, by careful washing, may be made to resume its spongy, vesicular structure, together with most of its normal characters. In very violent cases, such, for example, as run a very rapid course, we sometimes meet with small sanguineous effusions, traceable to ruptured vessels; and, another effect, which is occasionally wrought in this stage of the disease, is a peculiar softening of the pulmonic tissue, first described by Andral, who regarded it as the result of cadaveric congestion; but which the subsequent observations of Chomel, and other pathologists, have clearly shown to be dependent upon inflammatory irritation. The duration of this stage is usually from one to five days.

In the second stage, the lung is hard and solid, being converted into a heavy, inelastic substance similar to that of the liver. The crepitus, so distinct in the sound state, is no longer perceptible; the organ does not collapse, or only slightly, on opening the chest; and if the affected part be torn across, it will exhibit a large number of granulations, which we have reason to suppose are nothing but the natural air-cells filled with bloody inspissated lymph. These little bodies are of a spherical shape, closely grouped together, and so solid that, with proper patience, they may be lifted out of their position. The parenchymatous texture, in this state, is usually of a deep fleshy red, interspersed with various shades of grayish, pink, brown, or even black: it is much more friable than in the preceding stage, breaking readily down under the finger; and is so dry that blood no longer follows the knife that is employed to divide it. By scraping the incised surface, however, or pressing the part between the fingers, a small quantity of sanguinolent fluid may be obtained, mixed either with thin froth, or, as more frequently happens, with purulent matter. There may also be observed along the incision a considerable number of whitish-looking points and striæ, which correspond with unaltered portions of blood-vessels and bronchial tubes. It is asserted by many that the pulmonic tissue, when thus hepatized, is specifically heavier than water; but, although I have frequently tried the experiment, I have never witnessed the circumstance, and feel inclined, therefore, to regard it rather as an exception than as a general event. This stage seldom continues beyond three or four days, when it passes into purulent infiltration.

We have just seen that the color of a hepatized lung is liable to considerable variation. This is owing altogether to the nature of the effused fluids on which the solidification depends. When the product consists simply of plastic lymph, the hepatized part is generally of a grayish white ; but, when this substance is blended with hematosine, as it commonly is when the inflammatory irritation runs high, the color is always more or less red.

In the third stage, the lung, although it exhibits the same or even a greater degree of hardness, and the same granular structure, as in the second, assumes a pale yellowish cast, variegated with hepatized patches of red, gray, or even bluish. Pus always exists in this state, appearing at first in small isolated points, but which in a short time coalesce, and thus impart to the pulmonic tissue a uniform citron color. If an incision be made into the lung, it will be followed by the escape of an opaque, ropy fluid, evidently of a purulent nature, but almost void of smell, or at least much less offensive than the matter of an external wound. As might be expected, from what has been just stated, the parenchymatous structure is extremely moist, soft, and lacerable, the slightest pressure of the finger converting it into a yellowish, pulpy mass. The smaller bronchial tubes, in the third stage of pneumonitis, are completely obstructed ; the larger ones, on the contrary, contain more or less purulent matter, and their mucous lining is thickened, injected and of a brownish red color.

The anatomical characters of the three stages here described frequently occur in the same lung, dividing it into so many zones, which gradually and insensibly run into each other. Much diversity prevails in regard to the extent of the disease. In a few instances, I have seen it occupy almost the whole lung ; most generally, however, it affects only a single lobe, or small detached masses. We never find the whole of both these organs hepatized at the same time, for the obvious reason that an obstruction of this kind would be incompatible with the respiratory function. The right lung, according to Laennec, is more frequently involved than the left, not only in pneumonitis, but in nearly all the morbid affections to which these delicate structures are liable. This view is strikingly confirmed by the interesting investigations of Dr. Lombard, of Geneva. Uniting all the cases collected by Chomel, Andral, and himself, he ascertained that, in nine hundred and sixty-eight patients, one hundred and ninety-

five had the disease in both lungs, — two hundred and sixty
in the left, and four hundred and thirteen, in the right.*
Various explanations have been proposed of this fact ; the
most plausible hypothesis, perhaps, is that of Lombard, who
supposes that the difference in the size of the pulmonary ar-
teries will account for the circumstance. But it may well be
doubted, I think, whether the right lung receives more blood,
in proportion to its volume, than the left : the question, at all
events, remains undetermined ; and, until something positive
be known, it will be well enough to refrain from conjectures,
as very little good is ever to be expected from them.

The different lesions of pneumonitis are accompanied by
appropriate symptoms, which indicate their presence, progress,
and mode of termination. In the first stage, when the pul-
monic tissue is infiltrated with bloody serum, all the vessels
are in a state of engorgement. The characteristic manifesta-
tions are, hurried respiration, dyspnœa, obtuse pain in the
chest, distressing cough, and inflammatory fever. The lung
being still permeated by the atmosphere, the chest, on per-
cussion, yields pretty much the same sound as in health ;
though, if the disease occupy a large extent of surface, it will
often want its natural clearness. If the ear be applied, a pe-
culiar sound, accompanying the usual respiratory murmur,
will be heard : it is a fine, crackling noise, resembling that
which results from rubbing a lock of hair between the fingers,
and is regarded, by most pathologists, as pathognomonic of
the first stage of this disease. This sound, it may now be
observed, is called the *crepitating rhoncus.* It is always more
distinct in proportion to the extent of the engorgement, and
is most easily recognized at the lower part of the chest, be-
neath the axilla, and in the interval between the scapula and
spinal column. The expectoration, in this stage, is white,
frothy, and small in quantity, — at first thin and transpa-
rent, afterwards remarkably viscid, and often streaked with
blood.

In the second stage, in which the pulmonic tissue is hep-
atized, and consequently impervious to the air, the chest
over the inflamed lung is dull, on percussion ; and, instead of
the crepitating rhoncus, there is a singular whiffling sound, not
unlike that which is produced by blowing through a narrow
quill. This is the *bronchial respiration* of Laennec and An-

dral, and is always more audible in proportion to the solidifi-
cation of the parenchymatous structure. It seems to be
caused by the air striking forcibly against the mucus in the
larger bronchial tubes, and hence it is usually most perfect at
the root of the lungs, where it is occasionally so loud as al-
most to amount to a whistle. The earliest indications of its
presence are to be detected a little above the centre of the
dorsal region, between the spine and scapula. Laennec, not
knowing that this sound uniformly exists in this stage of
pneumonitis, was disposed to undervalue it, as a diagnostic
sign ; but, at present, it is universally regarded by practition-
ers as the most important character which, in this respect,
we possess.

As usually coëxisting with this altered state of the respira-
tory function, it will be necessary here briefly to advert to
that peculiar resonance of the voice which writers have dis-
tinguished by the term *bronchophony*, (from βρόγχος, the bron-
chia, and φωνή, the voice.) It does not occur in distinct words,
but in notes of various continuance, resounding, at the end of
the stethoscope, as if they came through little tubes. Always
loudest towards the root of the lungs, it is sometimes char-
acterized by a curious, vibrating tone, from the complication
of pleuritic effusion, which so often occurs in combination
with this disease. Like bronchial respiration, it is more dis-
tinct in pneumonitis than in any other affection, and hence is
occasionally of much value in determining the diagnosis.

The expectoration, in this stage, is still scanty, often not
exceeding a few ounces in the twenty-four hours. The
cough is hard, and the sputa, which are slightly yellowish,
and semi-transparent, are remarkably tenacious, streaked with
red, and blended with small air-bubbles. After a while, the
red streaks disappear, and the whole mass acquires a peculiar
rusty color, which, as it occurs in no other disease, may be
considered as absolutely pathognomonic of acute pneumonitis.
This tint arises from the intimate manner in which the blood
is incorporated with the ropy mucus of the bronchial tubes.

In the third stage, the bronchial respiration ceases, being
replaced by a coarse *mucous rhoncus*, which is always loudest
at the root of the lungs, in the axillary region, and below the
great pectoral muscle. The chest offers the same flatness, on
percussion, as in the second stage, and there is also the same
want of respiratory murmur. The expectoration is more easy
and abundant, and the sputa, which are commonly of a

yellowish hue, are of a muco-purulent character: they are not so tenacious as before, and frequently sink in water. In some instances, they are thin, homogeneous, and brownish, like the juice of prunes: this, however, is an occurrence of great rarity, and always portends danger.

Considerable variety obtains in relation to the *pain* which the patient experiences in this disease. In pure, uncomplicated pneumonitis, it is generally of a dull, aching character, and sometimes it is even entirely absent. In a man, aged forty, whom I attended, about eighteen months ago, with my friend Dr. Woodward, there was not the slightest manifestation of pain throughout the whole course of the disease, a period of upwards of three weeks; and yet, upon examination, both lungs were found greatly disorganized, being almost universally engorged, with several of the lobes in a state of purulent infiltration. For the most part, however, the disease occurs in connection with pleuritis; and then the pain is often very distressing, sharp, and lancinating, shooting from the affected structure towards the shoulder, the axilla, and corresponding arm.

The *respiration*, in pneumonitis, is performed chiefly by the diaphragm, and is therefore short, hurried, and painful: the frequency, on an average, is about twenty-five; but, in very severe cases, it often ranges as high as thirty-five, forty-five, or even fifty in a minute. The cough is at first dry and convulsive; in the latter stages of the disease, it becomes moist and less harassing, though it is still somewhat painful, especially in children. The patient lies almost always on his back, seldom or never on the affected side. The prostration of strength, in this disease, is usually great and rapid.

Pneumonitis occurs at all periods of life, from the cradle to the grave. Occasionally, indeed, it exists as an intra-uterine disease.* It is incomparably more frequent, however, in infancy and in old age than in the prime of life or vigor of manhood. In the winter of 1836—7, when this disease betrayed somewhat of an epidemic tendency in Cincinnati, the greatest number of persons affected, by far, were children under three years of age. In London, Paris, and other European cities, during the same season, it appears to have been remarkably destructive to old people.

The disease ordinarily begins in the inferior parts of the

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* Cogny, Dissertation sur la Pneumonie, &c. des Nouveau-nés. Paris, 1827.

lung, from whence it radiates in different directions, until it involves a greater or less extent of tissue. This statement accords with that of Laennec, and many of the best authorities of the present day; but it is opposed to the results of the observations of Broussais, Chomel, and several other highly respectable pathologists. In fifty-nine cases, Chomel found the upper lobes affected in thirteen; the inferior, in eleven; the whole of one lung, in thirty-one; the posterior parts, in two; and the middle, in one.* The universality of this occurrence, on the whole, is perhaps not so great as was imagined by Laennec: still, I feel perfectly satisfied, both from my own, and the observations of others, that his statement is applicable to the great majority of cases of this complaint, whether occurring in old age, in infancy, or in youth.

Pneumonitis frequently terminates by *resolution*, especially when it does not transcend the second stage. When this event is about to take place, the preternatural vascularity gradually disappears, the effused fluids are absorbed, and the air-cells regain their primordial volume and figure. Sometimes the pulmonic texture continues for a while to be œdematous, being characterized by slight dulness on percussion, and indistinctness of the respiratory murmur. The progress of a portion of hepatized lung is more tardy, a considerable period generally elapsing before the granulations give way to the developement of the air-filled vesicles. The first perceptible change is a diminution of color, accompanied by an absorption of the lymph which gave rise to the solidification. As the process advances, the pulmonic tissue becomes gradually more yielding and elastic, it loses its dryness, fragility, and is infiltrated with a thin serous fluid, — characters which closely assimilate it to the normal texture. In the third stage, resolution is a rare occurrence; but, should this take place, the yellow color may be supposed to become lighter, and the pus more liquid from the admixture of serum. Air-vesicles afterwards appear, and continue to increase, while the purulent fluid is reduced to small points, which progressively diminish in number as the vesicular structure returns. All these changes, as might be supposed, are accompanied by corresponding changes in the physical signs of this disease.

The formation of *abscesses*, as an effect of pneumonitis, is extremely rare. Laennec states that, in several hundred

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* Laennec on the Chest, p. 204, note, by Dr. Forbes.

examinations of persons who died of this disease, he never met with more than five or six cases in which the pus was concentrated into a focus. Precisely of the same import is the testimony of the latest pathological anatomists of Europe and this country. Broussais declares that he has met with this termination only once; Andral and Louis also consider it as very infrequent; and Dr. Horner, who states that he has dissected more than fifteen hundred bodies, has observed it in only two instances.* In my own examinations, I have not been more fortunate, having hitherto seen pulmonic abscesses only in two persons, the one an adult, aged forty, the other a child of fifteen months. In this case, the abscesses, which occupied the inferior lobe of the right lung, were about twenty in number, the largest of which scarcely equalled a cherry-stone. No tubercles were found : the child had been sick about four weeks.

Formerly the termination of pneumonitis by abscess was considered as very frequent, — an error which no doubt arose from mistaking tubercular excavations, which are of such common occurrence in consumptive subjects, for collections of this kind. Of this, any one may convince himself by a careful perusal of the works of Bonetus, Morgagni, and other pathologists of the seventeenth and eighteenth centuries. Even Dr. Baillie, so justly distinguished for the accuracy with which he generally conducted his researches, did not escape this error.† The reason of the infrequency of this mode of termination of pneumonitis will be explained by and by.

The walls of these abscesses are formed by the pulmonic tissue, which is usually infiltrated with pus, and in a state of putrilaginous softening. In one of the cases to which I before referred, the matter was bounded by a dark, flesh-colored substance, very considerably indurated. Occasionally, the abscesses are encysted, being enclosed by a thick, false membrane : cases of this kind, however, are very rare, and I have never met with them. Their size varies infinitely : in a few instances, they have been found as large as an adult fist ; but, in general, they do not exceed a nutmeg, hickory-nut, or small apple. Frequently they communicate with the bronchial tubes, through which the matter is at length discharged, when the cavity heals, and the individual recovers, the mode

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* Pathological Anatomy, p. 241. † Morbid Anatomy, p. 42.

of cicatrization being in every respect analogous to that which takes place in the spontaneous cure of a tubercular excavation, hereafter to be described. In old cases, the pus is usually of a thick, creamy nature ; in recent ones, on the contrary, it is apt to be semi-concrete, from the admixture of an undue proportion of lymph. It may be remarked here, that purulent depositions are commonly seated near the surface of the lung, seldom deep in their structure.

Abscesses of the lungs can occur only in association with, or as a consequence of, inflammation, whose limits are properly circumscribed ; in other words, the disease must be confined to particular parts, lobes, or lobules. The rationale of this is obvious. In universal pneumonitis, death must necessarily ensue before the matter can break up the cellular tissue and collect itself into a focus ; which need not be the case when the inflammation is limited, — nature, properly assisted by art, being often capable here of warding off this occurrence until after the establishment of the suppurative process. Abscesses sometimes form in the substance of the lungs, as in that of the liver, in consequence of severe wounds and great surgical operations. Their origin here, whatever it may be, is probably the same as in the latter organ. I cannot think, with Andral, that the pus is formed in the remote veins, and filtered into the pulmonic tissue in its passage through the lesser circulation. Such an event may occur, occasionally; but to suppose that it happens generally, or even frequently, seems to me to be repugnant to the laws of sound pathology.

Of the constitutional symptoms of pulmonic abscess, nothing need be said in this place. As to the physical indications, they do not differ from those which appertain to the third stage of pneumonitis, until the purulent matter has been partly expectorated. In that case, the bronchophony is replaced by a peculiar *gurgling rhoncus*, which becomes more and more-hollow in proportion to the evacuation of the liquid contents of the abscess, the voice, — if the stethoscope be applied over the cavity, seeming to issue directly from the chest of the patient. This is the *pectoriloquous* respiration of Laennec and other writers. When the cavity is very large, a *metallic tinkling* is sometimes heard, resulting from a mixture of air, pus, and mucus, in the same way as this phenomenon is developed in tubercular excavations.

The lungs are liable to become *gangrenous*, sometimes as

an effect of acute pneumonitis, but more generally without
any assignable cause. The disease may occur in circum-
scribed spots, or it may invade an entire lobe, or even the
whole of one of these organs. It may be readily detected
by its intensely fetid odor, and by its greenish brown, dirty
olive, dark brown, or black color. The pulmonic tissue is
softened, and converted into an offensive putrilaginous mass,
not unlike decomposed blood. When cut, the part affected
often gives vent to a turbid, sanious fluid, of a greenish tint,
and an almost insupportable smell : in rare cases, the sphace-
lated mass is dry and friable, like a rotten pear. When the
gangrene is circumscribed, an imperfect factitious membrane
may sometimes be discovered ; but, in most instances, where
there is a distinct line of demarcation, the living part is
preternaturally injected and infiltrated with sanguinolent
liquid, with cellular shreds and vascular filaments hanging
from its borders. By degrees, the putrid pulp finds its way
into the adjoining bronchial tubes, and is finally ejected by
expectoration. The cavity which is thus left, is either filled
up with lymph, or, as more commonly happens, its walls are
lined by a false membrane, which continues to secrete, for a
time, a thin, imperfect pus.

Laennec, who considers this disease as altogether of an
idiopathic nature, like hospital gangrene, seems disposed to
look upon it rather as exciting than following pulmonic
inflammation. This opinion is partly correct, partly erro-
neous; for it is now well ascertained that sphacelus is
generally a result of inflammatory irritation, more or less
intense in its character, though not always offering the usual
evidence.

Gangrene of the lungs seems to be of much more frequent
occurrence than was formerly supposed by pathologists. Dr.
Gerhard informs us that, in a single winter, he saw six cases
of it in the Philadelphia Almshouse ; and, in the same year,
the disease, it would appear, was extremely common in
Paris.* It is most prevalent in cold weather, and occasion-
ally betrays an epidemic tendency. It makes its attacks at
all periods of life ; but the aged, and especially such as are of
intemperate habits, are most prone to it. A singular fact
respecting gangrene of the lungs has been recently witnessed
by Dr. Guislain, a French physician. Out of thirteen insane

* On the Diagnosis of the Diseases of the Chest, p. 99.

patients who died of inanition in the hospital at Gand, nine
were affected with this disease. In one case, both lungs
were involved ; and in nearly all of them the sphacelation
was confined to the posterior and upper part of these organs.*
How is this occurrence to be explained? The present state
of our knowledge does not enable us to give a satisfactory
answer.

The only two specimens of gangrenous lung that I have
ever seen are preserved in our college museum. Of these, one
belongs to the circumscribed variety, and was taken from a
mechanic, forty years old, who died in this city in September, 1835, having had, six weeks before, an attack of confluent small-pox. During the latter part of his illness, he
was attended by Dr. Wood, who describes his symptoms as
having consisted in severe thoracic pains, distressing cough,
recurring in irregular paroxysms, and expectoration of large
quantities of dark-colored, bloody mucus. He expired in
about a week after. On inspection, I found the left lung, at
the part corresponding with the interlobular fissure, reduced,
for about one inch in diameter, to a dark, pulpy, gangrenous
mass, so excessively offensive, that it was almost impossible
to remain in the apartment where we were conducting the
examination. The eschar, which reached as far as the surface of the lung, communicated with a large bronchial tube,
and had been discharged in part by expectoration. The
pleura immediately over it was in a state of sphacelation,
and the matter was evidently prevented from escaping into
the chest by the adhesions which the lung had formed with
the wall of that cavity. The pulmonic tissue round the
gangrene was rather soft and injected, and the whole surface of the organ was covered with a false membrane, thick,
dense, and highly vascular.

In the other specimen which belongs to the diffuse variety,
the gangrene involved nearly the whole of the right lung,
which was of a dark, dirty olive color, extremely soft and
friable, and exhaled a most intolerable odor. The pulmonary
pleura was perforated in several places, and a considerable
quantity of black, offensive matter was found in the corresponding cavity of the chest. The disease, in this case,
supervened upon an attack of typhoïd fever, and was marked
by a brownish, fetid expectoration, which set in a few days

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* Gazette Médicale de Paris, January, 1836.

before death.   The patient was a young printer, about
twenty-three years of age.

The progress of this disease, if at all extensive, is gener-
ally most rapid ; the respiration is much embarrassed ; the
cough excessively distressing ; and the patient often expires
in a state of asphyxia.   The expectoration, which is of a
dirty black, green or brown color, is so horribly offensive,
that it may be considered as pathognomonic of the disease.
In case the slough is detached, the same signs of a cavity
may be produced, as in abscess of the lungs, already de-
scribed.

Chronic pneumonitis may be a sequel of the acute disease ;
but, in the great majority of cases, it seems to have a primary
and independent existence.   Some there are who still doubt
whether there is such an affection as chronic inflammation of
the lungs ; and it must be confessed that, at first sight, the
skepticism is not without some degree of plausibility.   The
older writers are entirely silent on the subject, nor do we
find any satisfactory information concerning it until the time
of the celebrated Laennec, who investigated it with his ac-
customed patience and accuracy.   He considers the disease
as extremely infrequent,*—an opinion in which he has since
been joined by many of the most distinguished pathologists
of the French school.   Chomel asserts that, although he
has annually, for the last sixteen years, examined about two
hundred bodies, he has seen only two well-marked examples
of it.†   Andral and Louis also consider it as very rare ; and
of the same nature, precisely, is the testimony of some of the
most experienced British pathologists.   What the sentiment
is on this point of American physicians, I am not informed,
as I have no means of ascertaining it ; and as for myself,
although I have in a few instances witnessed the disease, or
rather its structural effects, my observations are too limited
to enable me to draw any general deductions.

A chronically inflamed lung is hard, dense, and dry, yield-
ing little or no moisture on pressure ; it tears with a granu-
lated surface, pits under the finger, and cuts a good deal like
a sponge.   Here and there a reticulated structure, caused by
some remains of the air-cells, is visible ; and scattered through

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* "I am acquainted," says Laennec, "with only a small number of cases
which can be considered as examples of chronic peripneumony ; and they are
extremely rare."   (Treatise on the Chest, p. 238.)
† Dict. de Med. t. xvii. p. 252.

various parts of it, numerous tubercles may sometimes be observed, of a pale grayish hue, semi-concrete, and easily removable. The color of the indurated organ, being altogether of an accidental character, varies in different cases. Thus, it may be red, grayish, pale yellow, iron gray, brownish, or even black, or these tints may be blended, and so the part have a mottled aspect. In the College Museum is a specimen, for which I am indebted to my friend Dr. Woodward, of this city, which is of the color of flesh ; and another which is of a light grayish, beautifully dappled with black pulmonary matter. These, together with a specimen taken from a young horse that died of pneumonitis, complicated with chronic pleuritis, are the only instances, so far as I now recollect, which I have seen of this affection. In neither of them were there any tubercles. The pulmonary tissue in all was remarkably dry, hard, tough, smooth, and shining when incised, rough and granular when torn. The bronchial tubes seemed to have been entirely closed : many of the larger vessels were filled with red, clotted, friable blood, and the smaller ones were either obliterated, or so incorporated with the indurated mass as to have lost completely their original features.

A lung in this condition is much diminished in volume, sometimes almost one half, and occasionally sinks in water, though this I consider as rare. All my specimens, notwithstanding the induration in two of them, was very great, and involved the whole organ, having been specifically lighter than this fluid. Cases occur in which the disease is limited to a few lobules ; but, in most of them, it affects one or more lobes, and sometimes, as we have just mentioned, even the entire lung. This kind of induration is occasionally seen around pulmonary abscesses, and very commonly around tubercular excavations.

This disease may pass into purulent infiltration, abscess, and even gangrene. When fully formed, it is doubtful, I think, whether it is susceptible of resolution, the various textures being so firmly cemented together by lymph as to render it impossible for the absorbents to effect their restoration. When idiopathic, the progress of the affection is gradual, exciting little attention until a large portion of the pulmonary tissue has become impermeable to the air. Often there is very little pain, cough, or dyspnœa. The chest sounds dull

on percussion, and there is always a mucous rhoncus, with occasional bronchial respiration.

The lungs are occasionally the seat of *œdema*, — a disease which, as its name imports, consists in an effusion of serum into their cellular texture. The anatomical characters vary according as the lesion affects either the whole or only a part of the respiratory organs. When the entire lung is involved, it does not collapse on opening the chest : it is denser and heavier than in the normal state ; pits on pressure ; and, when cut, exudes a large quantity of clear, yellowish serosity. This fluid is intimately blended with the interstitial cellular tissue of the organ, into which it is originally deposited, and can be easily discriminated from that which is diffused during the first stage of pneumonitis, by its being less frothy, and of a lighter complexion. The lung, when thus affected, still crepitates on pressure.

This disease, although of very common occurrence, does not seem to have received much attention from the profession until the time of Laennec, to whom thoracic pathology is under so many obligations. Rarely is it idiopathic : on the contrary, it is usually associated with other dropsical disorders, occurring, for the most part, in worn-out cachetic individuals towards the close of painful and protracted fevers. Sometimes it accompanies organic affections of the heart. Chronic bronchitis likewise predisposes to it ; and it is the cause of the embarrassment of breathing which so often exists as a sequel of measles, small-pox, and scarlet fever. The œdema seldom lasts beyond a few days ; occasionally, however, it continues for several weeks or even months, when the fluid is either absorbed, or the case proceeds to a fatal termination.

There are no physical signs which can be considered as positively indicating the presence of this state of the lungs. The sound, on percussion, is nearly as clear as in health ; but the respiratory murmur is, in most cases, very much diminished. A crepitating rhoncus, most distinct at the base of the lungs, is usually perceived, resembling a good deal the sound of effervescing champagne. The respiration is impeded ; there is slight cough ; and the expectoration is thin and scanty.

Of *emphysema* there are two thirds — the vesicular and the interlobular — the one consisting in a dilatation of the pulmonic cells, the other in the extravasation of air into the

interstitial cellular tissue. These two forms seldom coëxist; and the latter, compared with the former, is usually regarded, though erroneously, as a most rare disease.

In the *vesicular* emphysema, the air-cells are preternaturally dilated, and distorted in shape. Their size varies in different cases. In the great majority of subjects, they equal in magnitude the head of a common pin; in others, they are as large as a currant; in others, again, as big as a cherry-stone, or even a French bean. When the cells are of the latter dimensions, which, however, is a very rare occurrence, it is not improbable that several of them are thrown into one, by the rupture of the intervening texture: in some instances, notwithstanding, the enlargement evidently results from a single vesicle; the walls of which, instead of yielding to the distending cause, are expanded into thin, transparent bags. Occasionally, all the cells disappear from one entire lobule, leaving merely some vascular and cellular shreds. In this manner, a capacious cavern is sometimes produced, which projects beyond the surface of the lung, in the form of one or more globules.

The lung, in this variety of the disease, seems to be augmented in volume, and to have lost its natural resiliency. It is considerably paler than the sound organ, less crepitous, more dry and elastic, and does not collapse on opening the chest. Its specific gravity, also, is increased; the surface is often studded with small vesicles; and many of the minute bronchial tubes are in a state of dilatation.

Vesicular emphysema may exist in both lungs at the same time; but whether this be the case, or whether it be confined to one of these organs, it seldom involves a very large amount of tissue, inasmuch as this event would be incompatible with the due performance of the respiratory process. It is a very common attendant on tubercles, aneurismal tumors of the heart and aorta, enlargements of the bronchial glands, and asthmatic disorders. Amongst the occasional causes may be enumerated whatever has a tendency to overdistend the air-cells of the lungs, as playing upon wind-instruments, singing, and loud screaming.

The principal signs of the disease are, habitual dyspnœa; shortness of breathing; slight cough, either dry, or attended with a thin, frothy expectoration, mixed with more or less mucus; absence of the ordinary respiratory murmur; and a loud drum-like sound on percussion. When the emphy-

sema is very extensive, the lung may be so much augmented in bulk as to encroach very sensibly upon the heart and mediastinum, — forcing down the diaphragm, elevating the intercostal spaces, and giving the chest a vaulted appearance contrasting singularly with its naturally compressed shape. So remarkable is this conformation, under certain circumstances, that, according to Laennec, we may often with certainty announce the existence of pulmonic emphysema from simple inspection.*

The second variety, or *interlobular* emphysema, consists, as was before stated, in the diffusion of air through the interareolar texture, in consequence of the rupture of some of the pulmonary vesicles. Of this lesion, I have observed a considerable number of cases, and am disposed to believe that it is exceedingly common in our Western States. So ·far as an opportunity has been afforded me of judging, no period of life, I should say, is wholly exempt from it. Males, between twenty and thirty, have appeared to me to be particularly subject to it, — much more so than at an earlier or later age, or than the other sex. I have never observed this affection in new-born infants ; but, in one instance, I noticed it in a child of seven months, who died, under symptoms of pneumonitis, complicated with hydrocephalus. Of nineteen cases of this disease, of which I have kept a record, six occurred in association with bilious and typhoïd fever, four with dysentery, three with hooping-cough, one with acute inflammation of the lungs, four with tubercular phthisis, and one with infantile cholera.

In twelve of these cases, the emphysema affected both organs, though not to the same extent. In five it was exclusively confined to the right lung, in two to the left. Nor does every part of these viscera seem to be equally liable to this disease. In nearly all the cases which have fallen under my observation, it was most distinctly marked along the interlobular intervals and the free margins. In a few only was it noticed at the base of the organ, and in not a single one at the apex, or at the posterior part of the internal surface. Why these differences should obtain, or, in other words, why certain portions of the lungs should be more frequently affected in this way than others, are circumstances in the history of this lesion which, in the present state of the science, we are totally incompetent to explain.

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* Treatise on the Diseases of the Chest, p. 162.

When a lung is thus affected, the diseased part is easily recognized by its peculiar whitish appearance, which contrasts singularly with the red-colored textures around it. It distinctly crepitates under the pressure of the finger, the contained air being readily pushed from one place to another, and the serous covering of the viscus appears, as in truth it is, to be lifted off from the parenchymatous substance. In this way, I have repeatedly known thin, flattened bags to be formed from two to three inches in length, by six or eight lines in breadth, and as perfectly pellucid as the most delicate soap bubble. In other instances, the pleura is raised into little globules, so closely clustered together as to bear a strong resemblance to a string of pearls. But whatever may be the form or extent of the elevation, the parenchymatous texture beneath is always more or less lacerated, of a pale color, and generally reduced, especially in cases of long standing, to a sort of net-work, consisting solely of vascular and bronchial ramifications.

In this, as in the preceding variety, the lungs do not collapse on opening the chest, and they also cover, to an unnatural extent, the surface of the pericardium, which, especially when the emphysema is very great along the anterior margins of both viscera, is sometimes almost entirely concealed. Occasionally, the air escapes into the cellular substance of the mediastinal cavity, where it is either arrested, or it extends up the neck, and forms an irregularly flattened tumor, which sensibly crepitates on pressure. In this way, the fluid may reach over the whole body.

In this species of emphysema, the chest emits a loud noise on percussion; the respiration is much embarrassed; and, on applying the ear, a dry, crepitating rhoncus can be distinguished, with large bubbles, which, in connection with the sudden supervention of dyspnœa, upon any violent effort of the lungs, is the pathognomonic sign of the disease. Sometimes, as before intimated, the air escapes into the mediastinal cavity, and thence spreads over the cellular tissue of the neck and upper extremities. When this happens, all doubt as to the true nature of the complaint must of course vanish. The most frequent cause of interlobular emphysema is the forcible and prolonged retention of the air during severe muscular efforts, as in lifting heavy weights, in parturition, in hooping-cough, croup, and other affections of the respiratory passages.

Like the disease which we have just been considering, *pulmonary apoplexy* may be distinguished into two varieties — the vesicular and the interlobular — the blood in the one being retained in the air-cells, in the other, extravasated into the connecting cellular tissue. The lesion, although incidentally noticed by Haller, and other writers of the last century, was first accurately portrayed by Dr. Hohntaum, of Erlangen, in 1817. A few years subsequently, a more detailed account of it was published by Laennec; and, since that period, it has been ably described by other pathologists, both in France, England, and Germany.

As might be expected, the anatomical characters of pulmonary apoplexy vary, as the fluid occupies the vesicular or the interstitial cellular texture. In the former case, the blood is collected into round circumscribed masses, from the size of a pea to that of a large apple. When incised, the section has a deep red, granular aspect, of the consistence of a hepatized lung, with numerous intersecting vessels and tubes of a much lighter color. By scraping with the handle of the scalpel, the clotted blood is removed from the air-cells, and the part exhibits a beautiful honey-comb arrangement, the pits being separated by irregular partitions.

In the second variety, the fluid ruptures the air-vesicles, and is extravasated into the intervening cellular tissue, breaking it down into a ragged, shreddy substance, in appearance not unlike a coarse sponge, saturated with dark blood. Large cells and excavations may be thus formed, penetrating to a considerable depth, and converting the lung, in some cases, into a soft, irregular, fluctuating mass. Occasionally, the apoplectic effusion is so great as to lacerate the pleura, and escape into the thoracic cavity. This, however, is rare; and I have never witnessed an example of it; nor are there, so far as is known to me, more than five or six instances of the kind on record.

When the effusion is very profuse, as often happens when it proceeds from a ruptured vessel of considerable magnitude, death sometimes occurs in a few hours,— occasionally, indeed, almost instantaneously. In other cases, the blood is discharged by the mouth, or a portion of it remains, and gradually assumes new properties. If the individual is cut off during the attack, the blood is found, upon inspection, to be of a dark venous hue, and only partially or not at all coagulated. In cases of an opposite character, however, it is uni-

formly clotted, more or less firm, and of a light brownish, pale gray, dun, or drab color. These alterations are always more conspicuous in proportion to the length of time that has elapsed since the apoplectic attack, and, it need scarcely be said, are dependent upon the absorption of the serum and coloring matter of the extravasated fluid.

The tissue around the clot may be quite sound and crepitous, but is more commonly pale and indurated. Sometimes the clot acts as a foreign body, producing inflammation, softening, suppuration, or even gangrene. Should the effusion be small, limited in extent, or not have caused much injury, it may be entirely absorbed, and the vesicular structure resume its normal characters. In other cases, again, though this is extremely rare, nature makes an effort at reparation by organizing the clot, or enclosing it within a cyst of false membrane, as in apoplexy of the brain.

The blood, in pulmonary apoplexy, may flow from two distinct sources, either from the mucous membrane of the bronchiæ, as a simple exhalation, or directly from a lacerated vessel. When depending upon the latter source, the hemorrhage is often extremely profuse, and proves rapidly fatal. Eighteen months ago, I examined the body of a man, thirty-two years old, who died about twelve hours after an attack of pulmonary apoplexy, in which he must have lost nearly a gallon and a half of blood. The stomach contained nearly a quart of this fluid; the bronchiæ, trachea, and larynx were nearly filled with it; and a large tubercular excavation in the upper lobe of the right lung, capable of holding five ounces, and from which the hemorrhage proceeded, was also occupied with it. A loss of blood, of five or six pounds, is by no means unusual in seizures of this kind.

Much dispute existed, at one time, concerning the probability of this disease emanating from simple exhalation of the mucous membrane of the bronchial tubes. The subject is amply discussed by Bichat, who espoused the affirmative side of the question; and his opinion has been abundantly confirmed by the more elaborate researches of modern pathological anatomists. It is now well ascertained, indeed, that the occurrence is not only possible, but much more frequent than is generally imagined. The hemorrhage, though sometimes profuse, is seldom so great as when it proceeds from a ruptured vessel.

Hypertrophy of the right ventricle of the heart, with con-

traction of the mitral valves, seems to be the most frequent
cause, by far, of this lesion. In the cases examined by Dr.
Hope, amounting to a considerable number, upwards of two
thirds were referable to this source.* Similar is the evidence
furnished by the dissections of Dr. Townsend, Andral, Bouil-
laud, Bertin, and other anatomists. Indeed, apoplexy of
the lungs may be said to have the same connection, pre-
cisely, with hypertrophy of the right side of the heart, that
apoplexy of the brain has with that of the left,— the tendency,
in both cases, being to throw the blood with more impetuosity
and force upon the respective organs. Should there be a
contraction of the mitral valve, the blood will stagnate in
the left auricle, and the pulmonary vessels be constantly
engorged from the obstacle in the venous circulation. When
this state is conjoined with thickening of the walls of the
right ventricle, nothing, it may be presumed, would be more
easy than the supervention of hemorrhage, whether as a
simple exhalation, or as the result of a laceration of one or
more vascular branches. The deposit of blood in the pulmo-
nary tissue is also a frequent attendant upon phthisis ; and,
in some instances, it is found to be *accidental*, the fluid being
poured down the windpipe from an ulcerated artery of the
tongue, palate, or fauces, or from the bursting of an aneu-
rismal sac.

The pathognomonic signs of pulmonary apoplexy are, dul-
ness of sound on percussion, and extinction of the respiratory
murmur in the part which corresponds with the seat of the
disease, together with a crepitating rhoncus in the immediate
neighborhood. When these phenomena — the rationale of
which will readily occur to the reader — are conjoined with
hœmoptysis, no doubt can be entertained of the true nature
of the disease.

Encephaloïd seldom occurs in the lungs. This affection,
which constitutes the cancerous phthisis of Bayle, and the
medullary tumor of Laennec, may exist under several varie-
ties of form. Thus, it may be diffused through the inter-
vesicular tissue, in small, uncircumscribed patches ; or it
may be deposited in irregular spherical masses, varying in
size from a small pea to that of a full-grown fœtal head ; or,
lastly, it may present itself in the character of an encysted
tumor, which, in fact, is most usually the case. In this

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* Morbid Anatomy, p. 41.

variety, the heterologous growth rarely exceeds a common-sized apple, and the capsule surrounding it, although hard and tough, is scarcely half a line thick, and of a white gray-ish color : the adhesion between the two structures is usually very slight, and the vessels which are so abundantly dis-tributed upon the latter, can seldom be traced to any great depth into the former.   In some cases, the medullary matter occupies only a single cyst ; in others, there are as many as six or eight, united together into one lobulated mass.   La-ennec, who has given a very good account of this disease, describes it as passing through three different stages.   In the first, the encephaloïd matter is of the consistence of concrete lard, lobulated, and of a pale yellowish color ; in the second, it has an appearance very much like that of the human brain ; and, in the third, it is soft, moist and pulpy.   Clots of blood, of a deep red, brown, or blackish color, are frequently in-termixed with this substance, altering its appearance and consistence.

Of this disease I have never seen an example, and feel, therefore, disposed to think it uncommon in the United States.   Dr. Morton has seen only a single case of it in a great number of dissections ; * and Bayle witnessed it only thrice in nine hundred subjects.†

No diagnostic signs of this disease have yet been pointed out.   If the tumors are numerous, or of considerable mag-nitude, there will probably be dulness on percussion, with diminution or absence of the vesicular murmur, pain in the chest, dyspnœa, and that peculiar state of the complexion which so often attends this lesion in other organs.

The lungs are liable to *melanosis*, though this may be classed amongst the rarest affections which we meet with in these organs.   It is commonly seen in amorphous masses, in small nodules, in thin, irregular laminæ, or in minute dots. The tuberiform variety, which is perhaps the most common, occurs in globular, oval, or pyriform tumors, from the size of a currant to that of an egg, or even a large apple.   Some-times they are encysted, the capsule by which they are en-closed being composed of dense, cellular tissue, about half a line thick.   Their surface is either smooth, unequal, lobulated, or studded with small tubercles, like a mulberry ; and their

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* Illustrations of Pulmonary Consumption, p. 85.   Philadelphia, 1834.
† On Phthisis.

consistence varies between that of tallow and that of a lymphatic gland, though occasionally they are quite fluid. The circumjacent textures are generally sound, and the connection between them and the heterologous bodies is often so slight as to require but little dissection to separate them from each other.

Melanosis of the lungs, must, on the whole, be regarded as a very rare disease in the inhabitants of this country. Of the tuberiform variety, I have seen only two or three examples ; nor have I been more successful as respects the others. The deposition, which is most frequent in old people, especially in such as are of a strumous diathesis, seems to be merely an excess of secretion of the black pigment, which is sometimes so conspicuous in the organs at that period of life. Andral relates the case of a man, fifty-nine years of age, in whom the left lung was entirely converted into a black, homogeneous substance, of such density, that the scalpel would scarcely penetrate it : the whole appeared like a mass of extravasated, black injection, after it has cooled.*

Serous cysts, containing a thin, limpid fluid, are occasionally found in the lungs. They are often seen in the inferior animals, as the ox, sheep, and goat, but are of very rare occurrence in the human subject. Morgagni gives only a single instance of these accidental growths ; and Laennec seems never to have met with them. I have never seen them in this situation.

Equally rare are the *hydatids* which are sometimes seen in the human lungs. Of a globular, ovoïdal, or pyriform shape, they are of variable magnitude, of a firm, semi-concrete consistence, and usually, if not always, of the acephalocystic kind. Their coats are of a light grayish color, sometimes speckled with opaque, yellowish dots ; and their contents, which are generally of a thin, limpid nature, like spring-water, are often milky, brownish, or sero-sanguinolent. The internal surface of the hydatid is frequently rough, and lined by a thin layer of lymph. Seldom is the number of these bodies great, or their size large. Occasionally, however, there is a very large one, including several of smaller dimensions. Dr. Geoffroy, a French writer, has furnished the particulars of the case of a young man, aged twenty-two, in whose lungs were two enormous hydatids, each eleven inches long,

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* Archives Generales for April, 1829.

which adhered to the ribs and mediastinum, and reduced
these organs each into a thin, spongy cake, lying in the ante-
rior part of the thoracic cavity.   Each contained about five
pints of thin, watery fluid ; and they were supposed to have
originated in the pulmonary tissue.*

These bodies, like the serous cysts to which I before ad-
verted, are extremely infrequent in the human lungs.   Out
of nearly six thousand patients, says Andral,† admitted
into the wards of M. Lerminier, in six years, pulmonary
hydatids were seen only five times.   In one of these cases,
they occurred in the pulmonary veins ; but, in all the others,
they were developed in the midst of the parenchymatous
structure.

Neither hydatids nor cysts seem to give rise to any
pathognomonic symptoms.   Oftentimes they acquire a con-
siderable magnitude without creating any pain, local suffer-
ing, or dyspnœa.   It is only when they compress the delicate
substance of the lungs by their great size, that they inter-
fere with its functions.   Sometimes they are ejected by
coughing ; and, in such cases, it is conceivable that the patient
may get well.

Of *calcareous concretions*, as occurring in the lungs, men-
tion is made by almost every writer, on morbid anatomy,
since the time of Bonetus.   These structures, of which I
have seen several examples, are usually observed in small
rounded nodules, of a grayish white color, friable, semi-con-
crete, sometimes hard, consisting almost entirely of phosphate
of lime, with a minute proportion of animal matter, and the
carbonate of that salt.‡   Cases occur in which these concre-

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* Bulletin de l'Ecole de Med. au 1805.   (See Laennec, p. 381.)
† Clinique Medicale ; translated by Spillman, p. 553.
‡ Very recently these concretions were analyzed by Professor Sqarzi, of Bo-
logna, who found the following ingredients : *

Phosphate of lime,	1.56
Carbonate of lime,	0.39
Carbonate of magnesia,	0.06
A peculiar fatty matter,	0.06
Cholesterine,	0.66
Mucus,	0.09
A yellow brown substance,	0.03
Oxide of iron,	0.09
Silex,	0.03
Loss,	0.03
	3.00

* American Journal of the Medical Sciences, vol. xv. p. 542.

tions are of a darker color, oval, cylindrical, or pyriform, hard and gritty, or rough on the surface like a mulberry calculus of the urinary bladder.

Their dimensions are very variable. From the size of a mustard-seed they may attain, and even exceed, that of a peach-stone ; though, in the generality of cases, they do not surpass the volume of a currant, a pea, or a small cherry. Their number is in an inverse ratio to their size. In the French Dictionary of Medical Sciences is recorded the case of a phthisical person, who, during eighteen months immediately preceding his dissolution, expectorated upwards of two hundred small stones ; and in another, mentioned by Portal, between five and six hundred were coughed up. Very frequently, these concretions coexist with tubercles. They are always isolated ; and, although they may occasionally be developed in the minute bronchial ramifications, they are usually deposited into the inter-areolar tissue of the lungs, the investing membrane of which they sometimes elevate by their projection. I have never found them encysted, but such cases have been detailed by authors, who describe the capsule as being thick, dense, firm, of a grayish color, and, in some instances, partially converted into cartilage or even bone.

I am not certain that these bodies can give rise, by their presence in the lungs, to any serious inconvenience. Bayle thought that they might ; but his opinion has been successfully controverted by Laennec ; and, from having myself several times found them in persons who, during their lifetime, had no embarrassment of breathing, I am disposed to agree with this writer, in the belief that they are commonly harmless.

It is a law of the animal economy, that in proportion as a part is exercised, so will be its size and strength. This is strikingly exemplified in the muscular system, and also in some of the other organs, as the lungs, testicles, kidneys, and mammæ. Under such circumstances, the organ increases in bulk, its texture becomes more firm and elastic, and the air-cells, although this cannot be demonstrated, are probably enlarged, at the same time that their walls are thickened and strengthened. The augmentation of volume is sometimes extraordinary. More than once have I seen the hypertrophous lung permanently dilate the chest, force down the diaphragm, displace the heart and mediastinum, and pro-

ject up nearly two inches into the neck between the clavi-
cle and spinal column.   In this way, although one lung may
be entirely gone, the individual may live for years in tolera-
ble comfort.   Such seems to have been the case with the
lamented Godman, one of the brightest ornaments of our
profession.   With one lung was he obliged to toil for his
daily substance, for nearly two years, undergoing a degree of
labor which has scarcely ever been equaled by any other
literary or scientific man, in the most perfect health.

Atrophy of the lungs, the reverse of the condition which we
have just described, is generally produced by accidental circum-
stances.   In great emaciation of the body, such, for example,
as is witnessed in protracted fevers, or painful local disorders,
the lungs do not seem to participate in the decay, at all events,
not to any appreciable extent.   That these organs experience
some changes in cases of wilful abstinence, when all the other
viscera are in a normal state, has been already seen ; * but what
these changes are, whether they consist in some structural
lesion, or in some derangement, simply, of the nutritive func-
tion, has not been accurately determined.   In old age, the pul-
monary tissue becomes sensibly altered ; it no longer possesses
the same softness, the same pliancy, or the same color, that
it did in youth or adolescence ; on the contrary, it is dry,
imperfectly elastic, of a pale grayish tint, and comparatively
ill supplied with blood.   Its absolute bulk and weight are
diminished, and the parietes of the air-cells are attenuated
and enfeebled.

But these are not the only causes of pulmonary atrophy.
In most cases, as was before intimated, it is dependent more
immediately upon causes, exerting a local influence, and
hence it is usually found in association with effusions of
water, lymph, pus, or air into the thoracic cavity, or with
tumors pressing upon the large bronchial tubes.   In such
cases, I have repeatedly found the lung reduced to a mere
cake, scarcely more than an inch in thickness, by sev-
eral inches in diameter, with a dark, dense, inelastic struc-
ture, almost void of air-cells.   This accidental atrophy,
which may occur at any period of life, in infants, in chil-
dren, and in adults, is usually connected, provided the patient
survives sufficiently long, with hypertrophy of the opposite
lung.

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* See article *Gangrene*.

Pulmonary phthisis. By far the most interesting disease
of the lungs is phthisis, whether we consider the frequency
of its occurrence, the rapidity of its progress,* its almost
uniform fatality, or the obscurity which still envelopes its
ætiology.† This affection, it need scarcely be remarked,
consists in a slow disorganization of the pulmonary tissue,
occasioned by the developement of tubercles. By the older
physicians, consumption was supposed to arise from a great
variety of lesions, which served, accordingly, as the basis of
a corresponding number of divisions, species, or varieties.
Even Bayle, whose treatise has been published within a
comparatively recent period, admits not less than six different
species of phthisis, — the tubercular, granular, melanotic, cal-
culous, cancerous, and ulcerous. This classification by the
French author has been adopted, with certain restrictions, by
the late Dr. Eberle, a writer who, in most of his productions,
has too servilely followed in the footsteps of his predecessors
and contemporaries. Such an arrangement, indeed, no matter
what may be the authority by which it is sanctioned or em-
braced, is not only unnecessary but absolutely subversive of
the best ends of science. Simplicity of arrangement, not
less than of language, should characterize all our writings;
and none more so than such as relate to pathological topics.

It is now pretty generally acknowledged, that genuine
phthisis depends *exclusively* upon the presence of tubercles
in the lungs. Such at least is the sense in which the term
is received by almost every intelligent writer of the present
day, of whose works I have any knowledge. Nor is this
notion peculiar to the physicians of the nineteenth century.
P. Dessault, of Bourdeaux, in an able essay on phthisis, pub-
lished more than a hundred years ago, clearly states that
tubercles constitute the essence of consumption; and the
same doctrine is warmly inculcated in the immortal work of
Laennec. Similar views have been promulgated, within the
last ten years, by Louis, Andral, and other anatomists, both
on the continent of Europe, in Great Britain, and in the
United States.

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* This remark has reference, of course, only to the heterologous formations.
† "It has been calculated, by the late Dr. Young, Dr. Woolcombe, and others,
from the best data which the bills of mortality afford, that, in Great Britain and
Ireland, consumption causes one fourth part of the deaths that occur from dis-
ease." (Clark's Treatise, p. 8.) In this country, the mortality from this source, I
doubt not, is equally great; though upon this point I cannot speak positively,
having no accurate data from which to deduce my conclusion.

The opinion now generally prevails, that the *primary seat* of tubercular matter is in the air-cells and minute bronchial tubes. For our knowledge of this interesting and important fact, we are mainly indebted to MM. Schrœder Van der Kolk, Cruveilhier, Magendie, and Professor Carswell, whose researches in this and other departments of pathological science are worthy of all praise. These distinguished anatomists have fully decided the question — which many have hitherto disputed — that the morbid product in question is, in the majority of cases, secreted by the mucous tissue of the lungs, instead of being poured out into the interstitial cellular substance, as was maintained, until lately, by the French school. That this doctrine concerning the site of tubercular deposits is true, as a general rule, observation has fully convinced me. Nevertheless, I am far from believing that it is applicable to all cases; for an instance occasionally occurs, where the matter is evidently, in a great measure, if not wholly, confined to the cellular texture. These cases, I acknowledge, are rare, yet that they really exist, does not admit, I think, of the slightest controversy or dispute. Independently of their easy demonstrability, in this situation, analogy is strongly in favor of the position here contended for. In the kidneys, for example, how often does it not happen, that the heterologous bodies are seated exclusively in the so called cortical tissue, notwithstanding the amount of mucous structure within? They are also frequently seen in the bones, in the substance of adventitious membranes, in the interior of the spleen, and on the surface of the serous membranes, — parts which are perfectly devoid of the tissue under consideration. The presence of this tissue is therefore not at all necessary to the production of tubercles, nor is there any reason for concluding that these deposits should be invariably formed by it, even where it abounds in an organ as it does in the lung.

The *varieties of form* in which this matter is deposited were pointed out in a previous section. Referring the reader to the general history of tubercle, I shall limit myself here to the statement of a few leading facts, which will enable him, it is hoped, more fully to comprehend the character of the lesion before us.

Of the four varieties of tubercular deposits already described, the *miliary* is unquestionably by far the most common. It occurs in at least forty-nine out of every fifty cases of phthisis. The individual granules, in this form of the

complaint, vary in volume between a mustard-seed and a fil-
bert : they are generally of a pale yellowish color, and of a
semi-concrete, friable consistence, like dry curds.   A grayish
hue is not uncommon : occasionally they have a greenish,
vitreous aspect, and a degree of firmness amounting to fibro-
cartilage.   This is especially the case in that variety of these
little bodies to which Bayle has applied the appellation of
gray granulations, and which this celebrated author consid-
ered, though erroneously, to be distinct from genuine tu-
bercles.   Studied in the early stage of their developement,
the granules, of whatever appearance they may be, are always
soft and isolated ; by and by, however, they augment, in
consistence, and run into each other, forming, thus, larger no-
dules, of variable color, size, and shape.   Not unfrequently,
the little masses are seen hanging from branch-like pedicles,
— a disposition strongly resembling that of the cauliflower.
Sometimes they contain particles of foreign matter, such as
grains of sand, especially in miners, masons, and grinders ;
and cases occur in which their central portions remain empty,
producing an arrangement, when divided, of internal depres-
sions.   At other times, there is a distinct nucleus of inspis-
sated mucus, around which the tubercular matter is depos-
ited, and which gives rise, as is supposed by Dr. Carswell, to
the appearance of central softening, so much insisted on by
Laennec.

The number of miliary tubercles is extremely variable.
In some instances, though this is rare, there are only a few, —
nay, perhaps, only a solitary one ; but, in the vast majority of
cases, there are hundreds and thousands, of all sizes, from that
of a pin-head to that of a hazelnut.   All parts of the lungs
are liable to be affected by them ; but, as will be shown here-
after, the superior lobes are their most frequent seat.   Occa-
sionally, they are confined to the interior of the organs, the
external surface being entirely free from them.   This, how-
ever, is rare.

These little masses sometimes appear *encysted ;* but this ar-
rangement, I am strongly disposed to believe, is in most instan-
ces altogether deceptive, as it probably depends entirely upon
the manner in which the tubercular matter is impacted in the
bronchial tubes.   Such, at any rate, I have found to be the
case in my own dissections ; for, except on two or three oc-
casions, I have never been able to detect any thing like a
cyst, of new formation, similar to what has been described by
some of the French and German anatomists.

The *stratiform variety* is also very rare in the lungs; and so likewise is the infiltrated. The former I have observed only in a single instance, and then not in the human subject: the latter I have noticed several times, but never to any considerable extent. The matter, in this form of the disease, may be diffused through several contiguous lobules, an entire lobe, or even the whole lung; and, as in the miliary variety, it generally occupies the air-cells, and the minute bronchial tubes, the parietes of which are at the same time somewhat thickened, and preternaturally brittle. Although usually of a yellowish color, it often varies from a light gray to a dark slate, arising from the intermixture of black pulmonary matter, which occasionally imparts to it a variegated, marbled tint. Its texture is homogeneous, opaque, and of a firm, semi-cartilaginous consistence: when torn, it exhibits a rough, granular surface, and seems to be entirely composed of small, irregular bodies, which, from the peculiarity of their arrangement, have been compared, not unaptly, to the eggs of certain insects, placed in close contact with each other. The tubercular infiltration is originally deposited in detached, lozenge-shaped patches, which, in time, coalesce, and so involve a considerable portion of pulmonary tissue: it is most common around old caverns, and is occasionally seen in conjunction with some of the preceding varieties, especially the miliary.

The *pulmonary tissue* around these deposits is variously altered. In the early stages of the disease, before the secretion has made much progress, it is not unusual to find the surrounding parts quite sound. This state, however, rarely continues very long; for, after the tubercles have existed for some time, they invariably act as extraneous bodies,— the more so if they are very large or numerous, producing different morbid changes, such as congestion, inflammation, softening, induration, serous infiltration, and the formation of accidental tissues, of a cellular, fibrous or cartilaginous nature.

Of these pathological conditions, none is more common than congestion. Nor is this surprising, when we remember the compressed and obstructed state of the pulmonary veins. The blood, being thus prevented from finding a ready outlet, must necessarily accumulate in the capillary vessels around the morbid deposits, which, in consequence, often exhibit quite a red appearance, the vessels being arranged in beautiful arborescent lines, some of which are occasionally trace-

able into their substance. As the result of this engorged condition, the pulmonary tissue is frequently infiltrated with serous fluid, the quantity of which is sometimes so great as to lead to great embarrassment of breathing, from the want of the free admission of air into the lungs. Hæmoptysis is also not uncommon. Pure uncomplicated congestion occurs much oftener, according to my own observation, in children and young persons than in the old, or in such as are greatly exhausted by the disease. If it be allowed to go on unrestrained, it produces, sooner or later, an effusion of lymph, with consequent hardening and atrophy of the pulmonary texture. Softening, gangrene, and ulceration are also occasionally noticed, but much less frequently I apprehend, than some have imagined.

The air-cells and minute bronchial tubes, the primary seats of the morbid deposit, are usually more seriously affected than the rest of the anatomical elements of the lungs. Not only are they obliged to bear the brunt of the disease, but, as might be anticipated, they must generally labor under considerable irritation for some time, even before the matter is poured out. Nor is it reasonable to presume that the irritation thus set up will wholly subside during the progress of the secretion. As the matter accumulates in these reservoirs, it presses upon them on all sides, by which, whilst their caliber is enlarged, their parietes are generally attenuated, and finally destroyed, by ulcerative absorption. Hence, when caverns form, the bronchial tubes generally open into them abruptly, as if they had been cut across with a sharp instrument. Along with these changes, there is very commonly a red and injected state of the lining membrane, which sometimes extends up into the trachea, and even into the larynx.

After having existed for some time, varying, on an average, from one to nine months, the tubercular matter, whatever may be the form in which it is deposited, manifests a disposition to become soft. The process by which this is effected was pointed out in a previous section, to which the reader is referred for an account of it. On the present occasion, I shall content myself with a description of the changes which are induced by it in the pulmonary tissue.

Of these changes, the most important is the formation of *excavations*, *caverns*, or *fistulous apertures*. These were formerly considered, under the name of *vomicæ*, to be essential to the existence of phthisis. It is now well known, however,

that it may prove fatal without them, especially that variety of it which is vulgarly denominated, "galloping consumption," and which is marked by great fibrile disturbance. In their size, these cavities are very variable ; but, as a general rule, it may be said to be in direct ratio to their number. When there is only one, it is occasionally as large as the fist, and capable of holding half a pint or more of fluid : on the other hand, when they are numerous, they rarely exceed a walnut, and frequently they are not larger than a hazelnut, an almond, or a pigeon's egg. In their shape, they are for the most part irregularly rounded, sometimes ovoïdal, and occasionally angular. In respect to their number, not less than in regard to their size and shape, much diversity obtains. It is seldom that there are more than two or three, yet, in some instances, the number is truly surprising. Not long ago, I examined the body of an old man, sixty-two years of age, whose right lung was literally one continuous chain of excavations, the largest of which was scarcely as big as a billiard-ball. Upwards of forty were counted. Many communicated together by short, fistulous tracks, and nearly one half of them were completely empty.

The largest excavations are almost always found in the superior lobes, inasmuch as the softening process usually proceeds there to a much greater extent than elsewhere. It also, for the most part, commences at this situation. Hence nothing is more common, in making examinations, than to meet with caverns in the summits of the lungs, with half-softened tubercles further down, and with crude tubercles and sound pulmonary substance at the base of these organs. In the majority of cases, the cavities occur in both lungs.

When recent, the *walls* of the excavations are soft, and lined by a thin layer of lymph, which is easily separated from the surrounding parts : in more protracted instances, the false membrane is dense, grayish, sometimes fibro-cartilaginous, and from one fourth to one third of a line thick. Occasionally several lamellæ are thus deposited, — the one last formed being always more delicate, more easily torn, and of a more yellow color. In some instances, the excavation is entirely destitute of a lining membrane, the parietes being formed by indurated pulmonary tissue, having a raw, fleshy appearance, not unlike the surface of a granulating ulcer.

The *contents* of these cavities vary, according to the period they have existed. Such as are recent, generally contain

thick, cream-colored, inodorous matter, like common pus ;
whilst, in such as are of long standing, the fluid is of a thin,
bloody, sanious character, and often quite offensive. Creta-
ceous matter also is sometimes found in them, and occa-
sionally a substance resembling fibro-cartilage. It is only in
recent cases, and then very seldom, that the excavations
contain fragments of pulmonary tissue. The period required
for emptying themselves varies from a few weeks to several
months, according to the size of the tubercular mass, the ex-
tent of the local disease, and the state of the system.

It is very seldom that we find the older caverns perfectly
smooth internally : their surface is almost always ragged and
uneven, and the irregularity is apt to be still further increased
by their being intersected in different directions by small cord-
like bodies, consisting either of condensed cellular substance,
or of impervious vessels. In their shape, these little bundles
bear a very close resemblance to the fleshy columns of the
heart ; their length is variable ; in thickness, they are from one
to two lines ; they are thinner at the middle than at the ex-
tremities ; and they are usually incrusted with yellowish
tubercular matter. It is a singular circumstance, and one
which has been noticed by every intelligent observer, that
these excavations seldom, if ever, contain any remains of the
bronchial tubes. The pressure that is exerted upon these
structures by the tubercular matter, both internally and ex-
ternally, would seem to be sufficient to produce their speedy
absorption ; and hence it is extremely rare to find the slight-
est relic of them, even where the cavern is only partially
evacuated, or the heterologous deposit only slightly softened.
Nor does the cavity always communicate with the air-
passages. In some instances — and these are not unfrequent
— it is completely closed, so that its contents, being unable to
work their way out, either remain, or are finally absorbed.
More commonly, however, one or more bronchial tubes open
directly into it, and serve to carry off whatever may be lodged
within. Occasionally the matter escapes into the pleuritic
sac, where, in a short time, it excites fatal inflammation. Dr.
Morton, of Philadelphia, describes an interesting case, where
the cavern, which was encysted, and situated in the apex of
the right lung, communicated, by a fistulous opening, with a
large abscess in the back.

It has already been stated that tubercular caverns are often
intersected by small *vascular cords*, the vestiges, evidently,

of the arterial and venous branches that supplied the affected structure. The changes which these vessels undergo, in such cases, constitute one of the most interesting themes that can engage the attention of the pathologist. Long before the softening begins, their caliber is obliterated, as if nature, intent on preventing hemorrhage, took care to anticipate the ulcerative process. In the early stage of the disease, the vessels are merely forced aside, and compressed by the tubercular matter ; but, as the deposition advances, they gradually become impervious, and are at length converted into hard, fibrous cords, like the umbilical vessels of the infant after parturition. Thus affected, they are greatly diminished in volume, and no longer admit the finest injecting matter : even air cannot be made to pass along them : in a word, they are completely, effectually, permanently obliterated.

But for this provision, which is as admirable as it is beneficent, few individuals would survive the softening process. As it is, with all the care that nature can exert, fatal hemorrhage is unfortunately of too frequent occurrence, arising from the rupture of the affected vessel, in consequence of the inability of its walls to withstand the shock of the circulating fluid. The blood occasionally finds its way from the cavern by a fistulous opening into the œsophagus. Of this a most interesting case is related by the late Dr. Mackintosh, of Edinburgh, in his excellent treatise on the Practice of Medicine.* The patient was a child, which had labored for some time under cough and anomalous symptoms, and died suddenly from what was supposed to be hæmatemesis. On inspection, it was discovered that the blood contained in the stomach and bowels had proceeded from a ruptured artery in an excavation in the upper lobe of the left lung. From this a fistulous passage was seen running high up into the œsophagus, along which the fluid flowed into the stomach.

One of the most interesting facts, in relation to these caverns, is, that they are susceptible of *cicatrization.* That this occurrence is rare, common sense alone, unaided by observation, is sufficient to convince us ; but that it occasionally takes place is abundantly proved by the researches of Laennec, Andral, Forbes, Carswell, Morton, and other pathological anatomists. Indeed, every physician who is at all in the habit of making dissections, must have met with examples of this

* Vol. i. p. 241, Philadelphia edition.

kind. I have had occasion to observe it in a considerable number of cases, and have taken care to preserve specimens of it in my cabinet.

There are three ways in which the healing may take place, each of which is deserving of a brief notice. In one of these, which is by far the most common, the cavern remains open, and its surface becomes lined with a thin layer of plastic lymph : this adheres more or less strongly to the surrounding textures, is gradually organized, and finally converted into a membrane, which possesses all the properties of the mucous tissue, excepting that it is devoid of mucous glands, and therefore incapable of secreting genuine mucous matter. Secondly, the cicatrization may be affected by the contraction of the excavation, and the slow but steady agglutination of its sides, through the intervention of dense cellular substance of new formation ; and, thirdly, by an effusion of coagulating lymph, or repeated depositions on the inner surface of the cavity, forming a white bluish mass, more or less dense in its structure, in which the bronchial tubes may be seen abruptly terminating. In the last two varieties of cicatrization, the contraction of the accidental tissue gives rise to a puckering of the lung, which is most distinctly marked when the serous envelope of the organ is forced to follow the retrocession of the parenchymatous substance. These scars — for thus they may be called — are most common in the apex of the lung ; and they may assume various figures, — oval, circular, linear, arborescent, or stellated.

Although tubercles generally coexist in both lungs, yet it is a singular fact that the left of these organs is commonly more extensively involved than the right. This circumstance, which was long ago noticed by Bonetus, Morgagni, and Stark, is fully confirmed by the recent observations of Dr. Louis, though it is opposed by the high authority of Laennec and Lombard, as well as by that of Dr. Mackintosh[*] and Dr. Home, of Edinburgh.[†] It is also in accordance with the experience of Dr. Morton, of Philadelphia. In

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[*] Principles of Pathology and Practice of Physic. Morton's edition, vol. i. p. 436.

[†] This gentleman, in an able report on phthisis, published in the January number of the Edinburgh Medical and Surgical Journal for the present year, states that out of one hundred cases, he found both lungs equally affected in twenty-five, the right most in thirty-eight, and the left in thirty-seven. In five cases in which one of these organs only was diseased, four were on the right, and only one on the left.

eighty-six cases analyzed by this distinguished physician, both lungs were equally affected in seven, the left most in fifty-one, and the right in twenty-eight. This conclusion is fully sustained by the results of my own dissections. With the exception of twelve or fifteen cases, I have invariably found the left organ more extensively implicated than the right. In a few instances, the heteroclite deposit was confined to one side. Upon what the difference here referred to depends, is a point which has not been satisfactorily explained.

Not less strange is the fact that the morbid deposit is almost constantly more copious and perfect at the summit, than at the base of the lungs. So true is this, that it may be laid down as a rule, scarcely liable to a single exception. Various explanations have been offered with a view of accounting for this phenomenon ; but, so far as I know, they all rest upon conjecture, and therefore scarcely deserve mention. That the confined and compressed state of the superior lobes of the respiratory organs should exert an injurious influence, predisposing these parts to disease, can scarcely be doubted ; but that it is the only cause of the proneness in question, I am by no means inclined to believe. Granting that the circumstances adverted to do produce a mischievous tendency, if nothing more, it seems to me that the real cause consists in a diminished supply of blood, and in a consequent debility of the parts under notice. Owing to our erect position, the circulation here is carried on with difficulty ; the pulmonary tissue is imperfectly nourished ; the proper stimulus resulting from the due admission of the sanguineous fluid is withheld ; and hence, wherever any cause exists that has a tendency to produce tubercular disease, it generally exerts its baneful effects upon this particular portion of the organ, in preference to others that are more directly under the control of the sanguiferous and nervous systems. This conjecture — for we claim for it no other appellation — receives support from the fact, now well established, that, in quadrupeds, the dorsal portion of the lung, which, in reference to the effect of gravitation, may be said to correspond to the apex of the human lung, is generally more extensively tuberculized than the rest of the viscus.

Having thus briefly spoken of the localization of phthisis, let us inquire, in the next place, whether tubercles ever exist in any part of the body without being at the same time present

in the lungs. This is a question which I should scarcely
deem it necessary to discuss, were it not for the extraordinary
assertion of Dr. Louis, that he has never, in a single instance,
seen an organ affected with these bodies independently of the
pulmonary tissue. Their existence in the respiratory organs
seems, says he, to be a necessary condition, a sort of sine
qua non, for their developement in other structures. In read-
ing this portion of his work, one would scarcely suppose that
the author was in earnest ; yet such is really the case. His
experience upon this subject is certainly at variance, in a very
high degree, with that of some of the most distinguished pa-
thological anatomists of the present day, as Laennec, Andral,
and Lombard. All these writers positively declare that they
have *repeatedly* witnessed tubercles in various organs when
none existed in the lungs; and my own observations tend
precisely to a similar conclusion. In a boy, four years old,
whom I examined two years ago, a number of tubercles ex-
isted in the liver, but not a single one in the lungs ; and in a
child of twelve months, which I opened, last autumn, for Dr.
Woodward, of this city, although the spleen was literally
crowded with these bodies, none could be detected in the
respiratory organs. Similar phenomena were noticed last
summer, in dissecting the body of a man twenty-eight years
old. In this case, notwithstanding the closest scrutiny, the
lungs were found perfectly free from tubercular matter,
whilst the lymphatic ganglions of the abdomen, the right
kidney, and the seminal vesicles, were absolutely filled
with it.

Sex appears to exercise a considerable influence on the
production of phthisis. According to Louis, women are
more prone to it than men, in the proportion nearly of nine
to seven. This conclusion of the French author is fully con-
firmed by the more recent researches of several of his coun-
trymen. M. Chateauneuf, in a very interesting memoir,
states that, out of 1544 deaths from pulmonary consumption,
745 were men, 807 women. In the statistical tables of
Paris, published under the auspices of M. Charbol, in 1830,
we find that, out of 9542 cases of this disease, 5582 were
females, 3960 males. Upon this subject my own experience
is too limited to enable me to speak positively ; yet, so far as
it goes, it is decidedly in favor of the greater predominance of
this disease in men than in women : certain am I that I
have examined the bodies of five of the former to one of the

latter. It is altogether probable that the mortality from this cause varies in the two sexes in different regions. This, indeed, is rendered almost certain by the calculations of Dr. Clark, published in his excellent treatise on consumption.* Thus, for example, in New York, the proportion of males to females, in round numbers, is as ten to eight ; in Berlin, as ten to eleven ; and, at Edinburgh, as ten to six.† In Sweden, the proportion is nearly equal. In Prussia, if Berlin can be taken as an illustration, phthisis in childhood appears to be much more common among females than among males.

The period of life most liable to phthisis is between twenty and forty. This fact, which was pointed out by Hippocrates, has been amply confirmed by the united experience of hundreds of modern physicians. Of one hundred and twenty-three patients observed by Louis, not less than seventy-two died during this interval. These results are confirmed by those of Bayle, Darwall, Home, Morton, and other writers. In two hundred and eighty-one phthisical persons, who died in the Philadelphia almshouse in three years and a half, ending with the month of June, 1833, one hundred and ninety-three perished under forty years of age. Forty-two died between the ages of forty and fifty ; twenty between fifty and sixty ; twelve between sixty and seventy ; three between seventy and eighty ; two between eighty and ninety ; one between ninety and a hundred.‡ From the recent report of Dr. Home, showing the ages of ninety-six persons treated in the Royal Infirmary of Edinburgh, it appears that sixty-six, or upwards of two thirds, died between twenty and forty. The mortality below twenty was eleven ; that above fifty, eight.§ From a careful analysis of the statistical reports of the principal cities of Europe, and the United States, Dr. Clark has deduced similar conclusions. The remarkable agreement of all the places, says this distinguished author, warrants the statement, that fully one half of the deaths from consumption occur during the period above specified, and that the mortality is at about its height at thirty, and from that time gradually diminishes.

Dr. Lombard, of Geneva, has found that children are most prone to tubercles between the ages of three and six, inclusive.

* London edition, p. 183.
† See Dr. Home's Report, Edinburgh Med. and Surg. Journal, No. 134.
‡ Morton's Illustrations of Pulmonary Consumption, p. 48, First edition.
§ Edinburgh Med. and Surg. Journal, p. 3, No. 134.

We have no correct data for estimating the frequency of phthisis immediately under and above this period, but the number of deaths is considerable. Infants are sometimes born with this disease. Of this occurrence, several well-authenticated cases are now on record; that they are uncommon, however, cannot be doubted; and, thus far, it has not fallen to my lot to meet with them. As was stated in a previous part of this work, I have in several instances observed tubercles in very young children; and similar observations have been made by some of my friends. Andral supposes that phthisis is most frequent among females below the age of twenty; but this opinion, although supported by his own experience, and by the statistical tables of Berlin,* requires further proof before it can be received as true.

The *duration* of phthisis varies from a few weeks to several years, the medium being about nine months. This estimate is founded on the data furnished by Bayle and Louis, which, in the main, agree with the calculations of Dr. Home and Dr. Clark. The duration is greatly influenced by the previous state of health, by the accompanying lesions, by the mode of life, and, above all, by the season of the year. In Edinburgh, most of the deaths from consumption occur in the summer; whilst, in London, according to Dr. Heberden, and others, they are most frequent in the winter. In Glasgow, the mortality is also greatest during the hot months; in Paris and Milan, the proportion of deaths in the different seasons is nearly equal.† In this country, we have no data on a sufficiently extended scale to enable us to institute a comparison on this subject. Should these ever be furnished, it will be found, I doubt not, that in our Northern and Middle States, if not everywhere, most persons die of this disease in February, March, and April, or at the close of winter and the beginning of spring.‡ Such at least is the result of my own observations, confirmed by that of many of my most distinguished medical friends.§

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* Clark on Consumption, p. 175.
† M. Benoiston, Ann. d'Hyg. July, 1831, p. 19.
‡ With respect to the city of New York, actual observation has already proved that the opinion expressed in the text is well founded. From the annual report of interments for 1837, recently published by Dr. Henry G. Dunnel, it appears that, of 1458 phthisical subjects, 152 died in February, 159 in March, 163 in April, 133 in May, 123 in June, 101 in July, 109 in August, 119 in September, 72 in October, 83 in November, and 97 in December. Thus about one third of the mortality occurred at the close of winter and the beginning of spring.
§ See American Journal of the Medical Sciences for May, 1838.

No *occupation* is exempt from this disease; but that some employments are more injurious than others, both observation and experience have long since demonstrated. All sedentary pursuits, especially when conducted in crowded and ill-ventilated apartments, are decidedly detrimental, and should therefore, if possible, be avoided. Masons, stone-cutters, carpenters, grinders, painters, and cotton-weavers, are particularly obnoxious to phthisis, probably from their being much exposed to the inhalation of irritating matter. For the former reason, sailors also suffer considerably; and shoemakers are often affected, from their constrained posture interfering with the natural play of the respiratory organs. Living in moist and filthy situations has a bad tendency; and we have the authority of Dr. Lombard for saying that the poorer classes are twice as liable to phthisis as those in easy circumstances. This remark has reference solely to the inhabitants of Europe, but may be extended, I am inclined to think, to our foreign emigrants, many of whom die of this disease before they have resided many years in the United States.

Dress exercises an unfavorable, and oftentimes a highly disastrous influence upon the human frame. Tight lacing, especially in young females, must be extremely injurious, from the pressure it exerts upon the tender and delicate organs of the chest, impeding their movements, stinting their growth, and leading to structural derangement. Even when the body has attained its full expansion, stays can seldom be worn without detriment. But I have not time to dwell upon this subject, and must therefore content myself by referring the reader to the various works on hygiene and phthisis, in which he will find ample information. He should also consult the excellent paper on tight lacing, by the lamented Godman, published as an appendix to his "Addresses."

Is the popular notion, that phthisis is *contagious*, well founded? This question has often been answered affirmatively, but never, at least so far as I know, in a single instance upon satisfactory evidence. Morgagni was so fully impressed with the idea that the disease is contagious, that he very rarely examined a person that died of it, for fear as he says, of contracting the infection. Professor Andral, in his commentaries on the treatise of Laennec, without attempting to decide the point at issue, thinks it ought not to be treated too lightly, alleging that it is by no means easy, in the present state of our knowledge, to give a positive opinion concerning

it. Upon this subject I have no personal experience, yet I cannot but believe that the notion about the contagiousness of phthisis is perfectly idle and ill-founded. If, as sometimes happens, the nurses and friends of consumptive patients contract the disease, the circumstance is surely explicable upon other and more philosophical grounds. Loss of sleep, and anxiety of mind, with the attendant impairment of the digestive function, are amongst the most powerful predisposing causes of the disease, and are alone sufficient, in many instances, to kindle it into action. Strong though not conclusive testimony in favor of the non-contagious character of phthisis is likewise afforded by the experiments of Hébrèard and Lepellatin, of France. These physicians inoculated different animals with pus taken from scrofulous ulcers, without, in a single instance, inducing the disease, or even any particular local derangement. The latter even tried the effects of the matter upon himself, but with no better success. Children have also been inoculated with impunity. Taking all these circumstances into consideration, there is not even a shadow of proof that consumption is contagious. Nevertheless, more extensive and diversified observation is still wanting, before we can pronounce positively on the subject.

It rarely happens that consumptive patients reach the goal of their existence, without other organs than the lungs becoming seriously involved in the disease. The affections, which thus complicate the thoracic lesion, may be purely accidental ; that is to say, they may supervene during the progress of the complaint without having any direct connection with it ; but, in the plurality of cases, they are to be viewed in the light of cause and effect, the presence of the one being necessary to that of the other.

One of the most singular phenomena, and at the same time one of the most common, is the excessive *emaciation*, which has been considered by some, though erroneously, as pathognomonic of the disease. The weight of the body is remarkably diminished ; and, with the exception of the glandular structures, the brain, spinal marrow, and nerves, there is not an organ, probably, that does not participate in some degree in the general atrophy. The fat is every where absorbed ; the muscles are pale, flabby, and attenuated ; the cellular tissue is deprived of its moisture ; the skin is thin and blanched ; the hairs grow slowly, and many of them drop off ; the nails are soft and incurvated ; the parietes of all the hollow viscera

are much reduced in thickness; the bones, although they retain the same length, shrink in circumference, are specifically lighter than natural, and have an unusual degree of whiteness; the marrow is almost wholly removed, and in place of it there is commonly a considerable quantity of oily serosity. Even the cartilages, ligaments, and tendons are in some cases sensibly diminished. The blood also is altered. It is exceedingly thin and pale, from the deficiency of fibrin and hematosine; coagulates imperfectly when drawn; is often buffed, and even cupped. These changes are always more conspicuous of course, during the latter stages of the disease, in persons who have suffered for a long time. Along with these changes, the whole contour of the body is altered. Every depression is rendered more conspicuous, and every osseous eminence stands out in bold relief. The chest is remarkably altered in shape; it is flat and narrow, instead of being round and protuberant; the intercostal spaces are sunk beyond the level of the ribs, and form long deep grooves; the shoulders are tilted forward; and the clavicles are unusually prominent, leaving a deep hollow between them and the upper ribs. During life, there is a peculiar stoop, which is almost characteristic of the disease.

We have already noticed the changes which take place in the pulmonary tissue. Let us now proceed to examine the lesions of some of the other organs.

The *pleura* is very rarely free from disease. Indeed, this can only be the case so long as the tubercles are few, small, and confined to the interior of the pulmonary tissue; for, as soon as they become numerous, large, and affect the exterior of the organ, they must necessarily act as irritants, and thus lead to structural derangement of the serous investment. Hence we generally find extensive adhesions, both interlobular, costal, diaphragmatic, and even pericardiac. The intervening substance varies in its consistence from that of recent lymph to that of fibro-cartilage, according to the period of its existence. Generally it is pretty thick, and of the nature of cellular tissue, being harder and firmer in some places than in others. When there are large excavations, there are almost always extensive adhesions; tubercles are sometimes disseminated through the false membranes; and, during the latter stages of the disease, the morbid deposit is often accompanied by effusions of serous fluid, the quantity of which varies from a few ounces to several pints. This

secretion, there is reason to believe, frequently takes place
only a day or two before death. It need scarcely be re-
marked, that as the superior lobes are usually most affected
with tubercles, so they generally adhere most firmly to the
walls of the chest.

One of the most distressing accidents which occur during
the progress of phthisis, is *perforation* of the pleura. This
usually takes place suddenly, in the advanced stage of the
disease, and almost always destroys life within the first few
days, from the violent inflammation that is excited by the
extravasation of acrid fluids and the entrance of the atmos-
phere. In such cases, there is commonly severe pain in the
region of the affected part, with much oppression and anxiety.
When the symptoms are more mild, life is occasionally pro-
tracted for several weeks ; and Dr. Stokes, of Dublin, men-
tions an instance where the patient survived five months.
The perforation may happen in either pleura, but has hitherto
been observed principally in the left side, — a circumstance
which may be readily explained, by the more frequent occur-
rence of tubercles in the left than in the right lung.

The *air-passages* are variously affected in phthisis. The
ramifications of the bronchiæ, as before stated, are frequently
obliterated, very much contracted, or otherwise altered, in
their form and dimensions. The mucous membrane of the
principal tubes, as well as that of the smaller ones, is gener-
ally reddened, opaque, and thickened ; occasionally softened,
encrusted with specks of lymph, or even ulcerated. Appear-
ances nearly similar, are often seen in the trachea ; and here
it is also more common to find erosions. Occasionally there
is extensive destruction of the mucous membrane, with great
thickening of the muscular fibres ; and, in rare cases, the
ulcerative action has been known to produce serious mischief
in the cartilaginous rings. The larynx and epiglottis are also
frequently studded with ulcers : Louis found them thus
affected in one fifth of his cases, Bayle in one sixth. An-
dral detected disease, of some kind or other, in as many as
three fourths of his examinations. He also found the muci-
parous glands often very much enlarged, and the lining
membrane variously altered in color and consistence. A not
uncommon lesion was a considerable degree of softening.*

That the *heart* should be affected in pulmonary consump-

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* Clinique Medicale, p. 488.

tion, is no more than what might be expected, from its close proximity to the lungs; yet that this does not so often happen as has been imagined, my own dissections warrant me, I think, in saying. Even in protracted cases, I have frequently been unable, notwithstanding the closest scrutiny, to detect any thing more than a pallid and slightly softened state of the muscular fibres, with an entire absorption of adipous matter. In the great majority of persons examined by Louis, the organ is stated to have been unusually small, being not more than two thirds of the normal volume. The most common lesion which I have noticed was hypertrophy of the ventricles; and, what is remarkable, this was generally more frequent, as well as more perfectly marked, on the left side than on the right. Occasionally, also, I have observed a diseased state of the mitral and aortic valves; and, in some of my examinations, there were numerous flakes of lymph, with partial adhesions of the pericardium, the result evidently of recent inflammation of its serous investment. In a few cases, the pericardium was distended, and pushed out of place by an immense quantity of sero-albuminous matter. The large vessels attached to the heart are usually healthy.

The most common appearance observed in the *peritonæum* is sero-albuminous fluid, which is always most copious when there is disease of the spleen, liver, heart, or mesenteric glands. The phenomenon, however, is extremely rare. The membrane is sometimes thickened, opaque, discolored, or studded with tubercles, in various stages of maturation. A small quantity of thick cream-colored matter is occasionally found, not unlike what occurs in phlegmonous abscesses.

The *spleen*, in phthisis, is seldom much involved. Louis observed tubercles in one sixth of his cases; Home in one fiftieth, or twice in one hundred subjects. From never having found these bodies in persons who died of other diseases, the former of these writers is disposed to consider them as peculiar to this affection. This conclusion is decidedly at variance with my own observations. In two cases, at least, have I witnessed this state of the spleen unconnected with phthisis. An alteration of volume and consistence is by no means infrequent; but whether these pathological conditions are foreign to or dependent upon the present affection, is a point which remains to be settled. My own belief is, that there is no connection whatever between them.

The *liver* is variously affected. In France, the most fre-

quent alteration is the fatty degeneration. Louis established
its existence in one third of his cases of phthisis, whilst he
met with it only nine times in two hundred and thirty per-
sons who died of other diseases. He also found it much
more common in women than in men, in the proportion
nearly of four to one. This state of the liver is probably
much more frequent in some localities than in others. In
my own dissections, I have rarely met with it ; in the exami-
nations of Dr. Home, of Edinburgh, it also occurred com-
paratively seldom ; * and Dr. Clark † affirms, that it is much
less common in England than in France. That peculiar
change, called *cirrhosis*, is, according to my own experience,
much oftener associated with phthisis than any other. The
waxy degeneration, which is probably only an advanced
stage of the adipous, and in which the organ acquires a
brownish, yellowish color, with a strong resinous lustre, a
dense but friable consistence, and a homogeneous aspect, I
have never noticed, in a single instance, as a complication of
the present disease. The hepatic tissue is sometimes exten-
sively softened ; at other times, it is preternaturally firm ;
whilst, in a third series of cases, though these are very rare,
it contains tubercular deposits, serous cysts, hydatids, or car-
cinomatous growths. With these various alterations, the
volume of the liver may be natural, augmented, or dimin-
ished. The former I believe to be the most common. The
gall-bladder is ordinarily exempt from this disease.

It is seldom that we find the *urinary* and *genital organs*
much affected in this disease. In a few instances, I have
observed tubercles in the kidneys, the ovaries, the prostate
gland, and the seminal vesicles. The uterus is almost inva-
riably sound. On two occasions I have met with ulcers in
the urinary bladder, and on one with a small deposit of tuber-
cular matter in the submucous cellular tissue. The pancreas
is rarely affected. I have found tubercles in it only in a
single case, — that of a negro boy about nine years old. Louis
and Home, seem to have entirely overlooked this organ in
their examinations.

During the latter stages of phthisis, aphthæ are very apt to
appear in the *mouth*. They are generally considered, and I
believe correctly, as the immediate forerunners of dissolution ;

* Report on Phthisis Pulmonalis, op. cit. p. 29.
† Op. cit. p. 162.

sometimes, however, they exist a considerable time before the occurrence of this event. In many cases they are extremely numerous, covering both the tongue, the inside of the cheeks, and the fauces. Occasionally, though this is rare, they are also observed in the nose, the ears, and even on the vulva. When first seen, they present the appearance of minute chalk-colored specks, resting upon a red florid base. By and by these white crusts fall off, exposing a great number of small ulcers, the primary seat of which is in the muciparous glands. The suffering caused by these aphthæ is sometimes intense. The pharynx and œsophagus are rarely affected in phthisis.

The *stomach* often sympathizes with the disorganization of the lungs. One of the most common lesions is softening, with diminished thickness of the mucous coat. These changes are sometimes produced after death by the action of the gastric juice; but more frequently they are caused by inflammatory irritation, and are usually most conspicuous along the great cul-de-sac of the organ. The mucous membrane is occasionally ulcerated, thickened, extensively reddened, or mammillated. Another lesion that is pretty often met with in Europe, especially in France, but which I have never observed, is great distention of the stomach, the organ reaching sometimes down to the brim of the pelvis. This condition, which is usually accompanied with a blanched and attenuated state of the different tunics, is supposed by Louis to be peculiar to phthisis, as he has very rarely witnessed it in other maladies. On this subject, as just stated, I have no personal experience. One thing, however, appears to me certain, that the explanation of this author, which ascribes the dilatation in question to the effect of the repeated shocks induced by coughing, is wholly inadmissible; otherwise, it would not only be much more common in phthisis, but often attend other thoracic affections.

But of all the organs there is not one which is so frequently or so extensively affected in phthisis as the *alimentary tube*, properly so called. The parts more particularly liable to suffer are the inferior third of the ileum, the cœcum, and the ascending portion of the colon. The most common lesions here by far are ulcerations; and it is rarely that we examine a subject in which they do not occur in considerable numbers. In the small bowel they are usually situated over the Peyerian glands, which they sometimes entirely destroy,

forming large, ragged ulcers, resting upon the muscular fibres.
In the large intestine, the erosions occur irregularly, and sel-
dom attain a great size, except when several of them coalesce.
The subjoined table, compiled from different sources, will
place this subject in a more familiar attitude :

Authors.	No. of Patients.	Locality.	Small Intestine.	Large do.
Bayle,*	100	Paris,	67	
Louis, †	112	"	78	70
Home, ‡	66	Edinburgh,	30	38

Tubercles are likewise not uncommon, and there is every
reason to believe that they often form the primary seat of in-
testinal ulcerations. These bodies, as will be shown hereafter,
are usually situated in the submucous cellular substance,
where they are sometimes seen in great numbers, either
isolated or grouped together. Their occurrence, I presume,
is not so common in this country as in France. Louis found
them in thirty-six out of ninety-five cases.

It is a pretty common opinion that phthisis frequently gives
rise to *anal fistula*, establishing thus, as it were, a sort of an
issue, which, by diverting from the affected organ, retards, as is
supposed, the progress of the original malady. Respectable as
the authority certainly is by which this notion is sanctioned,
it is entirely at variance with the experience of every intelli-
gent observer of the present day. The circumstance, I am
convinced, is in great measure, if not wholly, accidental ; at
any rate, I can truly say that it has rarely occurred in my
practice, nor have I witnessed it more than once in my dis-
sections of phthisical subjects. Nor do I stand alone in this
opinion. The more ample testimony of Laennec,§ Andral,
and Horner, || is equally strong and conclusive. The former
of these authors, who treated an immense number of con-
sumptive patients, positively declares that anal fistula was
not only very rare in his practice, but that, when present, it
seldom exerted any appreciable influence on the progress of
the pectoral complaint. Dr. Clark also states that, although
he has often met with this affection, he has not been able to
trace any connection between it and phthisis, further than its

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* Recherches sur la Phthisie Pulmonaire, p. 59.
† Louis, op. cit. p. 81.
‡ Report on Phthisis, op. cit. p. 28.
§ Op. cit.
|| Path. Anatomy, p. 256.

probable dependence on abdominal venous plethora, which so frequently precedes the latter malady.*

It is rare for phthisis to run its course without some of the *lymphatic ganglions* becoming diseased. Those of the mesentery, of the bronchiæ, and of the pelvis, appear to be much oftener affected than those of any other region ; yet the cervical and axillary are also not unfrequently found in a disordered state. The most common lesion is the tubercular deposit, which is generally conjoined with hypertrophy, induration, and vascular engorgement. In adults, according to my own observations, this heterologous formation is most frequent in the bronchial ganglions ; in children and young persons, in the mesenteric, meso-cœcal, and meso-colic. Louis considers the tuberculization of the lymphatic ganglions as peculiar to phthisis ; and he even goes so far as to affirm that this morbid change *never* exists, after the age of fifteen, without the lungs being similarly affected. This sweeping assertion has been contradicted by M. Broussais. It is certainly in opposition to the results of the experience of our best authors, and we hold it to be utterly untenable upon pathological grounds. Indeed, nothing can be farther from the truth.

The *brain* and its envelopes are found in various diseased states. Sometimes there is unnatural vascularity of the cerebral pulp, accompanied occasionally with softening of the fornix and great commissure. Tubercles are also observed in different situations, either solitary in some part of the encephalic mass, or spread generally over the arachnoïd membrane, which is not unfrequently opaque and thickened. In many cases there is effusion of limpid fluid, either in the ventricles, or between the arachnoïd and pia mater, at the base or top of the brain. This effusion probably takes place, in most instances, only a short time before death, inasmuch as the intellectual faculties generally remain sound until within a few hours of dissolution.

From the foregoing account it is obvious that the diseases which complicate phthisis are both numerous and distressing. That they are more common in some localities than in others is highly probable ; but further researches are needed before we can deduce any satisfactory conclusions in regard to this and some other topics. In the mean time, all our microscopic examinations should be conducted with the utmost

* Op. cit. p. 163.

scrutiny, taking care not to overlook a single organ, however distantly it may be connected by structure and sympathy with the suffering viscera ; for in this way alone can we hope to add any thing substantial to the pathological anatomy of phthisis.

I shall only further illustrate this subject by making a few cursory remarks on the *nature and symptoms* of phthisis. It is not deemed necessary to reiterate here what was said in a previous chapter, concerning the doctrine of the inflammatory origin of tubercle.*   The subject has been discussed at sufficient length. Since writing that part of the work, I am happy to find that similar views have been promulgated by some of the most eminent pathologists of Europe. That the doctrine of the inflammatory nature of tubercular phthisis will be generally embraced by the profession, it requires, I think, no prophetic vision to foresee. Every one who has carefully investigated the subject must be fully convinced that it is the only true one, and it is only surprising that there should ever have been any other. We do not deny those who have no personal experience in this matter the right of forming an opinion : we assume no such authority ; but we conscientiously believe that those who entertain a different view are, in ninety-nine cases out of a hundred, completely disqualified from coming to a just and rational conclusion concerning the point at issue. This is strong language, we grant; and we shall be very happy to modify it as soon as our physicians shall make themselves better acquainted with the principles of morbid anatomy, and the laws of abnormal action.

Dr. Armstrong and others have expressed the belief that tubercles of the lungs are probably never found without a constitutional or *hereditary predisposition* to them. That such a predisposition frequently exists, and exerts more or less influence over the developement of these bodies, is a point concerning which it would be unreasonable to doubt ; that it is not always present, however, seems to me fully borne out by the general experience of the profession. Per-

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* Professor Horner, of the University of Pennsylvania, after referring to the opinion entertained by some highly respectable authorities, that the developement of pulmonary tubercles is not produced by inflammation, holds the following language : "For my own part, I am not disposed to adopt this opinion. I rather view tubercles as a form of chronic inflammation, to which evidently all parts of the body are liable ; but especially the lungs, from the peculiarity of their texture, and the quantity of lymphatic vessels entering into their composition." (Treatise on Pathological Anatomy, p. 258.)

sons whose constitutions are perfectly sound, and in no wise tainted by what is called the strumous diathesis, nevertheless often fall victims to pulmonary phthisis, after having labored only a short time under general debility, such as results from a severe attack of bilious fever, typhus, cholera, bronchitis, pneumonitis, profuse hemorrhagic discharges, and other exhausting affections.   Thus, although the various organs and textures of the body may have been originally strong and well-built, yet, being worn out by disease, the lungs may finally take on tubercular action, of a character so destructive as to make the whole frame yield to its influence.   This is a point, however, upon which it behooves us to speak with caution, as further observation is still necessary before we can come to any positive conclusion.

That a morbid condition of the system frequently precedes and accompanies the developement of this disease, may be gathered from the foregoing remarks.   To this condition of the body various appellations have been applied, such as *tubercular cachexy, strumous habit,* and *scrofulous diathesis.* Persons are often born with it ; at other times it is acquired, and this may happen during any period of life, from infancy to old age.   Those in whom it prevails are generally distinguishable by certain external marks.   In one class, which is perhaps the most numerous, the skin is remarkably fair and delicate, the hair light, the countenance full and pasty, the upper lip tumid, the eyes blue, and the lids fringed with long lashes, the expression serene and placid, the mind unusually intelligent, and the nervous system highly excitable.   In another class, which may be named the brunette, the complexion is dark, the iris of an opaque brown, the cornea glistening, the mind dull and sluggish.   Occasionally the skin is extremely fine, the hair of a raven black, and the intellect at once sprightly and intelligent.

Children in whom the tubercular cachexy exists, are generally weak and ill-formed, and all the physical functions are imperfectly executed.   The circulation is unusually feeble ; and hence the extremities, especially the hands and feet, are almost always cold ; digestion goes on imperfectly ; the bowels are either sluggish or too loose ; the urinary and cutaneous secretions are deranged ; the muscles are soft and flaccid ; the joints appear as if they were too large ; the belly is habitually tumid ; the head disproportionably bulky ; the upper lip unnaturally full ; and the countenance has a swollen, sickly,

and disgusting aspect. Cutaneous eruptions are not uncommon, especially behind the ears; the eyes are extremely subject to chronic inflammation; and the nose, which is usually dry, from a deficiency of mucous fluid, is the seat of frequent hemorrhages.

With respect to the *diagnostic characters*, phthisis may be divided into three stages, the duration of which is too variable to enable us to lay down any definite rule. In the first stage, the more prominent symptoms are the following: 1. More or less cough, either dry, or attended with thin, frothy expectoration; 2. pain in the side of the chest, at the infra-clavicular region, or between the shoulders, or at all these points simultaneously; 3. hæmoptysis; 4. slight diminution or alteration of the respiratory murmur; 5. dulness of sound, in some part or other of the chest on percussion. Along with these phenomena, which may be considered as positively indicating the existence of crude tubercles, there is generally progressive emaciation, loss of strength, capricious appetite, dyspnœa, and great sensibility to atmospheric impressions.

A very important sign of incipient phthisis, one, indeed, that may be regarded as in some degree pathognomonic, was discovered, a few years ago, by that excellent observer, the late Dr. James Jackson, Jr. of Boston, a physician who, had he been spared, would have been an ornament alike to his profession and to his country. While pursuing his studies in Paris, under the guidance of the celebrated Louis, he ascertained that there is always, in the early stage of the present disease, a well-marked bronchial sound on expiration, before the same phenomenon is observable on inspiration, or even before the entire disparition of the breathing murmur. This circumstance, young Jackson supposes, is easily explicable. Although there already exists, at this period, a considerable deposit of solid matter around the bronchia, yet, as the greater portion of the affected lung is still permeable to the air, it follows that the respiratory murmur, on *inspiration*, completely masks the noise of the descending atmosphere, which would otherwise be transmitted through the surrounding denser medium. On expiration, however, the order of things is changed. The air, on passing through the bronchia, produces the same sound as on its introduction; and, as there is now no vesicular expansion to mask it, it is easily transmitted through the diseased structure to the ear of the exam-

iner.*   Other explanations might be offered of this phenome-
non, but the one given by its lamented discoverer is at least
ingenious, if not strictly true.

In the second stage, the cough becomes more violent and
paroxysmal ; the expectorated matter, instead of being thin
and frothy, is muco-purulent, and often streaked or mixed
with blood ; the breathing is hurried ; the pulse is more fre-
quent ; the fever is of a hectic character ; and the sound on
percussion is more dull.   Excavations now take the place of
the crude tubercles ; and hence there is generally, in addition
to the phenomena first enumerated, bronchophony, crackling
rhoncus, pectoriloquy, and cavernous respiration.

In the third, or concluding stage, there is an aggravation of
all the previous symptoms.   The emaciation is now excessive ;
the attacks of dyspnœa are not only more frequent, but often
much more distressing, bordering on suffocation : the perspi-
ration is extremely copious, especially towards morning ;
aphthæ appear in different parts of the mouth ; the legs and
feet are œdematous ; and the patient is harassed with con-
stant diarrhœa, which usually persists until dissolution.   The
latter symptom, which is rarely absent, occasionally manifests
itself in an early stage of the disease.   It is usually associated
with, and dependent upon, intestinal ulcerations.   There are
two other phenomena which are of a good deal of importance,
I conceive, as diagnostic signs of phthisis : I allude to the
incurvated state of the finger-nails, and to the glistening, pearly
lustre of the sclerotic coat of the eye.   The former is some-
times wanting ; the latter seldom if ever.   Hence it is a
symptom of no inconsiderable value.

Cough is a very uncertain symptom of phthisis.   It is gen-
erally most harassing towards the close of life.   At first, it is
very slight, dry, and short ; but, as the disease advances, it
becomes more severe, and, in the majority of cases, occurs in
distinct paroxysms, which are particularly distressing during
the night, or early in the morning.   In some instances, it is
entirely wanting.   Hence its uncertainty as a diagnostic sign.

Much variety obtains with regard to the color, quantity,
and consistence of the *expectorated matter*.   In the early stage

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* A Memoir of James Jackson, Jr. M. D. with extracts from his Letters to his
Father ; and Medical Cases collected by him. By James Jackson, M. D. Boston,
1835, p. 129.   We cannot omit this opportunity of expressing the gratification
we have received from the perusal of this interesting work.   It is a manly and
just tribute from a bereaved father to the memory of a worthy son.

of phthisis, there is either an entire absence of fluid, or it is remarkably scanty, thin, and spumous. At a later period, the quantity considerably increases; but it still retains the whitish, semi-transparent appearance of the bronchial secretion. These characters are observable until softening takes place, and caverns begin to form, when the sputa become streaked with opaque specks, from the admixture of broken down tubercular matter,* and are ejected in distinct, rounded masses, with irregular and indented edges. The color of these masses, is somewhat yellowish, with various shades of ash, and even green: they sink, in part, in water, and they are generally enveloped by a thin, ropy, and more transparent fluid, which is nothing but common bronchial mucus. In the concluding stage of the malady, the sputa assume a dirty, cineritious aspect: they are much more tenacious, and they usually run together. The quantity of matter expectorated, varies remarkably in different instances, and is seldom commensurate with the extent of the pulmonary lesion. In rapid cases, from ten to twenty ounces are sometimes discharged in the course of twenty-four hours, even before the disease has made much progress. Occasionally the matter is ejected suddenly in large quantities, as when a tubercular abscess gives way; and, under such circumstances, the patient has been known to be suffocated by it, from his inability to clear the bronchial tubes.

The sputa, especially in the latter stages of the complaint, are generally of a nauseous odor, and at times quite fetid. Their taste is variable; very often they are quite insipid; at other times they are saccharine, and, in a few rare cases, sa-

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* This matter generally appears in the form of small, whitish, opaque flakes, the size of which varies from that of a clover-seed to that of a pea. Hippocrates, who seems to have been acquainted with their existence, compares them to grains of hail, and he distinctly states that they are indicative of pulmonary phthisis. Their appearance, as has been observed by Bayle, resembles a good deal that of boiled rice. According to the recent observations of M. Bonnet, of Lyons, these flakes, which are essentially composed of fibrin, are insoluble in water, in alcohol, or ether. He has also ascertained that the immediate principles of tubercular matter are the same as those which exist in other kinds of pus. An emulsive, fatty substance is often found in the sputa of phthisical subjects; but this is not peculiar to this disease, inasmuch as it forms a part of the secretion of all the mucous membranes, both in health and in disease. M. Bonnet supposes that pus, of whatever nature, always derives from it its opacity and yellowish tinge.— London Medical Gazette, December, 1837. See also an account of Mr. Brett's able paper on the physical and chemical characters of expectorated matter, which was read last autumn before the British Medical Association at Liverpool. His results, in the main, agree with those obtained by the French author above quoted.

line. Fragments of pulmonary parenchyma, bronchial tubes, and false membrane, similar to that of croup, are sometimes mixed with the ejected matter; and occasoinally, though this is also extremely rare, the patient coughs up small calculous concretions. The sources of the expectorated fluid are three, the bronchial mucous membrane, softened tubercles, and excavations.

Hemoptysis, on the whole, is rather a frequent symptom. It may take place at any period of the disease, but is most common during the early stages. Sometimes it is the first circumstance which excites alarm. Age and sex appear to exert a considerable influence on the production of hemoptysis. Females are more liable to it than males, in the proportion, according to Louis, of three to two. The former are more commonly attacked after the age of forty, whilst the latter seem to be equally subject to it before and after that period. The quantity of blood varies in different cases, from half an ounce to a pint or more ; in some instances, it merely streaks the sputa, and in others it comes away in large mouthsful. Several years ago, I saw a case, in which upwards of a gallon was discharged in the course of a few hours. The hemorrhage in this instance, as in almost every other where it is profuse, proceeded from an opening of one of the branches of the pulmonary artery, which had traversed a large excavation in the superior lobe of the right lung. Bayle, Laennec, and Andral have reported similar examples. When less copious, besides the source just mentioned, the blood may be furnished, first, by the bronchial mucous membrane ; secondly, by the air-cells; and, thirdly, by the parietes of tubercular caverns, the surface of which, as was before intimated, is occasionally thickly studded with minute vascular granulations. The blood of hemoptysis is commonly florid ; occasionally it is dark and clotted; and at other times it is mixed with frothy, mucous, or purulent matter.

Pain is another symptom which is not much to be relied upon. It is rarely present in the early stage of the complaint ; and cases occasionally occur in which it is entirely absent. The situations in which it is most commonly observed, are the subclavicular regions, the side of the chest, and the interval between the shoulder-blades. Coughing, deep inspiration, and lying on the affected side, often though not constantly increase it. The cause of this symptom is inflammation of the pleura ; for, so long as this membrane

remains unaffected, there is generally little or no pain.   The
dyspnœa, when present — which, however, is not always the
case — is usually referred by the patient to the central part of
the chest, and is rarely noticed except when he takes exer-
cise.

Although phthisis is generally indicated by well-marked
symptoms both of a local and constitutional character, yet
cases occasionally occur in which there are no phenomena
whatever by which it is possible to recognize its existence.
To such cases, which are by no means infrequent, the term
latent has been applied.   This form of consumption, Dr.
Clark thinks, is more common after the middle period of
life, — an opinion which is at variance with my own, and the
experience of some other writers.   Every instance of the
kind which has fallen under my observation was under thirty-
five years of age.

Various states of the system have a manifest tendency to
disguise phthisis.   Pregnancy almost always retards its pro-
gress, and masks its symptoms.   No sooner, however, is the
delivery over, than the disease redoubles its vigor, and rapidly
advances to a fatal termination.   "Persons laboring under con-
sumption rarely abort, though labor pains frequently occur
about the seventh or eighth month.   A lady, the mother of
a very large family, had consumption arrested by eight suc-
cessive pregnancies.   The disease returned in a very marked
form after each delivery.   As she did not give suck, impreg-
nation speedily recurred, and her temporary comfort was thus
insured.   Death followed too closely upon her last delivery
to admit of the relief which pregnancy in so many previous
instances had afforded." *   Diabetes, dyspepsy, and diarrhœa
will frequently suspend the influence of this affection, and
even cause it to be entirely overlooked both by the patient
and by his attendant.   Mania occasionally produces the same
effect.   Dr. Rush mentions † two cases in which madness
alternated with phthisis, and for the time wholly suspended
every symptom of the thoracic complaint ; and numerous
cases of a like nature have been recorded by more recent
observers.   In three cases, which at this moment occur to
my recollection, and of which I have kept notes, although
the lungs were extensively tuberculized, and in two of the

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* Ingleby's Practical Treatise on Uterine Hemorrhage, p. 89.   London, 1832.
† Med. Inq. and Obs. vol. ii. p. 51.   Philadelphia, 1818.

subjects contained pretty large caverns, yet there was not the slightest indication of pulmonary disease during life, not even cough, expectoration, pain in the chest, or embarrassment of breathing. One of the individuals, a colored man, twenty-nine years of age, labored for six weeks under all the symptoms of an ordinary bilious fever, with a pulse seldom higher than ninety-six in a minute. On inspection, I found an excavation of the size of a walnut in each superior lobe, with numerous tubercles in other parts of the organ, and a large abscess between the serous and muscular tunics of the rectum. It contained about half a pint of thick, offensive matter, and its walls were in such a state of softening as to yield to the slightest traction. In the second case, there was extensive ulceration of the mucous membrane of the ileum and colon; and, in the third, that of a young married lady, whose body I examined along with my friend Dr. Richards, of this city, complete tubercular disorganization of the right kidney. Who can doubt that in these instances the disease of the abdominal and pelvic viscera acted in the manner of a revulsive, counteracting that of the lungs, masking its symptoms, and protracting its progress?

SECTION III.

Diseases of the Pleura.

THE serous membrane of the chest, like that of the other splanchnic cavities, forms a shut sac, which is reflected, on the one hand, over the lung, and, on the other, over the diaphragm and the ribs. Hence the distinction of pulmonary, diaphragmatic, and costal pleura, so frequently referred to by anatomists and pathologists. Inferiorly, this membrane reaches, in front, to the cartilage of the seventh rib, and, laterally, within an inch and a half of the margin of the sternum; whilst, superiorly, it extends into the neck, forming a narrow pouch, which lies in the hollow between the clavicle, spinal column, and scalene muscles. This portion of the sac, which is designed to receive the apex of the lung, is often from one to two inches in height, especially when one of the respiratory organs is in a state of hypertrophy, to compensate for the partial loss of the other.

In regard to delicacy of structure, the pulmonary pleura considerably exceeds the costal and diaphragmatic, and it is also united by much softer cellular tissue. That this is the case, is abundantly proved, both by anatomical demonstration and by the facility with which this substance is permeated by the air in emphysema, and the water in œdema, — no such appearance being ever perceptible in the subserous cellular texture of the thoracic parietes. Indeed, so great is the quantity of this substance in the latter situation, and so close the aggregation of its component filaments, that Stokes and Cruveilhier are inclined to regard it as of a fibrous nature, — an opinion which is entirely at variance with the result of my own observations. Careful examination has convinced me that the parietal subserous cellular tissue is not fibrous, as is supposed by these distinguished writers, but merely condensed cellular substance, spread out in the form of a lamella, similar, in many respects, to the transverse fascia of the abdomen, so well described by Sir Astley Cooper in his excellent treatise on hernia. Semi-transparent and of a dull whitish aspect, the lamella under consideration is highly extensible and elastic, and, withal, so firm and resisting as to require a good deal of force to tear it. Its thickness, which nowhere exceeds that of a sheet of common writing paper, varies in different portions of its extent, being much greater between the ribs than upon their surfaces, where it is quite thin and delicate. The connection between it and the pleura is so slight, that the latter can in general be easily pealed off in large-sized patches ; but, externally, the adhesion is very close and strong, particularly as it passes over the intercostal aponeurosis, from which it can be separated only with a knife or by protracted maceration. On the ribs, this structure, as was just remarked, is comparatively thin and spongy, and, in fat individuals, always contains a considerable quantity of adipous matter. Considered in reference to its situation, the lamella which we have here briefly described, may be called, with great propriety, the *internal thoracic fascia*. It is much more distinctly developed in the horse and ox than in the human subject, and performs a very important part in all diseases of the pleura, especially in such as are of a chronic kind, in which it often becomes hypertrophied and abnormally dense. It supports the tender ramifications of the vessels, both arterial and venous, as they proceed towards the substance of the serous membrane ; and the filaments of which it is com-

posed are interwoven with each other in every possible direction, forming thereby an inextricable net-work.

In the normal state, the pleura is perfectly colorless, no vessels of any kind being any where perceptible. Nor does it possess much animal sensibility. In several cases in which the chest was punctured by the elder Monro, he introduced a curved probe, and rubbed the point of it against the pleura, without the patient experiencing the slightest pain or uneasiness. He also repeated the experiments of Haller, of pricking and even lacerating the membrane, after removing the intercostal muscles, with precisely the same results.

Although, to the naked eye, the free surface of the pleura is perfectly smooth, yet this is rather apparent than real; for, when carefully examined with the aid of a magnifying-glass, it is found, like the rest of the serous membranes, properly so called, to be studded with an immense number of the most delicate villi, which give it somewhat of a rough aspect. Concerning the precise nature of these minute eminences we have no positive information. In chronic inflammation, they are frequently rendered visible to the naked eye, and impart a rough, gritty sensation to the finger.

Excepting the arachnoïd tunic of the brain and spinal cord, none of the serous sacs, in the normal condition, contain any fluid. This, I know, many have doubted; but reiterated examination of the inferior animals, as well as of persons who came to their end by sudden death, has fully persuaded me of the entire truth of the proposition here stated. Naturally the serous textures are lubricated merely by a sort of vapor, which is designed to facilitate the movements of the organs over which they are reflected, and which is evidently an emanation from the capillary vessels distributed through their substance.

With respect to their structure, the serous membranes may be regarded as a modification of the cellular tissue, since they may all be resolved into this substance by different mechanical and chemical processes. They are highly extensible and elastic, and, notwithstanding their tenuity, they possess no inconsiderable share of strength and firmness. By stretching a portion of peritonæum over a hoop, Scarpa found that it did not give way until a weight of fifteen pounds was placed on its surface. Their extensile properties are well displayed in pregnancy, dropsy, and hernial protrusions.

The proper serous membranes are only six in number:

1. the arachnoïd tunic of the brain and spinal cord; 2. the lining of the heart and pericardium ; 3. the two pleuræ ; 4. the peritonæum ; 5. the vaginal coat of the testicle. To these some have added the amnios, one of the envelopes of the fœtus, the membrane of Jacob, and certain structures of the internal ear, which all bear a considerable resemblance to the serous tissue, but the precise nature of which is still undetermined.

The diseases that will be treated of in the present section are, inflammation, with its ordinary consequences, and malignant growths. The first of these affections may be acute or chronic, partial or general ; that is, it may be limited to a small portion of the pleura, or pervade the entire membrane. Occasionally, too, though this is unusual, it attacks both sacs simultaneously. When the inflammation affects the pulmonary pleura, it often extends to the parenchymatous structure of the lungs, — a circumstance which gave rise, amongst the older practitioners, to the opinion that it was impossible for pleuritis ever to have an independent existence. The first writer that controverted this doctrine was Baldi, who published a work on Thoracic Diseases, at Paris, in 1640. A similar view was advanced, about forty years after, by the celebrated Hoffmann, of Germany ; and, in 1740, precisely a century from the period the subject was first broached in France, the question was finally settled by the writings of Triller, a physician of Prussia. Since that time, fact upon fact has been accumulated, and the subject no longer admits of the slightest disputation.

The anatomical characters of *acute pleuritis* consist in a change of color of the affected membrane, with an increase of its secretion, an altered state of the subserous cellular tissue, and a change in the form and volume of the lung, invested by the inflamed texture.

As soon as the pleura is irritated, the subjacent capillary vessels become injected with red blood, and spread out in every possible direction, anastomosing freely with each other. In this way they form, at first, beautiful dendritic lines, and afterwards, as the disease progresses, a close and intricate mesh-work, the intervals of which are often much smaller than the most delicate pin-head. The color produced by this capillary injection is usually a bright red ; and, although it generally occurs in small patches, with sound portions intervening, yet in many instances, it is diffused over a considera-

ble extent of surface, occupying the greater part of the entire membrane.   In very mild cases, we have sometimes the speckled, dotted, or punctiform redness ; as, in those of an opposite character, we sometimes have the blotched, echymotic, or bloodshot appearance.   In the early stage of the disease, the capillary vessels upon which this discoloration depends, seem to be confined, as already intimated, to the subjacent fascia ; but, by degrees, as the inflammation advances to completion, they extend into the substance of the pleura, as any one may convince himself by peeling off this membrane, and inspecting it by the aid of a good glass, or by holding it simply between the eye and the light.

In most cases of acute pleuritis, there is an effusion of serosity into the subserous cellular texture, which is sometimes so great as to give the affected membrane an œdematous aspect.   This infiltration, which usually begins at a very early stage of the disease, is always more abundant under the pulmonary than under the costal or diaphragmatic pleura, from the more considerable laxness of the connecting tissue. The serous membrane itself is not at all thickened, though the contrary, I know, has been asserted by numerous pathologists.

In acute pleuritis, as in the corresponding disease of the arachnoïd, pericardium, and peritonæum, there usually occurs, in the nascent stage of the complaint, if not an entire suppression, at least a considerable diminution, of the natural secretion ; so that the membrane, instead of being moist and lubricated, as in the normal state, is rendered somewhat dry and harsh.   But this state continues only for a very short period, when it is followed by an effusion of serum and lymph.   Some of the French pathologists suppose that this effusion takes place the very moment the inflammation sets in ; or, in other words, that they proceed with equal pace. The truth of this position, however, is by no means established ; indeed, it may well be doubted, I think, whether it holds good under any circumstances, further than as an exception to a general rule ; for it is satisfactorily ascertained, that a diminution, if not an entire suspension, of the exhaling process, is one of the very first effects of acute pleuritis, as it is of acute inflammation of every other serous membrane in the body.

The quantity of fluid poured out in this affection varies from a few drachms to several quarts.   Generally thin,

watery, and colorless, it is sometimes reddish, and slightly flocculent ; or it resembles unclarified whey, and contains masses of lymph, pus, or blood.   Occasionally, the fluid is of a yellowish, viscid character, not unlike copal varnish or thin olive oil.   An exhalation of pure blood is sometimes witnessed ; but this is much more infrequent than in acute pericarditis, or in acute inflammation of the serous membrane of the abdomen.

It is very seldom that genuine pus is secreted in this disease, yet such cases sometimes take place, with very great rapidity.   In the winter of 1837, two cases occurred to me, one in a boy, nine years old, and the other in a child of ten months, in both of which upwards of a pint of thick cream-colored matter was found in the pleural cavity after an illness of only about two weeks.   Piso relates several instances of acute pleuritis, in which the patients died on the fifteenth, and some even as early as the ninth day, with their chests full of pus ; and similar examples are recorded by Andral, Townsend, and other pathologists.

Concurrently with this effusion of serosity, there is a deposition of lymph, occurring either in small globules, in patches, or in continuous layers.   At first, this substance is quite soft, so that it can be easily scraped off with the finger-nail ; but, after it has existed for a few days, it is found to have a considerable degree of tenacity, and to exhibit the usual manifestations of incipient organization.   The precise period at which this process begins cannot be satisfactorily indicated, as it must vary in different cases ; yet, as a general proposition, it may be affirmed to be from forty-eight to seventy-two hours from the invasion of the disease.   The color of this deposition is usually a pale lemon, but not unfrequently it is a milky white, light gray, or even reddish, from the admixture of blood.

If the inflammation be early arrested, the effused fluid is gradually absorbed, and the contiguous surfaces of the serous membrane, being covered with lymph, are brought into contact, and speedily cemented together.   The adhesions thus formed, are at first very slight and easily broken ; but, in process of time, they are converted into cellular tissue, and become proportionally strong and resisting.   When extensive, they often greatly embarrass the movements of the lungs, at the same time that they exert a very serious influence upon the size and figure of the chest.

If, on the other hand, the disease be allowed to progress, until the effusion amounts to several quarts, it requires to be let out by puncturing the chest, the absorbents being no longer capable of taking it up. The wound thus made occasionally heals kindly ; and, if the fluid does not reaccumulate, the patient has a chance of getting well, the parts contracting adhesions, as in the preceding case, and the lung becoming again dilated by the introduction of the air. It deserves to be mentioned that, when the quantity of fluid is considerable, the adventitious membranes are apt to be quite thick, and to have their outer surface pitted like a honeycomb. Of the manner in which the lung is affected in this disease, I shall speak more particularly under the head of chronic pleuritis.

Gangrene is one of the rarest results of acute pleuritis. As a primary affection, I have never seen an instance, and Laennec met only with a single case in the whole of his long experience. Nor have others been more successful. Most commonly it is produced by external violence, and occasionally it is propagated from the pulmonary tissue. The affected parts may be readily distinguished by their softened, pulpy condition, by their dark grayish, brownish, or blackish color, and by their disagreeable, fetid odor. In some instances, the affection appears to begin in the adventitious membranes, from whence it gradually spreads to the other structures, such as the pleura, the lungs, intercostal muscles, and even the ribs.

The *symptoms* of acute pleuritis, as might be expected, are much influenced by the extent of the disease, and by the length of time it has existed. In general, there is inflammatory fever, with violent pain in the side, dyspnœa, a hard, dry cough, and inability to lie on the affected side. Having lasted for a day or two, these phenomena are followed by others, such as dulness of sound on percussion, bronchial respiration, a peculiar modification of the voice, and, finally, a complete absence of the respiratory murmur.

The pain is usually circumscribed, no matter what may be the extent of the inflammation, and is of a sharp, stitch-like character, increased by coughing, by deep inspiration, by pressure on the intercostal spaces, or by lying on the affected side. The situation where it is most commonly felt is the mammary region, whence it often shoots along the axilla, the clavicle, top of the shoulder, upper part of the back, or even

the arm and fore-arm. In the latter case, the pain seems to be reflected along the course of the intercosto-humeral nerves, from their participating, probably, in the disease of the serous lining of the chest, immediately beneath which they lie.

In acute pleuritis, the countenance is generally expressive of deep suffering, and the respiration is short, hurried, and jerky, from the inability which the patient experiences in inflating the lungs with air. These phenomena, together with the dry, hacking cough, and the sharp, lancinating pain, may be regarded as pathognomonic of this, one of the most frequent and distressing complaints with which we have to contend in this country.

When acute inflammation of the serous membrane of the chest continues beyond a few weeks, it becomes chronic; but it is by no means always thus preceded; for, in many instances, it exists as an original affection, stealing on in a slow and almost insensible manner. In whatever way, however, it may arise, the anatomical characters do not differ essentially in the two diseases, especially as far the effusions are concerned.

In *chronic pleuritis*, the membrane acquires a slight degree of morbid thickening, its color is of a more obscure red, and the subserous cellular tissue is hypertrophied and indurated. This, however, is not always the case; for, in some instances I have found this substance so soft and brittle that the pleura could be peeled off, almost entire, with the utmost facility. The effusion, which is generally much more abundant, as well as less limpid, than in the acute disease, is almost always mixed with lymph. Hence, when evacuated, and allowed to stand at rest, it usually separates into two parts; one thin and viscid, like serum, floating on the top; the other, which consists of fragments of albumen and serum, sinking to the bottom. Most commonly, perhaps, the effusion is of a light lemon color, of the consistence of thin oil, and destitute, or nearly so, of odor. Frequently, however, it is of a dark greenish hue, sero-purulent, and almost insupportably offensive. Cases also occur in which it contains blood, and now and then it is strictly purulent, possessing all the properties of genuine pus. The quantity of effused fluid is sometimes almost incredible. In a subject, fifty-two years old, I drew off, not long ago, fully two gallons of sero-purulent matter, from the right pleural sac : it was of a white yellowish color, and intolerably offensive. Occasionally, when the distension

is very great, the fluid has a tendency to work its way out, either through the bronchial tubes, through the intercostal spaces, or even through the diaphragm. Of the latter mode of escape, an interesting case is given by Andral, and another by Le Dran, in his surgical observations. When the patient survives, as sometimes happens, the passage along which the pus travels becomes lined with an adventitious membrane, as are fistulous tracks in other parts of the body.

The adventitious membranes of chronic pleuritis do not materially differ from those that are produced by the acute form of the disease, excepting that they are generally thicker, more extensive, denser, and more firm. Oftentimes they consist of a number of distinct layers, the outer of which are always much softer than the internal, or those which are formed first. Repeatedly have I seen from three to five such lamellæ ; and, on several occasions, it has occurred to me to meet with small compartments, formed by sheets of lymph, and filled with a thin, glairy fluid, not unlike the white of egg. Occasionally these cavities contain thick pus, and even pure blood. Soon after their deposition, these false membranes become organized, and consequently subject to the same diseases as the natural tissues ; for example, to the effusion of serosity, lymph, pus, or blood, gangrene, tubercles, and, lastly, fibrous, cartilaginous, and osseous transformations. Their vascularity is sometimes very considerable, as is shown by the red dots which are seen upon their free surface, as well as by the clots of blood found in their cavities. Thus, then, when these abnormal textures are organized, it is sufficiently clear, from what has been stated, that they perform the office of secretion ; and, from the fact that the effused fluids sometimes entirely disappear, it is equally manifest that they possess, in a very eminent degree, the faculty of absorption.

Small, bony *concretions*, very much like those of the joints, are sometimes found floating loosely about in the effusion. How these bodies originate, has long been a problem with pathologists ; but the most plausible explanation, perhaps, that can be offered concerning them, is to suppose that they are attached, at first, to the surface of the pleura, in the form of fibrin ; secondly, that they are organized ; thirdly, that, their nutrition being perverted, bony matter is deposited ; and, fourthly, that, after this process has continued for some length of time, the vessels supplying them are obliterated, and they drop off. Instead of being osseous, these concre-

tions are sometimes of a fibrous, fibro-cartilaginous, or gristly consistence, and of a white pearly color, with a tolerably smooth surface.

Gases sometimes accumulate in the chest, being either secreted there by the serous membrane, generated by the decomposition of effused fluids, or introduced from without, in consequence of a wound, a fistulous aperture, or the bursting of a tubercle. In the two former cases, they often have the odor of sulphureted hydrogen, and, on the chest being punctured, escape, with a loud hissing noise. When very abundant, these gases seem to be incapable of absorption; and their presence, therefore, may occasionally become a source of much inconvenience, by the pressure which they exert upon the lungs. Dr. Davy, of Edinburgh, has analyzed the air collected from a patient who died of *pneumo-thorax*, and found the following proportions: carbonic acid, 12.5; nitrogen, 85.5; oxygen, 2. Professor Apjohn, of Dublin, in a similar experiment, found, in one hundred parts, 8 of carbonic acid, 10 of oxygen, and 82 of nitrogen.

Ulceration of the pleura, though occasionally observed, is yet to be considered as very rare, and hitherto I have witnessed only a single instance of it. The patient was a female, fifty-five years of age, who died of hydro-thorax, complicated with pulmonary tubercles. On opening the chest, which contained an immense quantity of sero-purulent effusion, five ulcers, of an oval shape, were seen upon the left costal pleura, the largest of which was about an inch and a half in diameter: their surface, formed by the subserous cellular tissue, was bathed with bloody matter, and their edges were red, indurated, and slightly everted. The parts around were of a brownish color, deeply injected, and considerably incrusted with lymph. The lung contained hundreds of tubercles, in every stage of developement; and in the upper lobe was a large excavation, the margins of which firmly adhered around the principal ulcer of the pleura. Such erosions, perhaps, seldom or never heal. In fact, it is doubtful whether they are susceptible of it.

Another affection which is sometimes noticed, and which is also very rare, is *ossification* of the pleura. The bony matter, which usually appears in thin, narrow plates, is probably always preceded by cartilage, as is shown by the fact that these substances often occur together, the former being encircled by the latter. Laennec states that he once met with

a cartilaginous incrustation of the serous membrane of the chest as large as the hand, and more than half an inch thick in the centre.   The costal pleura seems to be the part most frequently affected by these transformations, though the pulmonary and diaphragmatic portions are not exempt from them.   Their original seat is the subserous cellular tissue, the involvement of the serous membrane itself being entirely secondary.

Tubercles are also rarely met with, — seldom if ever, except in connection with adventitious membranes and liquid effusions.   I have seen two instances of this disease, in both of which the tubercles were very large, — most of them of the size of a hazelnut, of an opaque, whitish appearance, and surrounded by inspissated lymph : they adhered with great firmness to the costal pleura, which was itself considerably thickened, and to the knife they offered all the resistance of the fibro-cartilaginous tissue.   Laennec, who supposes that these bodies generally originate in the false membranes, describes them as varying in size from a millet-seed to a hemp-seed ; as being of a grayish or yellowish color, semi-transparent or opaque, and as lying in close proximity to each other, with the intervening structure in a state of high vascularity.   Tubercles are sometimes developed with great rapidity.   Thus, Andral states that he has seen the abnormal membranes studded with these bodies in persons who died of acute pleuritis of only fifteen days' standing.

Schirrhus and encephaloïd are sometimes found in the pleura ; but their occurrence is so very unusual that it is unnecessary to say any thing about them in this place.   The same remark may be made respecting those cysts which have occasionally been noticed in this situation, and of which such an interesting case has been given by the late Baron Dupuytren of France.*

The *lung*, as might be anticipated, is variously affected in pleuritis, both acute and chronic.   When the effusion is very considerable, the organ is sometimes so much compressed, that, without a careful examination, it might be regarded as totally destroyed.   Repeatedly have I seen it reduced to the smallest possible size, lying like a thin cake, scarcely bigger than a child's hand, in the back part of the chest, beside the spinal column.   When thus atrophied, the parenchymatous

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* Cruveilhier, Essai sur l'Anatomie Path. Paris, 1816.

texture is peculiarly hard and dense, void of crepitus, pale, and almost bloodless, the vessels being flattened, and, in some instances, partially obliterated. If the lung continue in this state for a considerable period, it becomes hepatized, or, as is more generally the case, tuberculized, and entirely unfitted for the purposes of respiration. On the contrary, should the fluid which has occasioned the compression be speedily absorbed, the pulmonary tissue will gradually expand, and finally be as pervious to the air as ever. The only exception to this rule, so far as I know, is where the organ is tied firmly down, as I have several times witnessed, in the hollow between the spine and ribs, by shreds and layers of lymph; in which case, if I may so express myself, it will remain permanently strangled.

Nor is the alteration confined to the lung. Whenever the effusion is great, the affected side becomes manifestly larger; the intercostal spaces being not only remarkably wide, but projecting occasionally considerably beyond the level of the ribs. The diaphragm, also, is more or less depressed, and the heart is often thrust from its natural situation, either to one side, or down into the epigastric region. The extent of the dilatation varies in different cases, but does not in general exceed two inches. The best way of ascertaining how much enlargement there is, is to adopt the plan suggested by Dr. Townsend, of Dublin, which consists in measuring both sides with a tape, carried from a central point in the sternum under the mamma to the spinous process of the corresponding vertebra. The eye alone, however, is often quite sufficient to detect the difference, even when it amounts only to six or eight lines.

Sometimes the reverse of this phenomenon is observed, the chest, instead of being dilated, being considerably contracted. This diminution, which results from the complete absorption of the effused fluid, and from the conversion of the adventitious membranes into fibrous, cartilaginous or bony matter, is generally accompanied by a loss of resonance in the affected side, and by a very marked alteration of the respiratory murmur, — effects which usually continue for a long period after the cure of the disease, and not unfrequently during the remainder of the patient's life. A very rapid contraction of the chest sometimes takes place after the operation for emphysema. Dr. Townsend mentions the case of an individual, aged twenty years, in whom, in the space of nine days, the

circumference of the diseased side diminished nearly three inches by the falling in of its osseous parietes.

Chronic pleuritis as has been already stated, is the consequence, most generally, of the acute form of the disease; yet sometimes it is primary, and then its approaches are often so obscurely marked that it may have existed for a considerable length of time, and extensive effusion taken place, before the patient is led to suspect the slightest mischief. When chronic pleuritis is the relic of acute, the individual does not gradually or suddenly regain his health as is usual after active depletion; on the contrary, he remains weakly, feels some oppression in the chest on lying down, experiences shortness of breath on ascending a flight of stairs, and has a slow fever at night, followed, towards morning, by copious perspiration. The cough is irregular, short, and tickling, and the pain is commonly not severe, the stitch which marks the acute disease being seldom present, or, if present, only occasional in its occurrence. Sometimes, indeed, the disorder may be said, so far as this symptom is concerned, to be perfectly latent, the pleura being greatly disorganized, and even profoundly suppurated, without the person having ever complained of the least pain. Baglivi and Morgagni have transmitted the history of several cases of this kind; and similar testimony is borne by numerous writers of a more recent date. This is an important fact, which renders it highly imperative upon us always to watch our patients after an attack of acute inflammation, and not to neglect the stethoscope whenever there is the slightest suspicion of lurking disease.

When the individual, laboring under chronic pleuritis, sits up, he is often free from any marked inconvenience; but no sooner is he asked a succession of questions, or requested to cough, or to walk across the room, than the chest begins to heave, the respiration becomes hurried, and there is a sense of tightness and oppression, from which it will take some time to recover. Firm pressure on the abdomen or on the affected side will produce the same result. But one of the most remarkable symptoms in chronic inflammation is the position which the patient assumes in bed : in the acute disease, he lies invariably almost on the sound side ; in that under consideration, on the contrary, he lies on the affected side, on the back, or in an intermediate posture.

Such are the more prominent phenomena which denote the existence of chronic pleuritis. It only remains for me, there-

fore, in connection with this topic, to speak of the physical
signs of this malady, — a subject which has been so happily
elucidated by the labors of the immortal Laennec, that little
has been left to be done by succeeding pathologists.   These
signs, which are to be drawn from a stethoscopic examination
of the patient, do not differ in any respect in the two forms
of the disease which we have been considering, except that
in the chronic there is less frequently that shrill, jerky, tremu-
lous sound, which, from its resemblance to the voice of the
goat, has received the name of *ægophony*.

In the early stage of pleuritis, there are no physical signs
to indicate its existence ; but, as soon as effusion has taken
place, they become at once prominent and expressive.   Thus,
when a stratum of liquid intervenes between the lungs and
the walls of the chest, there must necessarily be dulness on
percussion, with diminution or absence of the respiratory
murmur.   This will be the case even when the quantity of
effusion is small ; but, should it be abundant, the lungs will
be greatly compressed, and the respiration be bronchial, from
the fact that the air can no longer gain admission into the
vesicular structure.

The dull sound is, in most cases, originally observed at the
inferior part of the affected side, from whence it gradually
ascends as the effusion becomes more copious ; and as it
changes, likewise, with the position of the patient, it thus de-
termines very accurately the level of the extravasated fluid.
The principal exceptions to this rule are, where the lungs
have contracted extensive adhesions, and the fluid occupies
almost the entire cavity of the thorax.   Examples of these
occurrences are not unfrequently met with in our dissections.
In the fifth volume of the Dublin Hospital Reports, two
remarkable instances of empyema are detailed by Professor
Stokes, in both of which the lungs were attached from their
summit to their base by a vertical adhesion of several inches
in breadth.   Similar instances have been published by other
writers, and of the influence which they exert over the
physical indications of pleuritis, every one must be fully
aware.   Dulness of sound alone cannot be regarded as
pathognomonic of the disease, as it may arise from other
causes than from effused fluid ; for example, from hepati-
zation of the lungs, or from an excessive developement of
tubercles ; still it should never be overlooked, inasmuch as,
when taken in connection with other signs presently to be
noticed, it will much aid our diagnosis.

The alteration of the respiratory murmur is always in direct ratio to the thoracic effusion, being deep and feeble when the quantity of fluid is moderate, but entirely wanting when it is very abundant, except along the spinal column, where it is still somewhat audible over a space of a few inches in breadth.   Sometimes the respiratory murmur survives the dulness of sound for several days ; and, not the least remarkable circumstance connected with this subject, is, that the crepitation after having ceased in all other parts, except along the dorsal vertebræ, often continues to be heard under the clavicle, from the adhesions between the pulmonary and costal pleura in this situation in phthisis.   This continuance of the breathing murmur towards the root and apex of the lungs, with its disappearance, either gradually or uddenly, from other parts of the organ, is generally sufficient to distinguish pleuritis from inflammation of the substance of the lung, in which the diminution or absence of this sound is invariably preceded by what is termed the crepitating rhoncus, and in which are ordinarily to be observed traces of the admission and expulsion of air.*

Another physical sign which we may sometimes recognize in pleuritis, especially in the acute form of the malady, is a peculiar *friction sound*, not unlike what is produced by rubbing against each other two pieces of sole-leather.   The cause upon which this depends is easily explained.   In the normal state the contiguous surfaces of the pulmonary and costal portions of the pleura are constantly bedewed with a thin, viscid exhalation, by which they are enabled to glide smoothly and imperceptibly over each other ; but, as soon as they become inflamed, they pour out plastic lymph, which adheres to them in different places, and renders them so rough as to thwart their physiological object.   Thus the movements of the lung are materially impeded, and the sound which attends them is heard both during inspiration and expiration.   We need scarcely remark that this sign can only be detected so long as there is no effusion of serosity.   Hence it is usually most distinct in the early stage of the disease, or after the accumulated fluid has been absorbed.

Ægophony is commonly most distinct towards the inferior parts of the chest, in the interval between the nipple and the spine ; but it changes its place whenever the patient assumes

* Laennec on Auscultation, p. 65.

a different position, and seems constantly to follow the upper level of the fluid. It does not exist either in the very early or in the more advanced stage of pleuritis; is heard only so long as the effusion is moderate, or a few lines in depth; disappears when it becomes more abundant; reappears when it diminishes; and finally ceases altogether, when it is absorbed. This phenomenon, considered by some writers, though erroneously, as pathognomonic of pleuritis, has been variously accounted for. Laennec ascribes it to the transmission of the voice through the compressed lung and the fluid which is interposed between this organ and the wall of the chest; whilst others, with more plausibility, suppose that it depends upon the air not penetrating beyond the larger bronchial tubes,— an opinion which is strengthened by the fact just mentioned, that, whenever the quantity of effusion is so great as to exert a considerable degree of pressure upon the pulmonary tissue, the ægophony is entirely absent, reappearing as the matter is absorbed and the pressure diminishes.

Besides these signs, which may be regarded as unequivocal evidences of pleuritis, fluctuation can often be distinctly felt through the intercostal spaces; and, on some occasions, a splashing noise is to be heard within the chest, resembling that produced by agitating a cask partly filled with water. Another test of thoracic effusion, first suggested, I believe, by Bichat, is the effect of pressure on the corresponding side of the abdomen. The diaphragm, with the fluid resting upon its upper surface, is thus thrust into the chest, and, the lung being greatly compressed, an insupportable sense of suffocation is produced. The value of this test, however, has been recently disputed by Chomel and Townsend, who assert that in most of the cases in which they have employed it, the result was the very opposite to that just stated. Important diagnostic signs may also be drawn from the figure of the chest, and from the fixed position which the ribs assume when this cavity is much dilated or contracted.

When the effusion is combined with gaseous matter, or when the latter exists alone, the physical signs are very nearly as they have just been described, excepting that there is often a remarkable tympanitic clearness on percussion, and a peculiar metallic tinkling during the act of respiration. This sound, which resembles that of the Jews-harp, may also be easily imitated by the dropping of a pin into a tumbler, or by touching gently a sonorous vessel with a quill.

CHAPTER IV.

Of the Heart and its Membranes.

SECTION I.

Of the Pericardium.

THE first disease of which we shall speak is *pericarditis.*
This is unquestionably of much more frequent occurrence
than is generally supposed by the profession. Most com-
monly induced by vicissitudes of temperature, and by exter-
nal violence, it often exists in combination with rheumatic
affections of the fibrous tissues, with pneumonitis, pleurisy,
and the autumnal remittent fevers of the United States and
other countries. In the acute variety of the disorder, the
leading anatomical characters which are to be observed in
such as die, are, preternatural redness of the lining mem-
brane, effusion of serum, and exudation of lymph.

It is rare to find the redness very bright; most generally it
inclines to a purple or light brownish tint. Presenting itself
under a great variety of forms, it is sometimes seen in small
dots, sometimes in arborescent lines, sometimes in considera-
ble patches. In all these cases, the surface of the pericar-
dium has a mottled appearance, from the intervening portions
of the membrane retaining their natural color. Not unfre-
quently, however, the part is almost free from this, the vascu-

larity, even when the inflammation is very intense, being extremely slight, or having so far disappeared, when the inspection is made, as to be scarcely visible. Very rarely is the redness uniformly diffused over the whole bag ; when this happens, the inner surface exhibits a stained appearance, as if the color had been dyed into it.

When the disease becomes chronic, or is so from the onset, the redness diminishes in intensity, and assumes a mahogany, brownish fawn, or cinnamon tint. The effused lymph, of which we shall presently speak, often acquires the same color, and the heart itself is usually of a bluish-white appearance. Neither in this, nor in the acute variety of the disease, does the serous membrane undergo much change. Its thickness and consistence are precisely as in health ; and although its surface is often roughened, yet this is altogether an adventitious circumstance, produced by the deposition of lymph.

Soon after the disease is fairly established, the lining membrane pours out a thin, *watery fluid*, either of a clear, limpid appearance, or of a light citron color, slightly inclining to greenish. This fluid is coagulable by heat, alcohol or acids, and is to be regarded simply as an increase of the natural secretion. In many cases, it contains fragments of lymph ; in others, it is mixed with pus, or even with pure blood ; or all these substances are found at the same time. The effusion of blood is always indicative of high inflammatory irritation : it may be a simple exhalation from the lining membrane, or it may proceed from a rupture of some of its vessels. The quantity of serum thrown out during the first two, three or four days, is generally considerable, amounting often to ten or fifteen ounces. After this, as the violence of the disease subsides, it gradually disappears by absorption, so that in the course of a week or two scarcely any of it is left. In chronic pericarditis, the serum has usually a singularly lactescent, puriform character, and is much smaller in quantity than in the acute form of the disease. When the fluid remains unabsorbed, it gives rise to what is called *hydropericarditis*. The quantity in such cases is sometimes very great. Corvisart relates one in which it was eight pounds.*

The quantity of *purulent matter* thrown out in chronic pericarditis is sometimes astonishingly great. In the case of a colored man, thirty years old, mentioned by Dr. Wright, an

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* Organic Diseases of the Heart, p. 63. Philadelphia, 1812.

eminent physician of Baltimore, the quantity is said to have
exceeded a gallon. It was of a uniform consistence, and of
a light yellowish color, exhibiting all the qualities of lauda-
ble pus. The pericardium, from the lining membrane of
which this immense accumulation of matter proceeded, was
excessively dilated, and both lungs, in consequence, were
thrust high up into the thoracic cavities. The heart was of
the ordinary size, and not particularly diseased.* In the acute
form of the complaint, pus is rarely observed, and never to
so great an extent as in the chronic.

Contemporaneously with the effusion of serous fluid is the
exudation of lymph, which is at first of a pale straw color,
and of a soft, viscid consistence, but which in a short time
acquires a light grayish, opaline tint, and a firm tenacious
character. Though occasionally deposited in small, detached
patches, it commonly forms a continuous layer, which is
spread over the opposing surfaces of the pericardium, both on
the heart and on the origin and termination of the great ves-
sels. The thickness of the false membrane seldom exceeds
a line, from which it may vary, in some instances, to nearly
an inch, being generally much more considerable than the
false membrane of pleuritis. The adherent surface is smooth,
and accurately adapted to the parts upon which it reposes ;
the other is rough, flocculent, and often marked with small
depressions, which give it a singularly reticulated aspect, not
unlike a piece of lace-work, a sponge, or a honey-comb.
This appearance, which is seen only in recent cases, results
from the incessant movements of the heart, and may be
pretty closely imitated by pulling apart two plates united by
a thick layer of butter.

After this membrane has been for some time formed, it
becomes organized, — vessels shooting into it from the sur-
rounding parts in the same manner as in the adventitious
structures in other situations. In this way, it may become
the seat of subsequent attacks of inflammation, or of tuber-
cles and various other transformations. Whilst the process of
vitalization is going on, the exudation is gradually deprived
of its more fluid ingredients, until at length it is completely
converted into dense, grayish cellular tissue, cementing the
contiguous surfaces closely and inseparably together. Of this
I have seen a number of specimens, two of which are now

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* American Journal of the Medical Sciences, vol. xii. p. 33.

in my museum. When the lymph is very thick, it sometimes assumes a laminated arrangement ; in other cases, it is drawn out into transverse wrinkles, or into long, slender filaments.

In chronic pericarditis, the false membrane sometimes contains plates of cartilage, and even small specks of bone. Occasionally we meet with compartments, filled with pus, serum, or puriform fluid ; and cases also occur, and this not unfrequently, in which the lymph is studded with tubercles. In a preparation which I took from the body of a colored man, ninety years old, the adventitious membrane, which is about a third of an inch thick, contains from fifteen to twenty of these bodies, some of which are as large as a common cherry-stone. They are of a light straw color, quite hard and dense in their texture, and seem to be firmly embedded in the substance of the abnormal tissue.

The muscular substance of the heart, in this disease, often remains wholly free from inflammation ; sometimes, however, it is found to be considerably changed in its color and consistence, — circumstances which would lead us to infer that it had participated in the derangement of its investing membrane. The organ is, in some instances, partially atrophied, from the pressure, probably, which it suffers from the effused fluid. When it has been long united with the pericardium by lymph, it is not uncommon to find hypertrophy and dilatation of the ventricles, with ossification of some of the valves, and softening of the muscular tissue. These disorders are brought about, no doubt, by the great exertions which the heart is obliged to make, in consequence of its restrained and shackled condition. Unable to act with its accustomed freedom, its fleshy fibres are in a state of constant congestion, and its chambers in a state of constant distention ; whence results, on the one hand, hypertrophy, and, on the other, dilatation of the auricles and ventricles.

Pericarditis has been observed at all periods of life, though it is undoubtedly most common after the age of forty, in persons who are naturally predisposed to gouty and rheumatic affections. The late Dr. Billard was led to suppose that it occurs most frequently in new-born infants. In seven hundred autopsic examinations which he made at the Foundling Hospital of Paris, he observed seven well-marked cases of this disease, two of which proved fatal in less than forty-eight hours after birth. In one of the children who died thus early, the adhesions between the pericardium and the heart were so

strong as to lead to the belief that the malady had existed for some time prior to birth. In the other six cases, the adhesions were much weaker, and there was also a considerable quantity of sero-albuminous effusion.*   Pericarditis, when occurring at this tender age, generally runs its course with great rapidity, and without affording any signs which can be considered at all as diagnostic. The little patients, according to Billard, appear to suffer violent pains, the respiration is greatly embarrassed, the muscles of the face are continually contracted, and there are occasional paroxysms of impending suffocation.

" There are few diseases," says Laennec, " attended by more variable *symptoms*, or of more difficult diagnosis, than pericarditis. Sometimes it appears with all the symptoms of a very violent disease of the chest, obviously calculated to carry off the patient in a few days. At other times, it proves fatal without leading us in the least to suspect its existence. Again, we find cases marked by all the symptoms usually attributed by pathologists to this disease, and in the subjects of which, after death, we discover no traces of its presence. I have myself," continues this celebrated individual, " frequently fallen into both errors, and I have seen the same thing happen to the most skilful practitioners." †   One of the great difficulties connected with the diagnosis of this affection, is the circumstance of its being generally complicated, as was before remarked, with pleuritis, inflammation of the lungs, or some other thoracic disorder, which masks its peculiar character, and deceives the physician.

The pain in acute pericarditis is generally of a pungent, burning, lancinating kind, and, as in acute pleuritis, often extends to the top of the shoulder and upper-arm : it is augmented by a full inspiration, by stretching the left side, or by pressure over the præcordial region or between the fifth and sixth ribs. The patient lies almost always on his back ; he is harassed with a dry, hacking cough ; the respiration is hurried and irregular ; the countenance is expressive of deep anxiety ; the features are contracted ; there is cardiac palpitation, with a peculiar disposition to faintness ; and the pulse is always frequent, and generally, at the onset, full, hard, and

* Traite des Maladies des Enfants Nouveau-nés, p. 624.   Paris, 1837.
† Treatise on Thoracic Diseases, by Forbes, p. 675.

jerky, the stream of blood being sent with a peculiar thrill. This state of the artery, however, usually continues only for a few days, when the pulse becomes very small and frequent, or even insensible.

, In some instances, a sound similar to the creaking of new leather is heard, which, however, seldom lasts longer than a few hours, and cannot therefore be considered as of much value. Very recently, Dr. Watson, of London, has called attention to, a symptom which, in most cases, furnishes a certain ground of diagnosis. It consists in a *superficial murmur*, heard equally during the systole and diastole of the ventricle. This murmur appears to be produced by the rubbing of the contiguous surfaces of the pericardium, roughened by lymph, and is designated by Dr. Watson by the term *to and fro sound*. The noise is not always to be recognized, however, with the same degree of distinctness : it is loudest when there is no serous effusion, and often entirely disappears when the quantity of fluid is great, becoming again audible as it diminishes. In this respect, it is analogous to ægophony. Very generally a systolic murmur is also heard, produced, it is probable, by a roughened state of the valves.

When there is much accumulation of fluid, whether in consequence of acute or of chronic pericarditis, the præcordial region sounds dull on percussion, and often becomes preternaturally prominent, in the same manner as the thorax does in pleuritic effusion. The projection is sometimes evident over a space of four or five inches in length, by three and a half in breadth. The pulsations of the heart are often perceptible on inspection, always irregular, tumultuous, and obscure. If, with these phenomena, the patient is unable to lie on his back without being threatened with instant suffocation, and is subject to frequent paroxysms of swooning, no doubt can be entertained of the true nature of the complaint.

It is surprising how large a quantity of fluid may occasionally exist in the pericardium, and yet the patient scarcely manifest any symptoms of uneasiness. In the case detailed by Dr. Wright, to which I previously adverted, although the pus amounted to four quarts, there was not the slightest appearance of impeded cardiac action ; the pulse was free, moderately full, and regular ; there was no embarrassment of breathing, no distress of countenance, no syncope, no præcordial pain, no œdema of the extremities. The patient could lie equally well on either side, and, the day before he died,

walked about the wards of the hospital with apparent ease. The formation and accumulation of this immense quantity of purulent fluid were obviously the work of time, and had commenced long before the man's last illness.

The signs of adhesion of the pericardium are generally very obscure. Perhaps the most characteristic symptom is an abrupt, jogging motion of the heart, recognizable by the hand or stethoscope placed over the præcordial region. When the lesion is joined with hypertrophy of the left ventricle, a bellows-murmur is occasionally heard, and not unfrequently the apex of the organ strikes with so much violence against the costal cartilages, as to produce a marked prominence.

We have already mentioned, that, in cases of violent pericarditis, there is sometimes an effusion of pure *blood.* In most cases, the fluid, amounting frequently to upwards of a quart, is coagulated ; occasionally, however, it is liquid, exceedingly dark, and almost destitute of fibrin. On examining the pericardium, in persons who succumb under this lesion, it is generally impossible, after the most diligent search, to discover any ruptured vessels, from which the blood might have flowed. Whence, then, does the fluid proceed ? In one way alone can this question be satisfactorily answered : taking into consideration the fact just stated, that the vessels of the pericardium always retain their integrity, and the analogy afforded by the serous textures in other situations, under like circumstances, it may be concluded that the blood, in these cases, is the result simply of a process of exhalation, dependent upon an altered condition of the capillaries of the lining membrane. When the effusion occurs in cachectic persons, as it appears often to do in Russia and some other countries, it is not improbable that the blood itself is considerably modified in its properties, being preternaturally thin, black, and manifesting no disposition to coagulate.

Cases have occurred, though very rarely, in which a large amount of *air* has been accumulated in the cavity of the pericardium. Commonly conjoined with sero-purulent effusion, its presence may sometimes be detected, according to Laennec, by an unusually clear resonance at the lower part of the sternum, or by a sound of fluctuation produced by the beats of the heart, and by strong inspirations. Its chemical nature is not known. Dr. Horner has never seen an instance of this aeriform accumulation, nor have I myself met with it.

Serous cysts are occasionally found in the pericardial cap-

sule.   Dr. Monro refers to a specimen of this kind, preserved
in the museum of the university of Edinburgh, in which the
morbid growth is nearly six inches long : the heart was of
enormous size, and the patient had labored for several years
under the usual symptoms of hypertrophy.

Finally, the pericardium is sometimes entirely absent.
Such an anomaly is no doubt rare, and has been supposed to
exist when it actually did not, from the deceptive appearance
produced by the adhesion of this capsule to the outer surface
of the heart.   The pericardium is sometimes partially trans-
formed into bone ; and, in one instance, observed by Dr. Bar-
low, of London, the ossification was complete.   The foreign
matter is probably deposited originally in the serous lamella,
from whence it gradually extends to the fibrous membrane.

SECTION II.

Of the Heart.

I. THE heart, situated in the central part of the thoracic
cavity, is placed in such a manner that its base looks oblique-
ly upwards and backwards to the right side ; the apex ob-
liquely downwards and forwards to the left.   Interposed
between the great arterial and venous trunks, it has the same
relations to the surrounding structures as the pericardium, by
which it is enclosed.   Anteriorly, it corresponds to the thy-
mus gland, the breast-bone, and several of the costal carti-
lages ; posteriorly, to the bronchial tubes, the œsophagus, and
descending aorta ; laterally, to the inner surface of the lungs
and the phrenic nerves.   Inferiorly, it rests on the tendinous
centre of the diaphragm, which forms the floor of the chest,
nearly on a level with the fifth rib, and thus separates it from
the abdominal viscera.   It is important to remember that, ex-
cepting in a few rare instances, the pericardium is not entirely
covered by the lungs, but that a portion of it remains in im-
mediate contact with the walls of the thorax.   This portion,
which is of a lozenge shape, corresponds to the anterior sur-
face of the right ventricle, and is seldom more than an inch
and a half in extent.

In the normal state, the apex of the heart beats against the

fifth costal cartilage, or against the interval between the fifth
and sixth, near their junction with the ribs. The left ven-
tricle is situated in advance of the right, which is behind the
other, and in great measure concealed by it. The auricles,
forming the base of the heart, mount as high up as the inter-
val between the third and fourth costal cartilages, and are
placed almost entirely under cover of the sternum. The
valves of the pulmonary artery are situated a little to the left
of the median line of the breast-bone, on a level with the in-
ferior border of the third rib : those of the aorta are directly
behind, and consequently concealed by them.

The organ, instead of being situated obliquely, is some-
times placed, like the heart of a quadruped, in a line with the
sternum ; and, occasionally, though rarely, it is found to pro-
trude externally, through an opening in the chest. Cases
have been observed where it lay in the epigastric region, on
the outside of the ribs, and in the substance of the liver.
Boudelocque examined the body of an infant, in which there
were two distinct hearts, one of which occupied the abdomen,
the other the thorax. Instances are also recorded in which
the organ was situated in the right side of the chest. These
cases are usually associated with transposition of the abdom-
inal viscera.

The situation of the heart is also influenced by diseased
states of the lungs, aneurismal enlargements of the aorta, and
by collections of water or purulent matter within the pleura
or abdomen. In ascites, the organ is sometimes remarkably
filled up; and in hydro-thorax, it is frequently thrown en-
tirely out of its natural position, so that the impulsion of its
apex can be felt on the right side instead of on the left.

In its shape, the heart is somewhat conical, the base being
above, and the apex, which is formed entirely at the expense
of the left ventricle, below. The division between the four
chambers of which it consists is indicated externally by two
grooves, one of them running transversely, the other nearly
vertically. The color of the heart is of a florid red, in a
healthy adult individual ; but it assumes a paler aspect as we
advance in life ; and, in certain morbid states of the system,
especially in dropsical affections, it is frequently quite
blanched. It is a remarkable fact that the internal fibres are
generally of a much deeper red than the exterior. With re-
gard to its consistence, the organ is sufficiently firm to resist
the pressure of the finger. After death, the auricles, from the

tenacity of their walls, are always in a collapsed state ; and the same is the case in respect to the right ventricle. The parietes of the left ventricle, on the contrary, are so thick as to prevent the obliteration of the corresponding cavity.

In the new-born infant, the position of the heart is nearly vertical, so that it lies more along the median line, as in some of the inferior animals. Its color is also of a brighter red, its muscular fibres are more distinct, and the walls of the ventricles are proportionally stouter, as well as more nearly alike in regard to their thickness.

The weight and volume of the heart vary much in different individuals, as well as at the different periods of life. Numerous attempts have been made to fix upon some standard of comparison, by which we might judge with some degree of certainty, of its dimensions, but with so little success, that the results that have been furnished can be regarded only as affording approximate evidence. Thus Lobstein estimates its weight at nine or ten ounces ; Cruveilhier at six or seven ; and Bouillaud at eight or nine. In ten examinations, made with a view of throwing additional light upon this piece of healthy anatomy, I ascertained the average weight to be eight ounces and a half ; the minimum seven, and the maximum ten and a half. Laennec merely observes that the heart ought to be about the size of the fist of the subject ; a means of comparison, which, although somewhat vague, will usually be found, according to my own experience, to be very near the truth.

The average length of the ventricles, including the apex of the organ, is four inches ; of the auricles, one inch and three quarters. The mean circumference, measured around the auriculo-ventricular groove, is nine inches and a half ; the breadth four inches. The thickness of the ventricles varies in different parts of their extent. Thus, the thickness of the right is scarcely two lines at the middle, whilst it is nearly two and a half at the base, and about one and a quarter at the apex. So also of the left ventricle ; whilst it is seven lines in thickness at the centre, it is only six at the base, and four and a half at the apex. Of the right auricle, the mean thickness is one line ; of the left, one line and a half. The thickness of the inter-ventricular septum also varies in different parts of its extent, being at its maximum at the middle, where it is six lines and a half, and at its minimum at the apex, where it is nearly the sixth of an inch

less. The mean thickness of the inter-auricular partition is one line and a half.*

The above measurements are founded upon a careful examination of twelve hearts taken from male and female subjects, between twenty-five and forty, and which were, in every respect, so far at least as I could determine, perfectly sound. They differ in some particulars from those of Bouillaud and Lobstein, which is not surprising when it is remembered that the weight and dimensions of the organ in question, whether considered as a whole, or in reference to its several parts, are remarkably influenced by sex, stature, age, and individual peculiarities ; so that upon this point it is extremely probable that the results of any two writers will never perfectly coincide. It would appear from the interesting researches of Dr. Bizot,† of Geneva, that the dimensions of the heart are in direct proportion to the breadth of the shoulders, and that the organ is always bigger, not relatively, but absolutely, in persons of middle stature or under, than in those who are distinguished for their tallness.

The mean circumference of the mouth of the aorta, measured in the same subjects, was two inches and three quarters ; of the pulmonary artery, three inches and a sixth. Of the left auriculo-ventricular orifice, the average circumference was four inches ; of the right, four inches and a half.

By placing the ear over the præcordial region of a healthy individual, two distinct sounds may be heard, followed by a period of rest. The first, supposing the pulse to be sixty in a minute, lasts about half a second, the other about a fourth, and the interval of repose the remaining quarter of the second. The first sound, which is dull and prolonged, coincides with the contraction of the ventricles ; the other, which is sharp and clacking, with their dilatation.

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* Professor Lobstein, of Strasburgh, attributes the following mean dimensions to the healthy adult heart: length, from the base to the apex, five inches and a half; breadth, at the base, three inches ; thickness of the walls of the right ventricle, at the upper part, two lines and a quarter, at the lower, half a line; of the left, seven lines superiorly, and four inferiorly ; thickness of the right auricle, one line, and of the left, half a line. (Traité d'Anatomie Pathologique, t. ii.)

M. Bouillaud, of Paris, found the mean circumference of the organ, measured around the base of the ventricles, to be eight inches and three quarters ; the mean length, from the root of the aorta to the apex, nearly three inches and two thirds ; and the same, as the mean breadth, measured at the base. The average thickness of the right ventricle, stated in round terms, is, according to the same authority, two lines and a half, and that of the left, seven lines ; of the right auricle, one line, and that of the left, one line and a half. (Traité Clinique des Maladies du Cœur, t. i. p. 52.)

† Mem. de la Sociéte Med. d'Observation de Paris, t. i. p. 276.

Concerning the causes of these sounds, there is still considerable difference of opinion, notwithstanding the numerous attempts that have been made to investigate them. From the experiments of Dr. Hope, an account of which is to be found in the recent edition of his excellent treatise on the Diseases of the Heart and Great Vessels, it would appear that the first sound is of a compound character, being produced partly by the shutting of the auriculo-ventricular valves, partly by the vibratory action of the muscular and tendinous fibres, and partly by the collision of the blood in its passage through the lower cardiac chambers. In regard to the second sound, the most probable conclusion is, that it depends upon the flapping to of the sigmoïd valves at the mouth of the aorta and pulmonary artery. At all events, it has been fully ascertained that it is stopped, and succeeded by a peculiar hissing noise, on transfixing one or more of these folds with a curved needle, and thus confining them against the walls of the vessels, so as to arrest their action. Similar efforts follow, though in a less striking degree, the compression of the aorta and pulmonary artery, whereby the column of blood is prevented from falling back against the sigmoïd valves.

The cardiac sounds vary greatly in intensity in different individuals. Ordinarily they are not audible, except at the præcordial region, if the ear be more than an inch and a half from the chest. The absence of adipous matter, the thinness of the ventricles, and the energetic contraction of the muscular fibres, together with the force with which the valves are thrown into action, are so many causes whose direct tendency is to augment the loudness of the sounds under consideration. It is worthy of remark, moreover, that the sounds are transmitted in a much more intense form through hepatized, tubercular, or compressed portions of lung than through such as are healthy.

It is extremely difficult, especially for one who has not had much experience, to distinguish between the normal sounds of the two sides of the heart. Nor is it possible to define their exact limits, except in a general manner, which is, that they are audible in almost every part of the chest, but much more distinctly so at the præcordial region, and at the left side of the sternum, near its junction with the third costal cartilage, than in any other situation.

The capacity of the opposite reservoirs of the heart does not seem to be precisely alike, although, if we take into considera-

tion the fact that the same amount of blood flows through both, it might reasonably be inferred that the reverse was the case. The two auricles are evidently larger than the ventricles, especially the right, the size of which is generally about one fifth greater than that of the left. This disproportion in the capacity of the auricles is by no means imaginary, as some anatomists have asserted ; nor can it, properly speaking, be dependent, as has been alleged by others, on the particular kind of death ; for, although the walls of the left chamber are more uniformly muscular, as well as a little thicker, than those of the right, yet if these cavities be carefully distended with wax, the right will always be found to be considerably larger than the left. This fact, indeed, is so familiar to those who are in the habit of making preparations of this organ, that it would be idle to dwell upon it.

With respect to the ventricles, the capacity of the right has usually been supposed to exceed that of the left, — an opinion which appears to be almost coeval with the earliest records of anatomy. Santorini, whose experiments on this subject are worthy of an attentive perusal, however, arrived at an opposite conclusion ; and the same is the case with the observations which have since been made by Lower, Weip, Moor, Lieutand, Sebatier, and other inquirers. Haller and Meckel assert that the difference, whenever there is any, is always attributable to the species of death, the results of their researches leading them to believe that either the one or the other of these reservoirs may be rendered more capacious, just according as the blood is arrested, during the last struggles of life, in the lungs or in the aorta. Opposed, again, to this conclusion are the observations of Seiler and Legallois, who, by distending the heart with mercury, invariably found that the right ventricle was larger than the left, no matter on which side of the organ the blood accumulated during death. This statement is likewise borne out by the examinations of Bouillaud, and is in perfect accordance with the results of my own researches. Legallois endeavors to account, very correctly, as I think, for this difference of capacity, on the well-known fact that the parietes of the left ventricle are much stronger and more muscular than those of the right, in consequence of which they are much less liable to become dilated ; the corresponding cavity thus presenting always the same size, whereas the other, from the same cause, is constantly subject to enlargement. The abso-

lute capacity of these reservoirs has not been very accurately determined ; but it will be sufficiently near the truth to state that, in their normal condition, they are capable of holding a hen's egg. The auricles are obviously a little larger, as above stated.

The outer surface of the viscus is covered, as was previously stated, by a reflection of the serous lamella of the pericardium, from which it obtains its smooth and polished appearance ; whilst its several chambers are lined by a membrane of a similar nature, which is continuous, on the one hand, with that of the hollow veins and of the pulmonary artery, and, on the other, with that of the aorta and of the pulmonary veins. In the healthy state, this membrane is perfectly white and pellucid : it is scarcely thicker than the arachnoïd tunic of the brain, and it adheres so firmly to the muscular substance that it can be detached only in very small shreds. Like the inner coat of the vessels, it is readily discolored by imbibition ; and, in certain morbid affections, it is rendered rough, opaque, and uneven, acquiring the consistence of the fibrous layer of the pericardium. In its structure, this serous lining differs considerably in the two sides of the heart, — that of the right half being very extensible, resisting, and but little liable to ossification, whilst that of the left half is almost inextensible, remarkably brittle, and extremely prone to bony deposits. This membrane, it may now be observed, is named the *endocardium*, and plays a very important character in the diseases of the heart. No vessels or nerves have been traced into its substance.

The endocardium is arranged in certain portions of its extent in the form of folds, the principal of which are situated at the mouth of the aorta and pulmonary artery, the orifice of the inferior hollow vein, and the auriculo-ventricular apertures. In their shape, they are nearly all semilunar ; and they are composed each of two distinct lamellæ, connected together by short, dense cellular substance. In addition to this, there is in the duplicature of the aortic and pulmonic valves, at the centre of their free margin, a small, firm tubercle, called the corpuscle of Arantius, after a professor of Bologna, who first described it. The precise nature of this little body is not determined, but it appears probable that it is of a fibro-cartilaginous structure. The auriculoventricular valves, or, as they are more commonly termed, the mitral and tricuspid, are united, on the one hand, to the

slender tendons of the fleshy pillars, and, on the other, to the contour of the corresponding orifices by a whitish, fibrous zone, which is particularly distinct on the side of the auricles. Thus the heart would seem to be composed of five entirely different anatomical elements, — the muscular, the serous, the fibrous, the fibro-cartilaginous, and the tendinous.

The heart contains scarcely any cellular substance, being composed essentially of muscular fibres. In many cases, especially in fat persons, there is a considerable quantity of adipous matter, which is generally most abundant along the course of the coronary arteries, at the origin of the great vessels, and on the surface of the right ventricle. In a number of instances, I have seen the whole organ incrusted with this substance, forming a smooth yellow lamella, from the third of a line to a line and a half in thickness, and yet the muscular fibres be perfectly sound.

The proper cardiac substance is much more firm and dense, as well as of a deeper red, than that of the voluntary muscles, and is composed of numerous fibres, lying in close contact with each other, and running, for the most part, in an irregularly spiral direction from the base to the apex of the organ. In the auricles, the walls of which are much thinner, as before stated, than those of the ventricles, they are arranged into two planes, one of which is external, the other internal. In the venous portion of the right auricular cavity, the fibres exhibit a smooth, uniform appearance, whilst in the proper ear-like appendage they are disposed in small parallel bundles, constituting the so called pectineal muscles : here numerous intervals are left between them, at which the two serous membranes of the heart are almost in immediate contact. In the left auricle, the two muscular strata are somewhat thicker, and also more uniform in their mode of arrangement : the fibres may be said to begin at the entrance of the pulmonary veins, and to take nearly all a transverse course, with the exception of the more deeply seated, which cross each other in almost every conceivable direction. The inter-auricular septum is likewise of a muscular nature, and the layer of which it is composed is considerably thicker and stronger than those forming the walls of the auricles.

The fleshy fibres of the ventricles are interwoven with each other at right angles, and they are all arranged — at least if we may credit the assertion of Wolff, Gerdy, and others, who have particularly investigated this subject — in the form

of loops, the convexities of which look towards the apex of
the organ. In the left ventricle, the fibres are disposed in
six layers, and in the right only in three, which accounts for
the comparative thickness of their walls. The superficial
strata run obliquely downwards, backwards, and towards the
left side; the middle take precisely the opposite direction;
and the deep-seated ones, which form the fleshy columns of
the heart, are for the most part longitudinal. After all, it
must be confessed that it is extremely difficult to determine
the exact arrangement of these fibres, let us adopt what
method we may; and instead, therefore, of saying that they
follow one particular course more than another, it may be
boldly affirmed that they begin at all points, and extend in
all directions, forming thus a net-work which it is utterly
impossible for any ingenuity to unravel.

The heart is supplied with blood by the two coronary
arteries, the branches of which are distributed through every
part of its substance : they take their origin just behind the
sigmoïd valves, and, as might be supposed, pursue a most
tortuous course. The coronary vein is very large, and em-
bogues into the right auricle. The lymphatics, which are
quite numerous, follow, for the most part, the direction of the
blood-vessels. The nerves are derived principally from the
cervical ganglion of the trisplanchnic ; but a few filaments are
also furnished by the pneumo-gastric, which accounts for the
sympathetic relations which subsist between the lungs and
the central organ of the circulation. Scarpa and Munninks
have fully demonstrated, that the branches of these nerves
are extensively distributed to the fleshy fibres of the heart,
and not merely, as was contended by Behrends and some
others, to the cardiac vessels.

II. The heart, like other organs, is liable to *malformations.*
These, though not frequent, are so various as to render it ex-
tremely difficult to classify them according to philosophical
principles. Any generalization, indeed, that may be offered
must necessarily, in the present state of the science, be im-
perfect, and susceptible of future improvement. The follow-
ing, without pretending to any thing more than ordinary
accuracy, will be found to embrace an account of the more
interesting varieties hitherto noticed. Before we proceed to
indicate this arrangement, it should be stated that the differ-
ent congenital deficiencies of which we shall speak, may be
conveniently viewed in reference, first, to the parietes of

the organ ; secondly, in respect to its internal septa ; thirdly, in relation to its valves ; and, fourthly, in regard to the origin and termination of the great vessels.

(I.) 1. The heart consists only of one auricle and one ventricle. This malformation is rare. Cases, however, are related by Kreisig, Burns, Billard, Breschet, and other authors. The organ gives origin to a single vascular trunk, which presently divides into the aorta and pulmonary artery. The type of this imperfection is to be found in fishes, in which the single heart and artery, with its branchial arches, are permanent parts. This malformation, it need scarcely be observed, is always hostile to the prolongation of life. The infant generally dies within the first twelve days.

2. Both auricles are wanting ; or there are two ventricles, with one auricle ; or, finally, two auricles, with one ventricle. These cases are likewise extremely rare ; but in a few instances the patient attained the age of manhood.

3. The auricles have a sort of supernumerary appendage. Of this species of malformation, De Haen and Billard have each recorded an instance.

4. The apex of the heart is bifurcated, or there is a deep groove marking the junction of the ventricles. The former of these appearances naturally exists in the human embryo, and constitutes the type of what is found in several species of mammalia, as the dugong and manatee.

(II.) The second series comprehends the malformations of the internal partitions, of which the most frequent and important are those of the inter-auricular septum. The aperture which naturally exists at this part is generally closed within the first few days after the establishment of the respiratory function, by a fold of serous membrane situated at the left side of the heart. This valve is sometimes defective, perforated, or entirely absent. More frequently, however, there is an arrest in the developement of the muscular substance, eventuating in the formation of an imperfect partition. The septum thus produced is seldom more than three lines in diameter, but occasionally the deficiency is complete. This malformation frequently coexists with patescence of the arterial duct. Although the individuals usually die within the first six months, yet cases are mentioned where life was protracted to the twentieth, thirtieth, fortieth, and even fiftieth year.

A congenital opening between the two ventricles is by no

means common ; at any rate very few such cases have been recorded by writers.   The form of this aperture is generally rounded, with smooth, polished margins ; and, in the majority of instances, it is situated at the superior part of the septum, not far from the origin of the great vessels.   With this vice there is frequently patescence of the arterial duct and oval foramen, with contraction of the pulmonary artery.   The essence of this imperfection exists in the heart of the alligator, in which the ventricles naturally communicate with each other during life.   Infants thus affected, usually die soon after birth.   Dr. Pulteney relates the case of a patient who reached his fourteenth year.

The symptoms which indicate the existence of these malformations are such as might be expected to arise from the admixture of venous and arterial blood in the chambers of the heart.   The individual is always in ill health, the respiration is disturbed, the circulation disordered, and the temperature of the whole body diminished.   With these phenomena, which are present to a greater or less extent, according to the size of the opening, there is a peculiar bluish discoloration of the skin, which is most conspicuous in the face, lips, eyelids, nose, and ends of the fingers, and which may be regarded as pathognomonic of the malformations in question.

(III.) The valves rarely exhibit congenital imperfections. Sometimes they are deficient in numbers, but more frequently they are too short, reticulated, or perforated, so as to serve as an incomplete barrier to the regurgitating fluid.   The sigmoïd, mitral, and tricuspid valves have all been found stretched flat across their respective orifices, with one or more apertures in their substance.   The Eustachian valve is more frequently deficient than any other.

(IV.) The fourth class of malformations relates to the origin and termination of the great vessels, which often exist without any accompanying imperfections of the heart.   Of these, several varieties may be enumerated.

1. The aorta arises from both ventricles.   This state is commonly accompanied with patescence of the oval foramen and arterial duct, the latter of which occasionally ends in a cul-de-sac in the substance of the heart.   The pulmonary artery is either contracted, obliterated, or entirely absent.   Death ensues at various periods, from the first day to the fourteenth year.   The symptoms are such as denote a mixture of venous and arterial blood, namely, lividity of the prolabia, palpitations, and paroxysms of suffocation.

2. The pulmonary artery springs from both ventricles. This is also a very rare variety of malformation. The oval foramen remains open ; and the vessel sends off the descending aorta, the ascending arising in the ordinary way.

3. The aorta arises from the right ventricle, and the pulmonary artery from the left. In this transposition, the veins generally retain their normal disposition. Nor do the oval foramen and arterial duct always remain open.

4. Both vessels originate from the same ventricle. This is extremely rare. Several well-authenticated cases, however, are on record. The internal septa of the heart are usually imperfect in this variety of malformation.

5. The arterial duct opens directly into the right ventricle, the aorta and pulmonary artery exhibiting nothing unusual in their size or mode of arrangement. This deviation has been observed only three or four times.

In regard to the venous trunks, the deviations from the normal standard are not less singular. Thus, the right auricle has been known to receive the pulmonary veins, and the left the superior or inferior cava, or both. Meckel relates an instance where the coronary vein opened into the left ventricle ; and Breschet records another, where the hepatic veins emptied directly into the right auricle. The latter cavity also sometimes receives the azygous vein. Le Cat narrates a case in which this vessel divided, near the heart, into two branches, of which one terminated in the right and the other in the left auricle.

These cases of congenital absence of the heart are extremely rare, and never occur without being associated with other vices of conformation, of which the most common is deficiency of the brain. Such a state, whether simple or complicated, it need scarcely be said, is inconsistent with the continuance of life. A double heart has occasionally been observed, but in no instance, perhaps, without a monstrous condition of the majority of the other organs.

III. The lesions of the muscular structure of the heart may be arranged under the heads of inflammation, suppuration, ulceration, gangrene, softening, induration ; cartilaginous, osseous, and fatty transformations ; scirrhus, encephaloïd, melanosis and tubercles ; hypertrophy, atrophy, dilatation, and rupture.

1. *Acute carditis* is an extremely rare disease, especially that variety of it which invades the whole organ. In the

majority of instances, it is conjoined with inflammation of the
investing capsule ; in others, however, it exists as an inde-
pendent affection, and runs its course without any particular
complication.   Of general carditis, very few well-authenti-
cated cases are upon record.   The disease seldom assumes
that acute type which generates pus ; in which respect it
offers a striking analogy with inflammation, as it appears in
the voluntary muscles.   Of this mode of termination, how-
ever, several examples have been related by the British and
French pathologists.   In the third volume of " the London
Medical Gazette," Dr. Latham has given the particulars of a
most interesting and instructive case of this kind, which he
observed in a boy twelve years of age.   "The whole heart,"
says he, "was deeply tinged with dark-colored blood, and its
substance softened ; and here and there, upon the section of
both ventricles, innumerable small points of pus oozed from
among the muscular fibres.   This was the result of a most
rapid and acute inflammation, in which death took place after
an illness of only two days."   Meckel saw a case, in a man
fifty years old, in which the muscular substance of the heart
was considerably infiltrated with purulent matter ; the fibres
were of a bright red color, rough, unequal, and clean, as if
they had been dissected from their cellular tissue.

Much more frequently, the disease is only partial, affecting
particular parts of the organ.   Here, as in the other varie-
ty, the inflamed structure is always unnaturally red, being
crowded with small crimson points, of an arborescent, stella-
ted, or punctuated configuration.   Occasionally, as when the
irritation is very severe, we meet with spots of extravasated
blood, of a bright red, violet, or purple tint, which impart to
the surface of the organ a singularly speckled aspect.   In-
flammation of the muscular substance of the heart is rarely
if ever attended with any tumefaction.   Why this should be
the case, will be at once perceived when we reflect upon the
intimate and almost inseparable connection of the fleshy
fibres ; for, of all the muscles in the body, the heart is the
one which has the least amount of cellular matter.   Hence,
serous infiltration, which is so common in some other struc-
tures of the system, can have no place in the organ now
under consideration.   When the inflammation is seated su-
perficially, the affected part is often covered with globules,
shreds, or patches of lymph, poured out by the visceral por-
tion of the serous membrane of the pericardium, from a propa-

gation of the disease. Its consistence is often much dimin-
ished; and not unfrequently the muscular fibres are bathed
in imperfectly elaborated pus. The diagnostic signs of car-
ditis, if any there be, are still involved in obscurity, no pa-
thologist having ever succeeded in pointing them out. Dr.
Bouillaud, the most recent and elaborate writer on the dis-
eases of the heart, positively asserts that he has never seen
an instance which was not complicated with pericarditis or
endocarditis; and he frankly acknowledges that, in the three
cases which came under his notice, the signs of the two lat-
ter affections were all that attracted his attention. Nor have
any other authors, so far as I am acquainted with their works,
been more successful.

When the disease passes into *suppuration*, the pus may
either be diffused through the muscular texture, or be col-
lected into an abscess. Of this, numerous examples are
related by the older anatomists, and not a few by those of a
more recent date. Corvisart found an abscess of more than
an inch in length, near the apex of the right ventricle of the
heart of a young man of nineteen. Laennec met with two
instances of cardiac suppuration, in one of which the pus was
deposited amongst the fleshy columns of the left ventricle; in
the other, it formed an abscess, about the size of a bean, in its
substance.

Collections of pus are occasionally found within the heart.
Of this, a case has been already given from Laennec, and
another has recently been reported by Dr. Mareshal, a French
physician. It occurred in a young girl, ten years of age.
The heart, both ventricles of which were very much dilated,
contained three distinct abscesses, each about the size of a
small nut. Of these, one was seated in the left ventricle,
near the centre of the inter-ventricular partition, the other
two in the right. They were of a white grayish color ex-
ternally, and filled with a dirty, yellowish looking fluid, of
the thickness and consistence of cream. Cases of a similar
character are narrated by Mr. Wardrop,* and various other
authors on morbid anatomy. The muscular substance around
such collections is generally red and softened.

Circumscribed carditis is sometimes attended with *ulcera-
tion*. The lesion is more frequently found on the internal
than on the external surface of the organ, and commonly

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* See his edition of Baillie's Morbid Anatomy.

supervenes upon inflammation seated originally in the lining
or investing membrane.   The external ulcer has been de-
scribed by some of the older pathological anatomists.   I have
never seen a case of the kind, but in one, the particulars of
which have been communicated to me by my distinguished
friend, Dr. Harrison, the whole outer surface of the heart
heart was abraded by ulceration, the appearance being very
similar to that species of ulceration, denominated the cutane-
ous, by Mr. John Hunter.   The pericardium was much
indurated and thickened, and contained several ounces of
purulent matter.   In other respects, both the heart and its
capsule were sound.   The right lung was completely hepa-
tized, the left partially.   In the abdomen was contained about
half a gallon of sero-purulent fluid ; the liver was somewhat
enlarged, unusually vascular, and adherent in different parts.
All the other organs were in a normal condition.   The sub-
ject of this case, so extremely interesting from the large
extent of the ulceration, was a boatman on the Ohio river,
thirty-five years old, who was admitted into the Louisville
hospital in April, 1825.   He died in about a fortnight there-
after, having suffered incessantly under dyspnœa, and dry,
convulsive cough, with inability of lying on either side,
dropsy of the abdomen, and œdema of the extremities.

These ulcerations sometimes extend deep into the sub-
stance of the heart, leaving merely a thin stratum of mus-
cular fibres.   The cardiac texture around is generally very
hard, pale, and so friable as to break down under the slightest
pressure of the finger.   The matter with which these ulcers
are bathed, is of a bland, homogeneous nature, like laudable
pus in other situations : in a few instances, it is mixed with
bloody serosity.

2. Is it possible for the muscular structure of the heart
ever to become *gangrenous ?*   Many writers suppose that it
is not, alleging as a reason, that, as this organ is so essential
to life, this termination of inflammation is always anticipated
by death.   Others, however, not only admit the possibility of
it, but cite numerous cases in confirmation of their opinion.
Leaving out of the question the more doubtful testimony of
Bonetus, Morgagni, Lieutaud, and other authors of the seven-
teenth and eighteenth centuries, the results of the observa-
tions of modern writers, are, I think, abundantly sufficient to
settle the point.   Portal, Goulay, and Kennedy relate each
a well-marked example of this disease.   The gangrenous

substance, says Portal, is of a dark color, relaxed, softened, infiltrated with ichorous serosity, and quite offensive to the smell.   Not unfrequently, it is of a livid, brownish, or green-ish hue, and emits an odor like that of a piece of flesh in a state of partial decomposition, which constitutes the essential characteristic of this lesion.   In most cases, the mortification occurs in superficial, dark-colored patches, not more than a line or two in depth ; but more rarely it pervades the entire organ.   The most interesting case of this kind, perhaps, on record, is that by Dr. Kennedy, of Glasgow, an account of which was published in the London Medical Repository for April, 1824.   The cardiac tissue, which exhaled quite a putrid odor, was throughout remarkably flaccid, of a black color, like venous blood, and easily perforated with the finger, The left ventricle, particularly, was very livid, and scarcely of the consistence of the cerebral substance.   No blood ex-uded from any of the ruptured vessels of the heart, and all the chambers were perfectly empty.   The inner surface of the pericardium was of a dark red color, and in its cavity were found about four ounces of a fetid, yellowish fluid, of a serous nature.

It appears from the dissection, which was made eight hours after death, that there existed a remarkable tendency to gangrene, not merely in the heart, but in various other organs and textures of the body, especially the omentum, small in-testines, uterus, and skin of the upper extremities.   The sub-ject of this extraordinary case was a woman somewhat past the prime of life.   The symptoms were of the most violent character.   Long before death the pulse disappeared altogether from the wrists.   There were stinging pains, with a sense of burning, in the region of the chest ; difficulty of breathing ; palpitations of the heart ; frequent disposition to syncope ; tumefaction of the limbs, and almost complete immobility of the joints.   Towards the last, broad, livid spots appeared on different parts of the surface, with here and there a large and sphacelated wheal, and the patient expired finally in a state of deep coma.

In a case of partial gangrene, narrated by M. Gaulay,* a French physician, two blackish-looking streaks, more than a line in depth, were observed on the anterior surface of the heart, extending from its base to its summit.   The whole

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* Journal de Méd. Chir. et Pharm.   Janvier, 1807.

organ was extremely flaccid, soft, lacerable, and of an un-
pleasant odor; it was of the usual volume, and had contracted
extensive adhesions with the pericardium, in the interior of
which, was a small quantity of serosity. During the three
days preceding dissolution, the patient, a female, fifty years
of age, labored under the most frightful dyspnœa; the pulse
was very small, unequal, and intermittent; and, at intervals,
the heart beat with the utmost violence, though, at times, its
movements were scarcely perceptible. The liver, pancreas,
and spleen were considerably enlarged, and in a state of
scirrhous induration.

Such is a brief outline of these two interesting cases of
cardiac gangrene. That they are true examples of this rare
disease cannot, I think, be doubted; such, at all events, must
be our conclusion, both from the phenomena that were ex-
hibited during life, and from the appearances that were re-
vealed on dissection.

3. The heart, like other organs, is liable to *softening*,
which may be either partial or general, though the latter of
these occurrences must be considered as extremely rare. It
may coexist with various other lesions, such as hypertrophy
of the walls of the organ, or dilatation of its cavities, or it
may take place as an independent affection. Occasionally,
the softening is limited to the outer surface of the heart, the
inner surface, or to the fleshy columns; and not unfrequently
it is found in small isolated points, running insensibly into
the healthy texture. No unnatural odor attends this lesion,
in which respect it differs remarkably and characteristically
from that which we have just described.

The cardiac substance, in a state of softening, is extremely
flaccid, tears with great facility, and is of a deep red color.
The finger can be pushed through it in every direction, and
when the ventricles are opened, they often collapse to so great
a degree, as to lose entirely their natural figure. This, how-
ever, is by no means a uniform, or even perhaps a general
occurrence. Much oftener, indeed, have I seen the softened
organ accurately retain its natural form. The color of the
cardiac tissue in this affection is variable. Most commonly,
perhaps, as was before stated, it is of a deep red; but occa-
sionally it is claret, marone, red-brown, violet, or purple. In
other cases, again, though very rarely, it is of a faint grayish
hue, cineritious, pale yellow, or almost white, as if the organ
had been macerated for some days in water. These different

shades of color appear to be so many modifications dependent upon corresponding grades of inflammatory irritation.

Softening of the heart often occurs in connection with tubercles of the lungs, chronic pleuritis, and adynamic fevers. In one instance, I found it in an old man who died of apoplexy, after an illness of about five days. The lesion is not peculiar to the human subject. In the horse I have met with it several times. In a remarkable case, occurring in a young colt that died of pleuro-pneumonitis, accompanied with an enormous accumulation of fetid water in the chest, the cardiac substance was of a red-brown color, and so soft that I could easily push the handle of the scalpel through both ventricles in every direction.

Doubts seem to be still entertained by many writers, whether softening of the heart ought to be uniformly ascribed to inflammatory irritation, or to some disorganizing cause of another character. Laennec, who first directed the attention of the profession to the disease before us, considered it as a peculiar affection, produced, as he thought, by some aberration of nutrition, by which the solid elements of the muscular tissue are diminished in proportion as its fluid elements are augmented.* This singular notion, which merely expresses the vague sentiments of its author, has been successfully controverted by M. Bouillaud. By him, softening of this organ, under whatsoever form it may appear, is attributed to the effects of inflammation, either of an acute or chronic character; and with this opinion my own belief entirely agrees. Many symptoms have been pointed out by pathologists as attending this disease ; as yet, however, none have been enumerated that can be in the least relied upon as pathognomonic.

4. Leaving the subject of softening of the heart, we come, in the next place, to that of *induration*, — a state which, like the preceding, is, in all probability, induced by inflammation, though generally of a much more chronic character. The affection seldom occupies more than a part of the organ, commonly one of the ventricles, which is at the same time in a state of hypertrophy. Sometimes it is confined to its outer or inner surface, to the fleshy columns, or to the inter-ventricular septum ; and not unfrequently it is blended with softening. In a case detailed by Bertin, there was induration

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* Treatise on Diseases of the Chest, by Forbes, p. 623.

of the left, with mollescence of the right ventricle ; and, in a second, some of the fleshy columns were hard, and others soft. Universal induration is perhaps never met with ; such an occurrence, in fact, would be incompatible with the exercise of the functions of the heart.

The degree of induration is subject to considerable variety, running through numerous stages, from the fibrous to the cartilaginous, and even the osseous. In some instances, it appears in the form of incrustations, and seems as if it had commenced, in the first instance, in the serous covering of the organ. The muscular substance is not always heightened in color ; sometimes, indeed, it is even unnaturally pale. When incised, it is found to be so firm as to grate under the knife. Corvisart states that he has occasionally heard a peculiar creaking sound, like that emitted by new sole-leather, on cutting through an indurated heart ; but this has never been perceived by Laennec, Bertin, Hope, Andral, or myself, and may therefore be regarded as very rare. The organ, if placed on a table, generally retains its rounded form, and, if struck with the scalpel, sometimes sounds like a dice-box or hollow horn.

The diagnosis of induration of the heart, like that of mollescence, is still involved in obscurity, it being quite impossible in the present state of our knowledge, to distinguish it from hypertrophy, with which it is so often associated. When these affections coexist, the impulse of the heart is often augmented to such a degree, that it can be seen and heard at some distance from the patient ; if, on the other hand, the induration is uncomplicated, very extensive, or of long standing, the strength of the organ is apt to fail, and, as a consequence, the pulse at the wrist becomes sometimes nearly imperceptible. How far the assertion of Laennec, that the firmest heart always imparts the strongest impulse, is correct, I will not pretend to decide ; I can only say, that, so far as I know, his opinion has not been verified by other observers.

5. The *cartilaginous* and osseous transformations of the muscular structure of the heart, being often associated with induration, may be noticed here. Both these lesions are extremely rare ; and, thus far, I have not been so fortunate as to meet with them. Corvisart has seen the apex of the organ, in its entire thickness, and the fleshy columns of the left ventricle, converted into cartilage. Haller, Albertini, Bertin,

and others, have observed partial ossifications; and the late Mr. Allan Burns, of Glasgow, found the ventricles of the heart of an old woman of sixty so completely changed that they resembled the bones of the cranium. This case, the most remarkable perhaps on record, was attended with terrible dyspnœa, great præcordial anxiety, and lividity of the countenance. The patient was unable to lie in any other than a semi-erect position; and, for a few days before her death, the pulse, although previously regular, became extremely feeble and intermittent. On dissection, the pericardium was found of an opaque, dusky color, excessively loaded with fat, closely adherent to the substance of the heart, and studded with ragged, projecting spicules of bone, which gave it a very rough and irregular aspect. Both ventricles were completely ossified, excepting about a cubic inch at the apex, the new tissue forming a broad, solid belt, as firm as the cranium. The auricles were sound, only a little thicker than usual, and so also were the great vessels.

A case nearly as remarkable as the preceding is to be found in the "Journal de Médicine" of Paris, for January, 1816, where it was reported by Dr. Renauldin, a French physician. It occurred in a man thirty-three years of age, who had been afflicted for a long time with embarrassment of breathing and cardiac palpitation. The left ventricle was converted into a petrifaction, which, in some parts, had a sandy aspect, in others, resembled a saline crystal. The fleshy columns, also ossified, were much increased in their dimensions, and looked like so many stalactites. The present Professor Monro, of Edinburgh, states, that he has in his possession a most remarkable specimen, in which the whole of the heart, with the exception of the left auricle, is converted into a mass of bone.*

6. *Scirrhus* and *encephaloïd* have been found in the substance of the heart, but their occurrence here is extremely rare. The latter of these lesions generally exists in the form of small spherical tumors, varying between the size of a pea and an egg, which stud the outer surface of the organ or project into its cavities. Cases occur in which it is seen in layers several lines in thickness, or wherein it is infiltrated into the muscular texture, converting it into a yellowish sub-

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* See his Morbid Anatomy of the Gullet, Stomach, and Intestines, second ed. p. 300.

stance. Recamier has found the heart partially converted into scirrhous matter, like the skin of bacon ; and a case is mentioned in the Memoirs of the Royal Society of Medicine of Paris, for 1776, in which a carcinomatous ulcer, more than three inches in diameter, occupied the whole posterior surface of both ventricles. The cardiac tissue around was indurated and scirrhous ; and the bottom of the ulcer was formed by a thin stratum of muscular fibres, so soft and friable as to break down under the slightest pressure of the finger. The heart itself was greatly enlarged, and the pericardium had almost entirely sloughed away. The subject of this remarkable case was a woman twenty-two years old : she complained of sharp, lancinating pains, darting from the left side of the chest towards the centre of the sternum, had frequent attacks of swooning, and was obliged constantly to remain in a semi-erect posture, with the head bent upon the chest, and the body slightly inclined backwards and towards one side. A singular case of scirrhus of the heart is mentioned by Billard. It occurred in an infant only three days old, and consisted of three tumors, which were firmly embedded in the muscular substance of the organ.

In the *fatty* transformation, the heart is converted into a substance having all the physical and chemical properties of grease. The apex is the part most commonly affected, but in some instances the infiltration pervades the entire organ, changing it into a pale tawny structure. In the few cases which I have observed as this lesion, the muscular substance was remarkably soft, thin, flabby, and greasy to the touch. It is most common in old age. Its causes are unknown.

8. The heart, like the rest of the muscular system, is liable to *atrophy ;* but this affection is much less frequent than the one which we have just noticed. The wasting is occasionally very great. Burns gives several cases in which the volume of the adult heart was not larger than that of a young child ; and in one instance it scarcely exceeded that of a newborn infant. Similar examples are detailed by Bertin, Bouillaud, Hope, Carswell, and other writers.

It is rare, however, that the atrophy is either so general or so extensive. In the majority of cases coming under my own observations, I have found it limited to particular parts of the organ, more commonly to the right ventricle, the right auricle, and inter-auricular septum. The color and consistence of an emaciated heart are seldom much altered ; fre-

quently, indeed, they remain perfectly natural, or are even augmented. It has been said that, when the atrophy is very great, the organ often presents a puckered and shriveled appearance, like an old withered apple; but such a condition I have never witnessed, and feel disposed to doubt the possibility of its occurrence. The cardiac chambers in this affection may remain natural, be diminished, or dilated, very much as in hypertrophy. Conjoined with dilatation, the walls of the heart are sometimes so thin as to exhibit quite a translucent, web-like aspect, and so weak as to be liable to break on the application of the slightest force.

Atrophy of the heart usually occurs in persons who are worn out by lingering and exhausting diseases, terminating in general emaciation of the body. Hence it is not unfrequently found in connection with organic affections of the lungs and bowels, dropsy, diabetes, cancer, and other incurable disorders. Excessive bleeding, especially when united with great abstinence, ossification of the coronary artery, and protracted compression from enlarged lymphatic glands or effused fluids, may also be so many causes of atrophy of the heart. In one instance I found it connected with permanent closure of the inferior cava and extensive disease of the abdominal organs, with collection of water in the peritonæal sac. There are no symptoms which can be regarded as diagnostic of this affection. The pulse is generally faltering, and the cardiac impulse scarcely perceptible.

Occasionally we find that the chambers of the heart, instead of being diminished in size, are dilated, so that their capacity is much greater than in the normal state. This condition of the organ, which was described by the celebrated Corvisart under the name of *passive aneurism*, may be either general or partial, that is, it may exist in all the cardiac cavities at the same time, or be limited to the auricles, the ventricles, or to one of these reservoirs alone, which is, in fact, most commonly the case. Universal dilatation is extremely infrequent, and thus far I have never seen an instance. The heart in this state seems to be sometimes much increased in weight. In a case mentioned by Burns, in which all the chambers, both auricular and ventricular, were equally dilated, the organ was larger than that of an ox, and weighed two pounds, its muscular substance being throughout of the usual thickness.

Dilatation of the heart may be conveniently arranged under

several species. The first species consists of dilatation with hypertrophy; that is, one or more of the chambers of the heart are enlarged, and the corresponding walls thickened: the second species is the simple dilatation, in which the cavities are augmented, whilst the corresponding parietes retain their normal state: the third consists of dilatation with atrophy; that is, one or more of the cardiac reservoirs are enlarged, and the corresponding walls attenuated: a fourth, and much the rarest variety of all, that which truly deserves the name of aneurism, is where there is a pouch or blind sac leading from, and communicating with, the affected cavity. These different forms, especially the first three, sometimes coexist in different parts of the heart, or even in different parts of the same chamber; and several of them are very commonly found in conjunction with hypertrophy.

In dilatation with atrophy there is often softening of the muscular structure, with an alteration of color, which, instead of a florid red, is either pale gray, cinnamon, brown, or purple. The emaciation varies in different cases, being sometimes so great that the most substantial portion of the organ is scarcely more than the eighth of an inch in thickness. The fleshy columns are stretched and attenuated; and occasionally, though very rarely, the muscular structure is so much unfolded that the whole heart looks like a membranous pouch. Extreme emaciation is more common in the right than in the left ventricle, in the right than in the left auricle, — a circumstance easily accounted for by the natural difference of thickness existing between the two sides of the organ. Formerly this species of dilatation was regarded as a very frequent lesion; but more recent observation has shown that this opinion is erroneous.

The fourth species of dilatation, consisting, as we have seen, in the formation of a pouch in the walls of the heart, is also extremely rare, not more than ten or twelve cases of it being found on record. Of these, two have been related by Dr. Bérard, a French writer, in each of which the dilatation formed a tumor about the size of a duck's egg.* The aneurismal sac, especially when of long standing, usually contains several layers of dense, tough fibrin, perfectly similar to those of aneurism of the limbs, with a small, rounded orifice communicating with the corresponding chamber of the heart.

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* Dissertation sur plusieurs points de Pathologie, &c.

In nearly all the cases which have hitherto been recorded, the dilatation was seated in the walls of the ventricle ; in one, mentioned by Dr. Hope, it occupied the substance of the auriculo-ventricular septum.　Occasionally the parietes of the tumor seem to consist only of the outer and inner lining of the heart, the muscular texture around being softened. Such was the case with the left ventricle of the celebrated French tragedian Talma, who died from almost total obliteration of the rectum.*　The remaining species of this disease it is unnecessary particularly to describe, as in one of them the walls of the heart are always natural, in the other hypertrophied.

The causes of dilatation of the heart are, valvular disease, narrowing of the auriculo-ventricular orifices, contraction of the mouth of the aorta or pulmonary artery ; and, in short, whatever has a tendency to impede the passage of the blood from the auricles into the ventricles, or from the ventricles into the great arteries connected with their base.　For the functional and physical indications of cardiac dilatation, the reader is referred to the various treatises on diseases of the heart.

9. On the subject of *rupture* of the heart, very little need be said in concluding our remarks on the different lesions of the cardiac tissue.　This accident is generally the result of softening, excessive deposition of fat, ulceration, or chronic inflammation, and seldom occurs except in persons above fifty or sixty years of age.　From whatever cause proceeding, laceration of the heart is almost always followed by immediate death.　Of ten patients mentioned by Bertin, eight died instantaneously, and the other two after a few hours.　The cause of these disastrous consequences appears to be not so much the extent of the hemorrhage, as the great and sudden shock sustained by the nervous system, together with the mechanical compression of the cardiac chambers.　If the patient survives the accident several days, the rent is generally plugged up by a clot of fibrin, in the same manner as sometimes happens after the reception of a wound.　In some instances there would even seem to be an effort made at cicatrization.　A species of partial rupture of the heart is mentioned by Laennec, Bertin, and Corvisart, consisting in a laceration of the fleshy columns and the tendons of the valves.

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* Revue Medicale, Janvier, 1827.

Tubercles are very rare. Dr. Bouillaud, of Paris, who has written two large volumes on the diseases of the heart, affirms that he has never met with tubercles in this organ ; and he is inclined to believe that they are more rare here than in almost any other part of the body. Andral and Laennec never saw more than three or four instances. Recently Dr. Townsend, of Dublin, has published a case in which this heteroclite deposit was situated in the substance of the left auricle, between the outer and inner membranes, and so compressed the pulmonary veins that they would scarcely admit the smallest probe. The right auricle and ventricle were greatly dilated ; but in other respects the heart was sound. The bronchial glands and lungs contained some tubercles, and were otherwise diseased. The patient was a male, sixty-two years old.*

10. *Melanosis*, serous cysts, and vesicular worms have also been seen in the muscular structure of the heart; but their occurrence is so infrequent, and their mode of origin so imperfectly comprehended, that it is unnecessary to say any thing further about them in this place.

Examples of this disease have been recorded by Houlier, Rolfinck, Fauton, Valsalva, Morgagni, Bonetus, Dupuytren, Duvernoy, and Andral. In a case mentioned by the latter author, a serous cyst was embedded in the substance of the left ventricle ; it was filled with a thin, limpid fluid, and was about the size of a walnut.

11. *Hypertrophy* is an excessive growth of the muscular substance of the heart, resulting, as the name literally implies, from increased nutrition, without any obvious change of texture. The true nature of this affection, of which there are three varieties, was first pointed out by the late Dr. Bertin, of Paris, in 1811. In the first and most simple variety, the walls of the heart are merely thickened, the cavities retaining their natural dimensions ; in the second, they are augmented in bulk, and the corresponding chambers dilated ; in the third, they are thickened and the cavities contracted.

In the majority of cases, the abnormal growth is confined to the walls of the ventricles, of which the left is more prone to suffer than the right. Seldom do the auricles participate in it ; on the contrary, they generally remain sound, even when the rest of the heart is enormously enlarged, — a cir-

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* Dublin Journal of Medical and Chemical Science, January, 1833.

cumstance which probably depends upon the paucity of their muscular fibres. Occasionally the hypertrophy exists only in particular parts, as the base, apex, inter-ventricular septum, or fleshy columns.

A hypertrophous heart is usually more firm and red than natural; but these are not essential characters; and, when present in a high degree, they constitute the affection which has been already noticed under the name of induration. The increase in the thickness of the walls of the organ varies in different cases, being sometimes two, three, or even four times the ordinary volume. In a remarkable instance of general hypertrophy, conjoined probably with dilatation, related by Dr. Wright, of Baltimore, the heart, after being injected, weighed five pounds, three ounces, its circumference at the base being seventeen inches and a half, near the apex twelve inches and a half, and its length, from the top of the right auricle to the point of the left ventricle, thirteen inches.* An example of general hypertrophy of the heart, not less extraordinary than the one just mentioned, I had occasion recently to observe in a boy, seven years of age, whose body I examined along with my friends Dr. Wood and Dr. Ridgely, of this city. The organ was of an obtuse conical shape, and considerably larger than we usually find it in the adult, its weight being ten ounces and a half after the removal of the great vessels. The thickness of the wall of the right ventricle was three lines; of the left, six lines and a half. The inter-ventricular septum was also unnaturally stout, and the parietes of the auricles were nearly double the normal dimensions; the cardiac chambers had a corresponding increased capacity; the pericardium adhered every where very closely to the outer surface of the heart; the mitral valves were rough and indurated; and the endocardiac lining of the left auricle and ventricle was very much thickened, opaque, and of a dense, fibrous consistence. The child had labored under all the symptoms of disease of the heart for about eight months. All the other viscera were sound. In such cases, the organ is very apt to become altered in its figure; it loses its elongated, conical appearance, and assumes a globular shape; and, instead of lying obliquely in the chest, as it naturally does, it is made to take a transverse position; and in this way it may encroach so much upon the left lung as to force

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* American Journal of the Medical Sciences, vol. xii. p. 54.

it high up into the thoracic cavity.   When great enlargement
is accompanied with adhesion of the pericardium, the heart
is secured by the attachments of the membrane in a higher
situation than its weight would otherwise dispose it to as-
sume ; and, being thus impacted between the spine and fore
part of the chest, it sometimes occasions a preternatural prom-
inence of the præcordial region, — a circumstance first pointed
out, I believe, by that distinguished pathologist and acute
observer, Dr. Hope, of London.

The *left ventricle*, as was before intimated, is much more
liable to hypertrophy than the right, and often grows to a
very considerable bulk.   In my own dissections, I have never
seen the thickness exceed an inch and a quarter ; but cases
are recorded in which it amounted to an inch and a half,
an inch and three fourths, and even two inches.   The
situation of the greatest increase is commonly somewhat
above the middle of the ventricle, opposite the attach-
ment of the fleshy columns.   From this point it dimin-
ishes rather suddenly towards the aortic orifice, and grad-
ually towards the apex, where it is reduced to less than one
half.   Generally speaking, the fleshy columns participate,
though occasionally, especially when there is much dilatation,
they appear to be flattened out and emaciated.   When the
hypertrophy is very great, the ventricle may not only occupy
the left præcordial region, but extend far under the sternum,
where its impulse and sound may be mistaken for those of
the right.

In hypertrophy of the *right ventricle*, whether alone or
coexistent with that of the left, the greatest thickening is
generally near its base, where it often amounts to twice the
natural bulk.   Increase of substance without dilatation is
much more infrequent in the right than in the left ventricle ;
and, what is remarkable, the growth is much oftener noticed
in the fleshy columns than in its walls, being sometimes so
curiously interlaced as to traverse the cavity in every direc-
tion, subdividing it into various compartments, and, in some
cases, almost filling it up.   When the ventricle in question
is alone hypertrophied, it may descend lower than the other,
and so form the summit of the organ.

Hypertrophy of the *auricles* is almost invariably conjoined
with dilatation, but the two other forms are not, however,
without example.   The thickening seldom exceeds twice
the natural size, and, as it is even then inconsiderable, it may

be easily overlooked by a superficial observer. Sometimes the pectinate muscles are the only structures in which the hypertrophy shows itself: more commonly it is uniformly diffused throughout the walls ; and, as these are naturally thicker in the left auricle than in the right, it is in the latter that the increase generally attains its greatest height.

Hypertrophy of the walls of the ventricles generally results from great and habitual accumulations of blood in their cavities, produced by disease of the semi-lunar valves, or contraction of the mouth of the aorta and pulmonary artery. In the same way may arise hypertrophy of the auricles ; or it may be occasioned, more directly, by a narrowing of the auriculo-ventricular apertures, preventing the ready ingress of blood from one chamber of the organ into the other. Hypertrophy of the right side is also frequently dependent upon disease of the lungs, as tubercles, emphysema, and hepatization of their tissue.

An increase of the muscular substance of the heart necessarily implies an increase of power ; and hence one of the most prominent effects of this state would be to force the blood with more vigor and velocity upon the different tissues and organs. Let us suppose that the individual is laboring under hypertrophy of the left ventricle. He would have a strong, bounding pulse, frequent attacks of headache, bleeding at the nose, ringing in the ears, and perhaps ultimately die of cerebral apoplexy, — all these circumstances depending not so much, as it is supposed by some, upon the increased amount of blood sent through the systemic circulation as upon the power with which it is impelled by the overgrown ventricle of the left side of the heart. In the same manner, hypertrophy of the right ventricle may bring about engorgement of the pulmonary tissue, with all the train of secondary effects, such as apoplexy, œdema, and dyspnœa, which are known to result from habitual accumulations of blood.

The physical signs of hypertrophy consist in increased impulsion of the heart against the walls of the chest, diminution of the natural sound, and dulness on percussion. In the simple form of the disease, as well as in that with dilatation, the sound is sometimes nearly lost, or converted into an obscure purring.

SECTION III.

Of the Endocardium.

OF the anatomy of this membrane we have already spoken. It only remains, therefore, that we should point out its lesions. Of these, the most important is acute inflammation, technically called endocarditis.

Encodarditis is anatomically characterized by redness, thickening, and opacity of the affected membrane, with deposition of lymph on its free surface. Redness alone cannot be considered as indicative of inflammation, as the same appearance is produced by cadaveric imbibition. The color varies from a slight rose to a scarlet, violet, or even brownish tint, and ordinarily occurs in small circumscribed spots, which are always most conspicuous on the valves. Sometimes it is universal, and, on the other hand, is an instance, occasionally, in which it is entirely wanting. The redness seems to depend rather on a tinging of the endocardium than on true capillary injection; and, although it seldom extends into the subjacent cellular texture, it cannot be easily washed away.

In acute inflammation, the endocardium is rarely much thickened; under the influence of chronic irritation, on the contrary, it often acquires the density and consistence of a fibrous membrane. In the healthy state, it will be remembered, it is perfectly smooth, polished, and so firmly adherent that it can be detached only in very small shreds; but, under protracted disease, it becomes opaque, rough, of a milky white, and can be easily raised in considerable patches. Occasionally the thickening is entirely dependent upon hypertrophy of the subjacent cellular tissue, or it may be produced by a layer of adventitious membrane.

In very acute cases, there may be softening of the endocardium, with an infiltration of pus, serosity, or bloody matter into the subjacent cellular texture. Ulceration also is sometimes observed, and may proceed to such a degree as to lead to perforation of the muscular substance.

Endocarditis, although noticed by previous observers, was first accurately described by Dr. Bouillaud, in his elaborate treatise on the Diseases of the Heart, published at Paris in

1835. The extensive investigations of this distinguished pathologist induce him to assert, in opposition to many able writers, that this disease is quite as common as pericarditis; that it is often produced by the same causes, and that it frequently coexists with and cannot be distinguished from it. The characters which he assigns to this affection, but which, as they are not invariably present, cannot be viewed as diagnostic, are, increased cardiac impulse, præcordial dulness on percussion, and violent palpitations, accompanied with a distinct bellows murmur, and sometimes with a metallic tinkle, isochronous with the ventricular systole. The beating of the heart against the side of the chest is usually very strong, sometimes like a hammer, extensive, and superficial, being recognizable both by the eye and hand. There is seldom much pain or dyspnœa, unless the lesion is coincident with pericarditis or pleuritis, or there is much obstacle to the circulation. In the acute stage, the disease may terminate fatally in a very few days, the principal cause of death being the formation of extensive fibrinous concretions, which fill up the cardiac cavities, and obstruct the passage of the blood.

It has been already stated that one of the morbid effects of endocarditis is the deposition of lymph upon the inner surface of the lining membrane. Though sometimes poured out as a distinct lamella, this substance more commonly occurs in the form of small *granulations*, varying in size between a pin-head and a cherry-stone. These bodies display a peculiar preference for the mitral and aortic valves, especially for their free borders, to which they adhere with considerable tenacity when old, though when recent, as they are then soft, they are easily detached: they are of a light pink color, whitish or yellowish, somewhat darker internally than externally, and are sometimes so clustered together as to give the surface on which they grow a rough, granulated aspect, not unlike that of a fungous ulcer. These bodies, are oftentimes organized; and in their nature they may be considered as strictly analogous to the tubercular concretions which are so frequently met with on the surface of the pericardium, pleura, and peritonæum, in chronic inflammation.

Somewhat similar to these tubercular concretions are those *wart-like excrescences* of the heart, the existence of which was first clearly indicated by Laennec, who has described them under the name of *globular vegetations*. Commonly of a spherical shape, they are of a pale straw

color, smooth externally, and encased by a distinct cyst; their size varying between that of a pea and a pigeon's egg. These singular bodies sometimes exist in considerable numbers, both in the auricles and ventricles, to the inner surface of which they adhere by narrow footstalks, occasionally more than a third of an inch in length. The capsule, which is usually about a fourth of a line thick, firm and organized, is filled with a dark grayish-looking, semi-fluid substance, somewhat similar to coagulated blood, or the lees of red wine. In some instances, the surface of these excrescences is rough, mammillated, raspberry-like, or divided off into numerous facets resembling those of a crystallized garnet. Oftentimes they are so closely grouped together, as to present the appearance of a cauliflower.

These globular vegetations are, on the whole, of very rare occurrence; and their origin seems to be still involved in considerable obscurity. From the fact, however, that they generally coexist with chronic endocarditis and inflammation of the aorta, I am led to the conclusion, that they are caused by a deposition of bloody lymph, which assuming, perhaps in consequence of the constant movements of the circulating current, the form and color above described, in time becomes perfectly firm, dense, and organized. Corvisart supposes that they are of a syphilitic origin; but the opinion is evidently groundless.*

These bodies do not give rise to any characteristic symptoms, yet Dr. Bouillaud seems to be inclined to suspect their existence, when there is a well-marked bellows sound, unaccompanied by any other indication. When seated on the valves, especially if very large and numerous, they must necessarily interfere with their action, and materially diminish the auriculo-ventricular orifices and the mouths of the great vessels.

As consequences of chronic inflammation, it is by no means uncommon to meet with *fibro-cartilaginous* and *osseous degenerations* of the endocardium. The most frequent seats of these lesions are the circular zones around the auriculo-ventricular orifices, together with the adjacent valves. They

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* See Corvisart, Essay on Organic Diseases of the Heart, p. 172; and Morgagni, on the Seat and Causes of Disease. The latter author saw a case in a girl of sixteen, in which the valves of the pulmonary artery were so indurated and ossified, that their agglutinated edges scarcely left an opening as large as a lentil for the passage of the blood.

may occur at all periods of life, but the age which seems to
be most prone to them is between forty and sixty.   Occa-
sionally they are seen in children ; and Bouillaud mentions a
case in which he found them in an infant of only ten months
old.   Like the tubercular and warty excrescences, just de-
scribed, these transformations are much more common in the
left side of the heart than in the right, though they are by
no means confined to it, as is thought to be the case by
Bichat and some others.*   The cause of this remarkable dif-
ference is not well understood.   That it depends upon some
difference of organization of the endocardiac lining of the op-
posite chambers of the viscus cannot, I presume, be reason-
ably doubted.   The arteries, we know, are extremely liable
to these degenerations ; and, as their internal tunic is contin-
ued into the left cavities of the heart, whilst the right are
lined by a prolongation from the internal coat of the veins, it
is highly probable that the same cause which operates in the
production of these lesions in the former of these structures,
is of the same character as that which produces them in
the latter, and conversely.   Bertin ascribes the difference
to the nature of the fluid which traverses the two sides
respectively, the left receiving blood of a more vital, acrid,
and stimulating quality than the right ; and Dr. Hope sup-
poses that it depends upon the greater energy of action of
the left ventricle, by which the endocardiac lining, with the
corresponding valves which are framed out of it, is more
severely strained.†   A somewhat similar notion is entertained
by Professor Cruveilhier, of Paris.

In the fibro-cartilaginous transformation, the endocardium
is often remarkably thickened, corrugated, opaque, and of a
pale milky color.   Not unfrequently, indeed, the membrane
is of the consistence and tenacity of tendon, or of a truly car-
tilaginous hardness, with a creaking sound on being cut.   In
this advanced stage, bony depositions usually occur, forming
granules, patches, scales, or nodules, of various sizes, rough,
opaque, whitish, or yellow.   The ossifications, in most cases,
assume a very irregular shape ; and occasionally they pen-

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* For a most interesting case of this disease, illustrated by several very graphic
wood cuts, the reader is referred to the fifteenth volume of the American Jour-
nal of the Medical Sciences, where it has been detailed by Professor Jackson, of
Philadelphia.   It occurred in a man aged fifty-four, and was complicated with
pericarditis, dilatation of the heart, and œdema of the larynx and fauces.
† Hope, on the Diseases of the Heart, p. 311.

etrate deeply into the muscular substance of the heart itself.
For the most part, they are seated on the valves, which are
often perforated with holes, torn, reticulated, or almost en-
tirely detached, though these morbid appearances are by no
means common.

The tissue in which the ossific deposition begins seems to be
the cellular, which binds the endocardium to the muscular sub-
stance, and which is evidently somewhat of a fibrous nature,
especially where it connects the folds which constitute the
valves.   From thence it gradually extends to the endocardi-
um itself, and occasionally even to the muscular substance.

Amongst the most serious lesions resulting from cartilagi-
nous and osseous degeneration of the valves of the heart, is
the contraction of the auriculo-ventricular and arterial orifices.
In its extreme degree, the point of the little finger, or even a
quill, can scarcely pass.   Sometimes the valves become con-
solidated with each other, leaving merely a small rounded,
oval, or elliptical aperture, through which the blood is forced
with so much difficulty that hypertrophy and dilatation, with
various other diseased conditions, are sooner or later the in-
evitable consequences.   Cases occasionally occur in which
the valves form adhesions with the walls of the heart, giving
rise to pretty much the same symptoms as those which result
from contraction of the orifices.

The *diagnosis* of induration of the valves with contrac-
tion of their orifices, has been very happily elucidated, within
the last few years, by Dr. Bouillaud, who considers it quite
as easy and certain as that of stricture of the urethra or rec-
tum, by the most skilful surgeon.   The most important phys-
ical signs upon which our reliance is to be placed, are the
bellows, rasping, or sawing sound; a peculiar vibratory sen-
sation imparted to the hand ; and an irregular, intermittent,
and tumultuous action of the heart.   When these phenomena
are present, it is in the highest degree probable that the lesion
is the one in question ; and the suspicion is fully confirmed,
when to these signs are added those of impeded circulation, —
such, for example, as discoloration of the countenance, con-
gestion of the lungs, dyspnœa, bleeding from the nose, and
beating of the jugular veins, synchronous with the pulse.

Polypous concretions are sometimes found within the heart ;
more generally in the right side than in the left, — for what
reason, it is not very easy to say.   Many of these bodies
are formed during the last agonies of life, and do not ma-

terially differ from the buffy coat of the blood; but there are others which are evidently organized, and which adhere quite intimately to the walls of the heart, especially to the fleshy columns and tendons of the valves, around which they are often intricately coiled. In their early stage, they are attached solely through the medium of coagulating lymph; after a while, however, as they become older, and more fully developed, they adhere by true cellular tissue, at the same time that they receive an abundant supply of vessels from the parts with which they lie in contact, and into which they are as it were ingrafted. In this advanced state, they are generally of a pale grayish color, dense, highly elastic, and distinctly fibrous in their texture. Sometimes the centre of these concretions is softened, and occupied with purulent matter; in other instances, it contains small vesicles, clustered together, and filled with a semi-concrete liquid. Their size varies in different cases: very often they are confined to the right or left side of the heart; but, in many instances, they extend into the great vessels, especially into the inferior and superior hollow veins. In their shape, they may be cylindrical, conical, pear-like, flattened, or irregular. The symptoms to which these concretions give rise, are such, generally, as might be expected to result from obstruction thrown into the way of the circulation: there are none which can be regarded as strictly characteristic.

CHAPTER V.

Of the Nasal, Maxillary, and Frontal Cavities.

I. THE interior of the nose is covered throughout by a mucous membrane, which is continuous, on the one hand, with that of the fauces, and, on the other, with that which lines the various sinuses of the skull. Anteriorly, it is insensibly blended with the skin, and at the inferior meatus it extends up into the nasal canal, spreading over the lacrymal sac, and terminating at length on the surface of the eye in forming the conjunctiva. Thus the Schneiderian membrane, as it is called, has a very extensive distribution, as well as important sympathetic relations; upon which, however, we have not time to dwell in this place.

In its structure, the Schneiderian membrane resembles the mucous textures generally; its color, however, is naturally of a deeper and uniform red; and it is thicker also in some places than in others. Its free surface has a fleecy villous appearance, as may be seen by floating it in water; and it is every where studded with minute crypts, from which proceeds the mucus of the nasal cavities. The other surface is rough, and reposes upon a fibrous membrane, being connected to it by cellular tissue, the density of which varies in different parts of the organ.

The parietes of the nasal cavities are developed by several distinct points, the union of which is effected at the mesial line. The regularity of this formation is much influenced by that of the olfactory nerves, the imperfection of which appears to be always attended with a corresponding imperfection of the parts over which they preside. Cases are recorded in which these nerves were entirely absent, and in which, as a conse-

quence, there was a complete deficiency both of the septum and of the floor of the nostrils.

The external nose, properly so termed, is very rarely absent as a connate vice. A much more common defect is congenital malformation of the *nasal septum*. Of this quite a number of examples have fallen under my own notice, and others have been reported by authors. The defect to which I allude is generally confined to the cartilaginous portion of the septum, but may also implicate the vomer and the nasal lamella of the ethmoïd. It consists, for the most part, simply in a lateral curvature, obstructing more or less the corresponding cavity, and leading to indistinct enunciation. The cartilage is occasionally thickened, perforated, or tuberose, and the external nose deformed; but these are rather accidental than necessary attendants. On the whole, it may be confidently affirmed, that there are few persons in whom the part in question is perfectly vertical.

The most common disease of the Schneiderian membrane is *inflammation*, the anatomical characters of which are the same as in the rest of the mucous system. With the increased redness, there is generally at first a suppression of the natural secretion, which, in a short time, however, is not only restored, but becomes extremely abundant, watery, and so irritating as to excoriate the parts with which it comes in contact. When the inflammation begins to decline, as it usually does in a few days, the secretion assumes a thick yellowish or greenish appearance, is less acrid, and gradually regains its natural standard, both as regards quantity and quality. The sense of smell is very much impaired, — often lost. Both cavities are usually affected, and in many instances the disease invades the neighboring parts, as the conjunctiva, the fauces, and the frontal sinuses. Dark-colored spots, evidently caused by the effusion of blood into the submucous cellular tissue, are sometimes observed, and the same fluid is occasionally discharged along with the altered mucous secretion. The Schneiderian membrane between these spots is of a deep florid hue, verging upon purple.

The duration of this affection varies from a few days to several weeks, when it either subsides, passes into suppuration, or assumes the chronic type. Submucous abscesses occasionally form, and are eventually followed by ulceration, with an escape of their contents. More frequently, the matter is discharged along with the mucous secretion, unaccom-

panied with any breach of continuity. In the chronic stage
of the disease, the membrane loses its spongy texture, in-
creases in thickness and density, and can generally be easily
detached, owing to the brittleness of the subjacent cellular
tissue. Ulceration sometimes succeeds, and in its progress
involves the osseous structure, producing what is called
ozœna,—an affection which is frequently attended with a
profuse muco-purulent discharge, of a character the most
intolerably fetid. In secondary syphilis, the ulceration is liable
to commit the most extensive ravages, destroying the greater
part of the nasal septum, the lateral cartilages, and the turbi-
nated bones, and so producing the most unsightly deformity.

Another affection of the nose is hemorrhage, which re-
ceives the name here of *epistaxis*. Owing to the great vas-
cularity of the Schneiderian membrane, this is an extremely
common occurrence, much more so than in any other part of
the body, and is most frequently observed about the age of
puberty. In females, it is sometimes vicarious of the men-
strual flux. The blood rarely proceeds from both nostrils. In
general, only a few ounces are lost at a time. When arising
spontaneously, it is almost always the result of exhalation.

The Schneiderian membrane is a common seat of *polypes*.
Persons of all ages are subject to the formation of these
heterologous growths, but their occurrence is most frequent in
adults and old people,—occurring both in man and in the
lower animals, especially in the horse and the dog. They
often display a malignant tendency, and are generally regen-
erated when extirpated. In regard to their structure, polypes
may be divided into three species, the gelatinous, the fibrous,
and the vascular.

The gelatinous polype generally grows from the mucous
membrane over the turbinated bones, never from the median
septum. As its name indicates, it is of a soft jelly-like con-
sistence, smooth, of a white greenish color, slightly transpar-
ent, and striated with a few scattering vessels. Most com-
monly it has a narrow, elongated neck, with a broad bulbous
part hanging forward into the nostril. It readily breaks
under the pressure of the forceps, is void of sensibility, and
is composed of a thin, mucous pellicle, enclosing a soft cellular
substance, the cavities of which are occasionally filled with
watery fluid. This species of polype seldom exists singly,
and is often met with in great numbers together. One nos-
tril is very rarely affected alone. It is most common between

the age of twenty and forty, may attain a large size, and usually expands in damp foggy weather.

The *fibrous polype* is distinguished by the extreme firmness of its texture, which nearly equals that of tendon.   Great effort is required to detach it ; and, when cut into, it exhibits a faintly striated arrangement, being composed of whitish filaments agglutinated by a dense fibrinous substance. Although it sometimes grows in both nostrils, it almost always exists singly, and is most common in young adults.   When touched it blends profusely, and often acquires a very great bulk, protruding externally, descending into the fauces, and pressing upon the walls of the nasal cavities in all directions.

The third and last species of polype requiring to be noticed is the *vascular*, which, in comparison with the other two, is extremely rare.   Young persons are most subject to it, and it occasionally grows to a very large size.   Of a red florid color, it is soft and erectile, bleeds from very slight causes, the hemorrhage issuing from every part of its surface, and is composed essentially of vessels, some of them of considerable magnitude.   It is rarely of a malignant character, and does not often return when extirpated.

Of the different species of polypes now described, the fibrous is by far the most liable to degenerate into malignant disease.   When thus affected, it becomes extremely friable, bleeds profusely when injured, and often assumes the character of genuine fungus hæmatodes, encroaching without limitation upon the bones of the nose and face, and gradually but surely sapping the foundations of life.   The malignant growth exudes a fetid, purulent, or bloody matter, is attended with severe pain, usually occurs late in life, and invariably returns when extirpated.   Small cysts, containing a glairy, mucous fluid, are sometimes found in these polypes ; and in a specimen now in my possession, removed from the nose of an elderly gentleman in this city, there are five large tubercles, of the same nature exactly as those that are found in the lungs and other organs.

There is a disease of the nasal cavities, which, as it is often mistaken for polypes, requires brief notice in this place. It is observed chiefly in weakly children and in females of a relaxed constitution, and consists in an elongation of the Schneiderian membrane, produced by the effusion of serum into the subjacent cellular substance.   A tumor is thus formed of a red vascular appearance, and of a soft, spongy

consistence. The parts on which it grows are the turbinated bones, of which the superior is more frequently affected than the inferior. Both nostrils are sometimes affected. The tumor may exist for a long time, but is always amenable to proper treatment.

The mucous follicles of the nose, like the same structures in other situations, are liable to obstruction of their orifices, leading to the formation of *encysted tumors.* They have an irregular, bulbous shape, a light grayish color, a soft, gelatinous consistence, and hang within the nose like so many little bladders. No pain attends these tumors; they easily break under pressure, discharging a thin, glairy fluid, like the white of eggs, and are extremely apt to reappear after they have been removed, either at the same place, or in the parts immediately around.

II. The *maxillary sinus,* situated in the body of the upper jaw, is subject to different maladies, the most important of which, by far, is inflammation of the lining membrane, occasioned by cold, the irritation of a carious stump, or extension of disease from the nasal cavities. The anatomical characters of this lesion have not been accurately described, but it is presumable that they do not differ from similar affections in other parts of the mucous system. The purulent matter, which is often quite abundant, is of a thick, cream-like consistence, and almost always highly offensive, apparently from its long sojourn in the antrum. When the inflammation is protracted, the lining membrane becomes thickened, the natural outlet is partially or entirely closed, the dimensions of the sinus are increased, ulceration is set up, and great mischief is frequently done to the maxillary bone. The first manifestation of this malady is a dull, aching pain, which gradually augments in intensity, and at length assumes a throbbing, pulsatory character : very often it extends towards the forehead, in the direction of the frontal sinus, and in most cases it is accompanied by a sensation of weight and tightness. In a short time the cheek becomes red, hard, and full ; and, on raising the lip, the gum is found to be abnormally tumid just above the fangs of the teeth.

When the natural outlet of this cavity is shut, an immense accumulation of mucous fluid occasionally takes place, forming a tumor which exhibits all the outward features of carcinomatous disease. In this affection, the maxillary sinus is brought in the same relations as a mucous crypt laboring

under an obstruction of its orifice. The normal secretion still goes on, but being unable to find an outlet, it is pent up, and thus forms a species of encysted tumor. The fluid is usually of a thick, glutinous consistence ; but occasionally it is thin and glairy, like the white of an egg, or the contents of a ranula.

Polypes, of the same nature as those of the nose, sometimes grow in the antrum. They are generally attached to the mucous membrane by a pretty broad base, and increase with more or less rapidity, until they fill the whole chamber. In time, they encroach upon the surrounding parts, as the eye, nose, mouth, and face, thrusting them out of their natural position, and thus occasioning considerable deformity. In color, they are ordinarily florid, from their excessive vascularity ; and in consistence they vary from the softness of flesh to the firmness of fibro-cartilage, cartilage, and even bone. A profuse discharge of fetid, sanious matter usually accompanies this disease, and the part is the seat of constant pain, commonly of a dull, aching character.

Another affection, which is sometimes observed in this chamber, is *carcinoma*, generally, if not invariably, of the encephaloïd kind. The young appear to be most obnoxious to it, but the old are by no means exempt from it. The disease usually begins, I presume, in the lining membrane, or perhaps in the submucous cellular texture ; and, as it proceeds, it invades the osseous frame-work of the face, leading finally to the most hideous deformity. In a case which recently fell under my observation, in a man fifty-seven years of age, the tumor, although scarcely of eleven months' standing, was of enormous size, encroaching, on the one hand, upon the roof of the mouth, and, on the other, upon the nose, eye, and forehead. The progress of this malady is generally rapid, and its result always unfavorable. When removed with the knife, it is sure, sooner or later, to reappear at the cicatrix, or in some neighboring part.

Exostoses occasionally grow in the antrum. In a specimen which I had an opportunity of examining a few years ago, there were from eight to a dozen of these excrescences, varying in volume between a mustard-seed and a grain of wheat, which they also resembled in shape. In a few rare instances, these exostoses acquire a very large magnitude, so as to fill not only the antrum, but encroach very much upon the neighboring organs. In a case recorded by Sir Astley

Cooper, the bony masses projected into the orbits of the eyes, and eventually produced fatal compression of the brain.

III. It is seldom that the *frontal sinus* is the seat of disease. This cavity is lined by a reflection of the pituitary membrane of the nose, in the lesions of which it sometimes participates, especially in the catarrhal affections which are so common in this country. The inflammation occasionally terminates in the effusion of purulent matter, which commonly finds a vent through the nostrils, though in a few rare instances, it has worked its way out through the bones and soft parts, leaving a troublesome fistulous opening. When chronic, the disease is generally attended with thickening of the mucous membrane, together with a discharge of thin, fetid matter, and a diminution of the sense of smell.

It is rare that the frontal sinus contains *calcareous concretions ;* nevertheless, a few such cases have been recorded by authors. A most instructive one is to be found in the first volume of the Gazette Medicale de Paris. It occurred in a female who had daily suffered, for several years, from an obstinate and distressing headache, which commenced in the left frontal sinus, and gradually involved the whole of the corresponding side of the cranium. Under the influence of sternutatories, three or four calculi, about the size of a small bean, were discharged from the nose, followed by a very offensive suppuration, and finally by a complete cure. On analysis, these concretions were ascertained to consist of phosphate and carbonate of lime, magnesia, slight traces of soda, oxide of iron, and animal matter.

CHAPTER VI.

Of the Mouth, Pharynx, and Œsophagus.

I. The *lips* afford a subject of interest to the morbid anatomist chiefly on account of carcinoma, encysted tumors, and congenital malformations. Cancer is sufficiently common here, especially in oldish subjects, and usually begins in the follicular structure of the part, which becomes hard and thickened, and soon tends to ulcerate. The sore thus formed is often very deep, with fiery and everted edges, and gives vent to a thin, sanious, and eroding fluid. When removed by excision, the disease commonly returns. If permitted to progress, it gradually eats away the lip, and involves the gum, together with the periosteum, and the substance of the jaw.

When the orifice of one of the labial glands becomes accidentally obstructed, mucus accumulates in it, converting it into an *encysted tumor.* The swelling seldom exceeds a hazelnut, but, in a few instances, I have found it as large as an almond. Its form is usually spherical, its appearance semitransparent, and the fluid it contains is thick and glairy, like the white of eggs.

The congenital malformations of this structure are usually comprehended under the title of *hare-lip*, from their supposed resemblance to the lip of the hare. The most simple form in which it is presented is that of a fissure, extending from the border of the lip to its connection with the gum. Gen-

erally seated to one side of the mesial plane, more frequently
on the left than the right, it exists either by itself, or is com-
plicated with malformation of the jaw, palate, or nose, or of
all these parts together. The margins of the abnormal cleft
are more or less rounded off; and, as they are covered with
mucous membrane, they are usually of a reddish color. In
double hare-lip there are two such fissures, separated by an
intermediate portion of lip, which varies much in size and
shape, being sometimes broad and quadrangular, but more
commonly narrow, elongated, and tit-like. The cleft, wheth-
er single or double, is occasionally more or less oblique. The
defect, it need scarcely be observed, always depends upon an
arrest of the natural developement of the part concerned.

" The malformation to which the upper-jaw is liable consists
in a projection of the central part that holds the cutting teeth,
forming a tumor from which the teeth grow out at a right
angle to their ordinary direction. In most cases of this kind,
the projection comprehends an equal portion of both superior
maxillary bones, the portion, namely, which, in the lower ani-
mals, is occupied by two distinct pieces, the *ossa incisiva*.
It forms a round knob, connected by a narrow neck to the
septum of the nose, covered with a firm substance, similar to
the gum, and having at its anterior part a similar shaped but
smaller sized appendage, which seems to consist of the tis-
sue that should have constituted the lip. The fissures on
each side of this knob meet together behind it, and are there
continued single through the palate backwards. Instead of
this conformation there is sometimes merely an overlapping
of one edge of the split gum over the other, and the degree
to which the projection thus formed takes place is extremely
various."

II. The *tongue* is liable to be affected with inflammation,
suppuration, ulceration, hypertrophy, cysts, and cancer.

Glossitis may exist as an idiopathic affection, but is most
generally induced by salivation, by mechanical injury, or cor-
rosive substances. The idiopathic variety, to which these
remarks are intended more particularly to apply, is a most
formidable malady, in reference both to its local as well as to
its constitutional effects. The organ is extremely painful,
and swells sometimes so enormously as to threaten the patient
with speedy suffocation : all its vessels are engorged with
blood; and its surface, which is at first of a bright red, is
soon coated with viscid mucus, or, when the inflammation

runs high, even with a layer of lymph.   Now and then the disease is limited to one half of the tongue, the raphe forming a pretty distinct line of demarcation between it and the unaffected side.   Glossitis terminates either in resolution, in suppuration, or in gangrene.   The disposition to disappear is sometimes manifested as early as the third day, but mostly not until about the sixth.   When matter forms it is generally deep-seated, and requires free incisions for its evacuation. The termination of glossitis in gangrene is extremely rare, and has hitherto been noticed only in persons of a debauched habit and worn-out constitution.

The mucous membrane of the tongue and cheek is liable to several forms of *ulceration*.   In psoriasis there are whitish excoriated patches, not unfrequently half an inch in diameter ; and in children nothing is more common than to see these parts studded with small milky-looking vesicles.   These blebs, which are technically called *apthæ*, are of an irregularly spherical figure, and vary in size from a pin's head to a small pea.   When punctured, their contents are found to consist of two parts, one of a fibrous, the other of a serous nature. Apthæ are frequently connected with gastro-enteric irritation ; and there is reason to believe that they often extend through the œsophagus, as far as the cardiac extremity of the stomach. In several instances, however, in which I made a careful inspection with a view of ascertaining this point, I failed in tracing the vesicles beyond the fauces, although the tongue, the inside of the cheeks, and the roof of the mouth were literally covered with them.

Flat, shallow ulcers, with hard and thickened edges, are occasionally observed on the tongue, cheeks, and fauces, in secondary syphilis, and in persons who have been excessively salivated.   The parts are foul and clammy ; the saliva acrid and abundant ; the gums spongy, and disposed to ulcerate.

The tongue being composed of different structures, *hypertrophy* may be limited to its muscular substance, to its mucous covering, or to its papillæ.   The former variety, although sometimes congenital, commonly appears soon after birth, and is now and then witnessed in adults, either without any assignable cause, or as the result of glossitis.   Of this nature, seems to have been the case published by Dr. Harris, of Philadelphia, of a girl twenty-four years of age.   Commencing when she was quite young, the intumescence was attended, at first, with great pain and difficulty of deglutition,

and gradually progressed, until the organ protruded four inches beyond the incisor teeth, measuring one inch and three fourths in thickness, by six inches and three fourths in circumference. The projecting portion was extremely dense, of a dark chocolate color, and constantly covered with a thick, tenacious mucus. The part within the mouth was entirely free from disease, excepting the lenticular papillæ, which were about five times the natural size.* In another case, recently reported by the same distinguished surgeon, the hypertrophy was congenital, and was attended with unusual shortness of the branches of the lower-jaw, with great separation of the incisor teeth.† Hoffman, an old physician, of Stockholm, removed a tongue of this kind from a girl, ten years old, which protruded four inches, and was two inches thick.‡ An interesting case, of a similar description, but where the swelling was considerably less, is recorded by Dr. Wells, in the Western Journal of the Medical and Physical Sciences for July, 1832. The patient, likewise a girl, was six years of age, and had formerly suffered much from inflammation and ulceration of the mucous membrane of the tongue. The organ, preternaturally dense and rigid, hung down two inches and a half beyond the teeth of the upper-jaw, being a little more than two inches in breadth. This lesion, like that next to be mentioned, is generally caused by inflammatory irritation ; and, upon a careful examination of the principal cases of it on record, I am disposed to believe that it is much more frequent in the female than in the male. Enlargements of this kind are sometimes remarkably vascular, being pervaded by plexuses of dilated vessels, and subject to temporary erections, from the preternatural influx of blood. Dissection shows that the fleshy fibres of the tongue have lost their normal color, and that they are converted into a dense semi-cartilaginous substance, with scarcely a trace of the primitive structure.

With respect to the *mucous membrane*, the hypertrophy, as might be expected, is usually limited to one or more points, though, in a few instances, it has been known to extend over the entire organ. The affected part varies in thickness from the twelfth to the third of an inch, and exhibits a rough,

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* American Journal of the Medical Sciences, vol. vii. p. 17.
† Op. cit. vol. xx. p. 15.
‡ Acta Literaria et Scient. Sueciæ. 1732, t. iii.

grayish appearance, the prominence being occasionally divided by deep fissures. The enlargement has little or no pain in it, and the sense of taste is almost always partially destroyed.

The *papillæ*, situated on the dorsal surface of the tongue, have a narrow base, and a broad, mushroom-like head. From a deranged state of the stomach, or from local injury, they are capable of becoming considerably enlarged, so as to form preternatural tumors, of a deep florid color, which may be mistaken for cancerous excrescences. From these, however, they are readily distinguished by there being no real ulceration of the tongue, and by the absence of any decided pain. The size which such tumors may acquire varies from that of a pea to that of a nutmeg.

Still more rare than the lesion just described is *atrophy* of the tongue. This is generally associated with inflammatory irritation, and may reach such a height as to leave behind it nothing but a dense, whitish mass, with scarcely a vestige of muscular tissue.

A singular disease of the tongue, first noticed, I believe, by Mr. Earle, of London, is occasionally met with. It consists in very minute semi-transparent *vesicles*, occupying the muscular substance of the organ, the mucous membrane of which they not unfrequently elevate in the form of little tumors. The precise nature of these vesicles is not well understood. In the case mentioned by Mr. Earle, they grew in clusters, and were so sensitive as to bleed profusely on the slightest injury. The clusters, in some places, were separated by deep clefts, which discharged a fetid, irritating sanies.

This organ is not unfrequently the seat of *cancer*, — a disease which, though most common in old persons, is sometimes observed in the young. It commences in the form of a hard, inelastic, puckered tubercle, situated towards the anterior part of the tongue, by the side of the mesial plane. The ulcer which follows is excavated, foul, and uneven; the edges are thick and contracted; the base and surrounding substance hard and gristly. In time, the disease affects the gums and cheeks, and the erosion thus produced often presents a frightful aspect. The breath is intolerably fetid; the patient is harassed with lancinating pain; the neighboring lymphatic ganglions swell; and profuse hemorrhages supervene from the ulceration of one or more vessels. In some instances, the disease begins in a fungous excrescence, at

the side of the tongue, which extends rapidly over the sur-
face, and assumes all the characters of encephaloïd. In
whatever manner it may appear, there is reason to believe
that carcinoma is originally located in the follicular struc-
tures, from which it gradually spreads to the other tissues.

The tongue, finally, is liable to congenital *malformation.*
Thus, it may be bifurcated at the tip, as in the snake and
the lizard ; be extremely small, and nipple-shaped, as in
parrots ; be double, or even entirely absent. The frœnum is
sometimes too long, or too short, or unusually thick, and of
a dense, fibro-cartilaginous consistence.

III. The *salivary glands*, situated to the number of three
on each side of the jaws, although differing in size and
shape, all agree in being of a pale ochrey color, not un-
like the cineritious substance of the brain, and in being com-
posed of minute granules, aggregated into lobules and lobes,
and connected together by firm, cellular tissue. They are
provided each with an excretory duct, by which the fluid
they secrete is poured into the mouth ; but none of them
have a proper envelope ; and hence the reason, perhaps, why
they are so little subject to disease.

All the salivary glands are not equally liable to morbid
alterations. The parotid is infinitely more frequently affected
than the others, and the disease to which it is most subject
is *mumps*, — an infectious, inflammatory complaint, occurring
sometimes endemically. Both organs are usually involved.
The swelling, which is often considerable, reaches its height
about the end of the fourth day ; after which, it gradually
subsides, and, in a week from the time of the invasion, is
entirely gone. One of the most singular features of the
disorder is its liability to be translated to other organs, as the
testicle in the male sex, and the breast in females. It rarely
occurs more than once, and youth is its favorite period of
attack.

In whatever way induced, the anatomical characters of the
disease are generally the same. That is to say, the substance
of the affected gland is preternaturally red, its density is
augmented, its lobules are rendered more distinct, and the
connecting cellular tissue is infiltrated with serosity. In
severe cases, fibrin and blood are often effused, giving the
part a bloodshot appearance. Added to these phenomena, the
capillary vessels, both arterial and venous, are excessively en-
gorged, and the minute excretory ducts are so much com-

pressed, as to be no longer permeable to the most diffusible injecting matter. The salivary fluid is also more or less altered. When the inflammation is at its height, the secretion is either very much diminished, or else entirely suspended : by degrees it is restored, and is then often discharged in immense quantities, as is exemplified in mercurial salivation. In this affection, which appears to be propagated from the gums and cheeks, as there are always manifestations of it there, before it involves the glandular structures about the jaws, the salivary fluid is remarkably thin, pellucid, and of a strong, disagreeable taste. Much of this is owing, doubtless, to the follicular secretion of the mouth, which, under such circumstances, is poured forth in great abundance, and of a very fetid quality.

Parotitis, under favorable circumstances, may terminate in *suppuration*. Of this I have noticed several instances, in one of which an opportunity was afforded me of making an autopsic inspection. Both glands were considerably enlarged, unnaturally dense, of a grayish, gristly appearance, and pervaded throughout by purulent matter, collected here and there into little abscesses, the largest of which did not exceed the volume of a hazelnut. The pus was white, thick, and tenacious, like that of a scrofulous lymphatic ganglion. The weight of the right parotid was one ounce two drachms ; of the left, one ounce one drachm. The glandular substance was very little injected, a small straggling vessel being only here and there perceptible. The patient was sixty-eight years of age, and died of disease of the liver and the duodenum, for which he was attended by my friends Drs. Drake and Rives. The parotitis came on ten days before death ; and, what is remarkable, the man never complained of the slightest pain from this source.

Gangrene has been known to seize on the parotid, and to proceed until it had entirely destroyed its substance. This termination, however, is extremely rare, and has hitherto been observed chiefly in cases in which the surrounding textures were extensively involved by the inflammation.

The salivary glands, especially the parotid, are subject to *atrophy*. This is usually induced by some morbid growth in their immediate vicinity, which, by causing the absorption of their substance in proportion to its own enlargement, at length usurps their place. *Hypertrophy*, an affection much more common than the one just adverted to, is generally as-

sociated with induration, the effect of which is to render the glandular structure hard, dense, and sometimes almost of a gristly consistence.

True *scirrhus* is occasionally met with in the parotid, as are also encephaloïd and melanosis. The occurrence, however, of these malignant growths is rare in this country, and is seldom witnessed, except in persons passed the prime of life. The size of the organ, in these affections, is sometimes really surprising. In a case in which it was removed by Dr. Prieger, of Germany, on account of a carcinomatous disease, it weighed two pounds and three quarters. The patient was a female, thirty-five years of age. Tubercles, I believe, have never been observed either in this or in the other salivary glands.

I am not aware that authors have recorded any examples of the *fatty degeneration* of the salivary glands ; but an interesting case of this kind has recently fallen under my own observation, in a man forty-two years of age. The disease involved the right parotid, which was enlarged to nearly three times the normal bulk, and had been gradually coming on for several years, unattended with pain or tenderness on pressure. After the extirpation of the organ, which was successfully accomplished by my friend, Professor Parker, who is well known to the public, as an excellent anatomist and surgeon, it was found to be completely transformed into adipous matter, quite greasy to the touch, remarkably friable, and of a pale bluish color, not unlike the buffy coat of the blood. The granular texture was still recognizable, but the connecting cellular tissue appeared to be entirely destroyed. When pressed between the fingers, a clear oily fluid oozed out, and which, when the gland had remained some time in alcohol, collected in considerable quantity on the surface of that liquor. A similar transformation, as will be shown hereafter, is occasionally witnessed in the pancreas, which bears so close a resemblance to the parotid, that it has been described by many under the name of the salivary gland of the abdomen. Whether the sublingual and submaxillary are susceptible of a like change, I am not able to say, as there are no cases of it on record.

The ducts, both of the parotid and submaxillary glands, are sometimes the seat of calcareous concretions, which are named *salivary calculi*. Their volume varies from that of a clover-seed to that of a large almond : their number is

usually small. They are of a pale yellowish color, oval in their shape, and have a finely tuberculated surface. Their composition is phosphate and carbonate of lime, agglutinated together by a small quantity of animal matter.

The principal disease of the sublingual gland is *ranula*, which is generally supposed to depend upon the dilatation of one of its ducts, but is in reality an encysted tumor. The swelling is usually occupied by a thick, glairy fluid, like the white of eggs, but sometimes is watery, or of a pultaceous consistence : occasionally, it resembles the synovial liquor of the joints, and contains particles of gritty matter, probably a mixture of phosphate and carbonate of lime. The size of the tumor varies from that of a pea to that of the fist ; its form is irregularly oval, and its parietes are thin, and for the most part translucent. The submaxillary gland is sometimes similarly affected.

IV. Although the *teeth* bear a very striking resemblance to the bones, yet as they differ from them essentially in their mode of developement, and the uses which they subserve in the economy, to say nothing of the peculiarity of some of their diseases, it will be necessary to consider them separately. To enter minutely upon this matter would be foreign to the design of this treatise, and I shall therefore, after making a few remarks concerning the structure and composition of these organs, content myself with a very rapid outline of their more interesting lesions.

The total number of teeth in the adult is thirty-two, of which eight are named incisors, four cuspid, eight bicuspid, and the remaining twelve molar. Although these four classes are arranged in perfect uniformity in each jaw, yet they differ widely from each other in size and form, as well as in their use and articulation. Anatomically considered, each tooth has a body, a neck, and a root : the first, which is also called the crown, being the part which is incrusted with enamel ; the second, that which is embraced by the gum ; and the third, that which is implanted into the substance of the jaw.

In the interior of every tooth is a canal, which represents very faithfully its outward form, being larger in the crown than in the root or fang, at the extremity of which it terminates in a minute foramen. The whole of this cavity is lined by a very delicate membrane, which is highly vascular and exquisitely sensitive, and which is intimately connected with the growth and preservation of the organ, into the com-

position of which it enters.   The vessels and nerves penetrate
the aperture at the bottom of the fang, and ramify over this
membrane in every direction ; but whether any branches are
spent upon the substance of the tooth, is still a mooted point.
After a successful injection with size and vermilion, neither
the enamel nor the bony part appears to be reddened.
Nevertheless, it is not only highly probable, but almost cer-
tain, that these structures are organized ; otherwise it would
be difficult, if not impossible, to explain the sympathetic con-
nections between them and the rest of the system, and the
various changes which they experience in consequence of
disease.   Their vitality, however, is no doubt of a very low
grade ; and hence they readily yield to such agents as have a
tendency to destroy them.

The nerves of the teeth are derived from the ganglionic
portion of the fifth pair, filaments of which may be traced
through the cavity of the fang into the substance of the
lining membrane.   The arteries, which are accompanied by
corresponding veins, are furnished by the internal maxillary
branch of the external carotid.   The existence of absorbents
has been ably controverted by Mr. John Hunter, but not
successfully, as there is every reason to believe that these
vessels exist here as in other parts of the body, though
doubtless in less abundance.

The mode of articulation by which a tooth is fixed in its
socket, is termed gomphosis.   The fang, however, through
the intervention by which this is effected, does not lie in im-
mediate contact with the walls of the containing cell, but is
separated from them by a very delicate vascular membrane.
This is merely a prolongation of the periosteum of the max-
illary bones, which, after covering the alveolar processes, dips
down into each socket, the parietes of which it lines.   From
the bottom of the cavity it is reflected over the root of the
tooth, which it entirely invests as far as the neck, at which
part it is intimately united with the gum.   Thus, the mem-
brane here spoken of not only adds materially to the firmness
of this articulation, but it may be said to answer to the osseous
portion of the organ which it covers, — the same purpose that
the periosteum does to the bones of the skeleton, preserving
its connection, and contributing to its support.

Two distinct substances enter into the formation of the
teeth, differing widely from each other in their structure, as
well as in their chemical composition.   The first, of which

the mass of the organ mainly consists, is of an osseous nature, extremely hard, compact, and indestructible : it is of a dull yellowish color, and is made up of a cartilaginous frame-work, the cells of which are occupied by earthy matter, upon which the solidity of the teeth essentially depends. The chemical composition of the bony substance, as ascertained by Berzelius, is as follows :

Animal matter,	28.
Phosphate of lime,	62.
Fluate of lime,	2.
Carbonate of lime,	5.5
Phosphate of magnesia,	1.
Soda, with muriate of soda,	1.5
	100.0.

The enamel covers the crown of the teeth, forming an incrustation for it, the thickness of which varies in different parts of its extent. In the grinders it is always more abundant on the triturating surface than at the sides, the reverse being the case in regard to the front teeth. As it approaches the neck, it becomes gradually thinner, and finally terminates almost imperceptibly. The enamel is the hardest animal substance with which we are acquainted : it is of a pale milky color, semi-transparent, and glistening, and consists of minute fibrous crystals, disposed in a radiated direction in regard to the centre of the organ to which it is attached. This arrangement is very obvious when the enamel is broken. The following is the result given by the celebrated chemist above mentioned, whose analysis appears to have been more elaborate than that of any other experimentalist :

Animal matter,	1.
Soda, with muriate of soda,	1.
Phosphate of lime,	85.3
Fluate of lime,	3.2
Carbonate of lime,	8.
Phosphate of magnesia,	1.5
	100.0.

When a tooth is steeped in diluted muriatic acid, it becomes flexible, but retains its form : the earthy matter is dissolved, and leaves the animal substance with which it was incorporated.

Although a tooth is not sensibly vascular, yet, if it be taken from the jaw of a living person, and immediately replaced in

its former socket, it will contract adhesions to the raw surface, and be permanently retained. The singular experiment of Mr. Hunter is well known. This ingenious physiologist transferred a tooth from its cavity into an incision, made on purpose, in the comb of a cock, to which it became so firmly united that, on killing the animal some time subsequently, and injecting its head, the fluid ran freely into the internal membrane of the transplanted organ. No better proof, surely, could be offered, of the vitality of a structure, than the result of such an experiment. If the same operation be performed with a tooth that has been some time drawn, it acts as an extraneous substance, and the socket makes an effort to throw it off.

The most common disease of the teeth by far is *gangrene,* a lesion which is strictly analogous to necrosis of the osseous tissue. Commencing invariably in the bony substance of the crown immediately under the enamel, it presents at first the appearance of a minute, opaque, brownish speck, which gradually extends towards the centre of the organ, assuming at length a blackish color, and becoming so soft and brittle as to be crushed on the slightest touch. Thus a large cavity is exposed, which perhaps had not previously been suspected to exist. Advancing in the manner here described, the gangrene frequently destroys the entire crown, or converts it into a dark, pulverulent substance, without a single trace of its primitive texture. The roots are usually the last to die, and it often happens that they retain their vitality long after the other parts have fallen into complete decay. Deprived of life, they act as extraneous bodies, exciting ulcerative absorption of the gum and alveolar processes, whereby they lose their connection, and are finally dislodged.

The teeth most liable to this disease are the last grinders, probably from some defect inherent in their constitution in consequence of their late developement. The upper central incisors are also frequently affected ; and so likewise the first molar teeth, particularly those of the under jaw. The lower incisors, on the contrary, are rarely attacked. Every part of the crown appears to be equally liable to gangrene ; and it sometimes happens, though this is infrequent, that the disease begins at several points simultaneously. Generally tardy in its progress, there is at first seldom any pain or even uneasiness ; by and by, however, when the internal cavity is laid open, the lining membrane becomes exceedingly tender, and

productive of excruciating suffering, which is either continu-
ous, paroxysmal, or remitting.   The proximate cause of den-
tal gangrene is inflammation.

Persons of a tubercular constitution are very subject to
this species of decay, which often sets in at a very early
period of life, and proceeds until nearly every tooth is de-
stroyed by it.   The upper incisors of children are frequently
attacked in this way within a short time after their appear-
ance, and occasionally, indeed, when they are still partially
covered by the gum.   There would likewise seem to be a
hereditary proclivity to this disorder.   "It often happens,"
says Mr. Bell, in his admirable work on the Anatomy,
Physiology, and Diseases of the Teeth, "that this tendency
exists either in the whole, or great part of a family of chil-
dren, where one of the parents had been similarly affected ;
and this is true to so great an extent, that I have very com-
monly seen the same tooth, and even the same part of the
tooth, affected in several individuals of the family, and at
about the same age."

The internal membrane of the teeth is occasionally affected
with *inflammation*, the other anatomical elements of these
organs being apparently in a sound state.   The disease, as
might be anticipated from the confined situation of this deli-
cate structure, is generally accompanied with the most excru-
ciating pain, of a throbbing, pulsatile nature, and, if allowed
to go on, almost always leads to the formation of an alveolar
abscess.   In other cases, there is a pretty abundant deposit
of fibrin, both within the canal of the affected organ and
around its roots, the latter of which exhibit a singularly
shreddy aspect, the plastic lymph hanging from the thick-
ened periosteum in all directions. Occasionally, again, though
this is not very common, purulent matter is poured out, form-
ing an abscess analogous to what is sometimes observed in
the interior of a bone.   When the quantity of fluid is con-
siderable, it is very apt, from its confined situation, and con-
sequent pressure, to produce mortification of the lining mem-
brane, with absorption of the parietes of the cavity.   By
this means the pus gradually escapes at the extremity of the
fang, the foramen of which is much enlarged.   Ulcerative
inflammation is next set up in the alveolar process and gum,
which continues its ravages until the enclosed matter, now
extremely offensive, obtains an outlet, the affected tooth
meanwhile losing its vitality, and presenting a dull yellow-
ish, dark, or brownish color.

The exposure of the internal membrane from gangrene, fracture, or other causes, not unfrequently leads to the formation of fungous tumors, varying in volume between that of a pin-head and an ordinary pea. Of a pale reddish color, they are of a soft, fleshy consistence, and are essentially composed of a plexus of vessels, connected together by delicate cellular substance, and traversed by minute nervous filaments. From their excessive vascularity, these growths are liable to bleed upon the slightest touch ; and although they are occasionally as insensible as healthy gum, yet in the majority of cases they are the seat of the most exquisite pain. The period required for their developement varies from a few months to several years ; but, from the great suffering which they induce, they are seldom permitted to remain for any length of time. They appear to arise, for the most part, from the lining membrane of the fang, from which they proceed more or less rapidly until they fill the whole cavity of the organ. Occasionally, there is reason to believe that these growths spring directly from the dental nerve, which becomes exceedingly vascular, elongated, and thickened. The teeth most frequently affected with this disease, are the central incisors and the large grinders. In the case of a young lady observed by Dr. Hullehen, of the State of Virginia, there were two fungous tumors of this kind, which were the seat for several months of periodical hemorrhage, vicarious, as was supposed, of the menstrual flux.*

When we consider that, with the exception of the enamel, the teeth are essentially composed of the same anatomical elements as the bones, it is not surprising that they should be the seat of *exostosis*. The substance which is thus added differs from the preëxisting structure principally in being of a denser consistence, and in presenting a yellowish transparent aspect, not unlike chalcedony. The deposit ordinarily takes place at the root of the organ, but in some instances it affects the body, and may even extend as high up as the crown. Analogy would lead us to infer that the new matter is furnished exclusively by the vessels of the periosteum ; and this doubtless happens in the generality of instances. The progress of this disease is usually very tardy, a long time elapsing before the bony tumor attains much bulk.

There is a singular affection of the teeth, which has been

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* Western Journal of the Medical and Physical Sciences, No. 38. p. 558.

described by Mr. Hunter under the name of "the denuding process," and the precise nature of which is still unexplained. It consists in the gradual removal of the enamel, generally without the slightest discoloration or any diseased appearance. I have most frequently observed it in the incisors, especially the inferior, but it occasionally attacks the whole dental arch. As the denuding process advances, the crown of the tooth is slowly worn away, the enamel first disappearing at the top, and subsequently at the sides, until the greater part is removed. The organ in the mean while changes its color, gradually becoming more yellow, and finally, when the enamel is completely destroyed, assuming a brownish aspect. The most curious circumstance in the history of this lesion is the beautiful provision by which the cavity of the tooth is protected from exposure. This consists in a deposit of new bony matter, perfectly hard and solid, but so transparent that nothing but the closest examination could detect it. Thus a sort of permanent plug is formed, which effectually protects the delicate structures within, and which exactly resembles the transparent layers of an ægose pebble, surrounded by a more opaque mass. In what this lesion essentially consists it is not easy to determine, though it is not improbable, I think, that it depends upon some original or acquired defect of the enamel, whereby it is made to yield more readily to the mechanical attrition to which the teeth are constantly subjected. It is witnessed at nearly every period of life, but is most common by far in old people.

The teeth, from want of cleanliness, as well as other causes, are very apt to become the seat of *calcareous concretions.* When first deposited this substance possesses the character of a soft, friable, porous paste, which by degrees acquires the consistence of hardened mortar, and often scales off in large masses, having the shape of the organ around which it was formed. Its usual color is a dull whitish yellow, though in some cases it is dark brown, blackish, or even greenish. The specific gravity of this matter is 1.571. From the analysis of Pepys it would appear to be composed principally of phosphate of lime, in association with a small quantity of cartilage and fatty substance.

The accumulation of this substance often takes place with great rapidity, so that in a short time the dental arches are almost completely incrusted with it. Calculous and gouty persons are particularly liable to it; and it is also frequently

witnessed in lying-in females.   It is ordinarily deposited, at
first, around the necks of the teeth, just beneath the free
margin of the gum.   As it increases in quantity it produces
the most disastrous effects, exciting irritation in the soft parts,
which leads to absorption of the gum and alveolar processes,
until the teeth, deprived of their support, are loosened and at
length drop out.

Various notions have been entertained respecting the source
of this substance.   Some believe that it is derived directly
from the mucous secretions of the mouth, vitiated by chronic
irritation ; but the more plausible opinion is, that it is fur-
nished solely by the salivary glands, and that it is held in
solution by the fluid which it is the office of these organs to
elaborate.   This view of the subject is not only supported by
the analogy which obtains in the formation of urinary calculi,
but by the fact that this substance is always deposited in
greatest abundance upon the superior grinders, and the in-
ferior incisors, — teeth which lie in the immediate vicinity of
the mouths of the salivary ducts, and by the circumstance,
moreover, that it is composed of the same elements as the
fluid just referred to.

The teeth experience important changes in consequence of
age.   As we advance in life they gradually lose their white-
ness, and assume a peculiar yellowish tint, which is often re-
markably conspicuous in old people.   They become likewise
more brittle, and the enamel exhibits an irregularly abraded
appearance.   These changes are produced by certain altera-
tions which take place in the anatomical constitution of the
teeth, from the obliteration of many of their vessels, followed
by a diminished supply of blood.

The temporary teeth, which are only twenty in number,
are surrounded each by a membranous cyst, which often in-
flames during dentition, and thus gives rise not only to much
local uneasiness, but occasionally to great disturbance in
other organs, especially the stomach and bowels.   The gum
at the same time becomes red and tumid, and there is general-
ly an inordinate secretion of salivary fluid.   When the tooth
is fully formed, the sac is no longer of any use, and is there-
fore gradually absorbed.

Lastly, the teeth are liable to certain congenital vices in
regard to their developement, situation, and direction.   In
persons affected with hare-lip and cleft palate, the upper
incisors are almost always badly formed, and thrust out of

their natural position.   Instances also occur in which some
of these organs are firmly united together by osseous matter ;
and Albinus has related a case where the crown of the eye-
tooth was turned towards the maxillary sinus, the situation
of the fang being reversed.

V. Another structure which requires mention here is the
gum.   This substance, after having covered the alveolar
processes of the maxillary bones, to which it adheres with
great firmness, encircles the necks of the teeth, forming a
partition between every two adjoining organs, which extends
up as high as the enamel.   In its texture, the gum is some-
what peculiar, — less hard and dense than cartilage, but more
so than the other parts of the mucous membrane of the
mouth, of which it is essentially constituted.   No follicles
are discoverable in it, though it is highly probable, I think,
that they exist here as elsewhere.   This substance is highly
vascular, and of a beautiful vermilion color : it possesses
very little sensibility in the normal state, but becomes ex-
tremely painful and irritable when inflamed.   In old age,
when the teeth fall out, it parts with its florid complexion,
and acquires the density of cartilage, compensating, in some
degree, for the loss of the dental arches.

Of the occurrence of ordinary inflammatory affections to
which the gum, in common with the rest of the mucous
system, is liable, it is not my intention here to speak ; but
there are several lesions which are either peculiar to this
situation, or are produced by irritation of diseased teeth, of
which it will be necessary to treat with some degree of
minuteness.

One of the most formidable diseases of the gum, though
fortunately not a very common one, is *epulis*, as it is termed,
which is generally in the form of a small wart-like excres-
cence, of a reddish color, and of a hard, gristly consistence.
Its growth is seldom rapid, nor is it attended, at first, with
any decided pain or inconvenience.   After having remained
for some time, it loses its solid feel, becomes soft and spongy,
bleeds upon the slightest touch, and throws out an abundance
of irregular cauliflower-like processes.   Ulceration now com-
mences, the morbid mass rapidly augments in volume, and
there is a constant discharge of fetid, purulent matter.   At
this stage of the disease, the gum has a remarkably red and
spongy aspect, the teeth drop from their sockets, and the
lymphatic ganglions in the neighborhood are more or less

contaminated ; the pain is also very great, and the system labors under hectic. If the tumor be excised, it almost invariably returns, especially if a part be left behind, and requires a fresh operation. Epulis never occurs in those situations of the gum from which the teeth are perfectly removed ; nor is it usual to see it without some disease of these organs, or of the sockets in which they are contained. Its most frequent though not constant seat is on the transverse process of the gum, where this structure projects between the incisor teeth.

Epulis is merely a species of local hypertrophy, varying in volume, between that of a pea and an egg. It is invested by a prolongation of the mucous membrane of the gum, and is intersected by fibrous filaments, which add much to its density and cohesive power. Vessels enter it at every point, and, in some cases, the tumor appears to be almost entirely made up of them. Besides these anatomical elements, which constantly exist, there is occasionally, in the truly malignant form of the disease, a deposition of encephaloïd matter.

The most frequent lesion of the gum is *ulcerative absorption*, produced by the accumulation of tartar around the necks of the teeth. The pressure that is thus exerted, excites inflammatory action, leading to great thickening, sponginess, and discoloration of the gum, with erosion of its substance. In this way the teeth are entirely denuded at their necks, and, as a necessary consequence, they often drop from their sockets, or become so loose as to be useless.

The gum, in common with the rest of the mucous membrane, is liable to sloughing, from excessive mercurial action, and probably also from causes which exert their influence chiefly through the constitution. Of this nature appears to be that variety of mortification which has been so ably described by the older writers under the name of " black canker," and by Coates * and others of our own times, under that of the " gangrenous ulcer " of the mouth. This disease prevailed quite extensively, some years ago, in the marshy districts of New Jersey and Pennsylvania, attacking, for the most part, weakly children, between two and five years of age. Although it may begin at any part of the mucous

* Description of the Gangrenous Ulcer of the Mouths of Children. By B. H. Coates, M. D. one of the physicians of the Philadelphia Children's Asylum. North American Medical and Surgical Journal, vol. ii. 1826.

membrane, yet, in by far the greater number of cases, it makes its appearance at the edges of the gum, over the neck of the central incisors of the lower-jaw, in the form of a whitish, cineritious, or reddish ulcer, which varies in diameter, from half a line to the eighth of an inch. In this state, the disease may continue for several weeks, or even months ; but more commonly it extends its ravages, affecting either a large portion of the dental arches, or passing down in the direction of the sockets of the teeth, which, together with their periosteum and the alveolar processes, are thus gradually deprived of their vitality. The soft parts, in the mean while, assume a dirty blackish appearance ; and, on being detached, they leave a ragged, sloughing ulcer, which is the seat of a foul, sanious discharge, of so excessively acrid a nature as to excoriate whatever texture it may happen to come in contact with. In this manner, the disease appears to be frequently propagated to the mucous membrane of the cheeks and lips, where it generally spreads with great rapidity, until the parts are completely perforated, or a black gangrenous spot manifests itself upon the external surface.

The true pathology of this disease is still enveloped in obscurity. It is almost wholly confined in its attacks to young, weakly subjects ; and, from the researches of Dr. Coates and others, it would seem occasionally to display an endemic tendency. Out of two hundred and forty children observed by this physician in the Philadelphia Asylum, upwards of seventy were more or less affected with the primary ulcer at one time. In the early stage of the complaint, there is little or no pain, the system is free from excitement, and the appetite and strength are scarcely at all impaired. When the sloughing process, however, has fairly commenced, the child suffers much local distress, and is harassed with constant fever. Dissection has thrown no light on this singular variety of gangrene.

Another disease, which is deserving of mention here, is *alveolar abscess*, or, as it is familiarly termed, gum-boil. Although this may be produced by a great variety of causes, yet the most common by far is the irritation of toothache, or the existence of a dead fang. This, acting as an extraneous body, excites inflammation in the periosteum of the alveolar cavity, followed by an effusion of plastic lymph, which becomes condensed into a sac, in the centre of which,

pus is formed.   This sac, which is commonly of an ovoïdal figure, closely embraces the root just above its extremity, which is, as it were, bathed in the purulent matter.*   The quantity of pus cannot of course be great ; but the pressure which it exerts upon the investing parts always induces ulcerative absorption, by which it gradually makes an outlet through the gum, generally opposite the base of the dead fang.

VI. The *tonsils* are two small bodies, about the size of an almond, situated between the arches of the soft palate.   They are of an elongated, oval shape, of a firm, glandular consistence, and are composed of a great number of mucous follicles, connected together by short, cellular substance.   The internal surface of each presents several small apertures, which lead into cells, that secrete a viscid, mucous fluid. They are of a reddish-gray color, and exceedingly vascular in their texture.

Tonsilitis, vulgarly called quinsy, is a very common complaint in cold and variable climates, which is announced by a sensation of dryness, heat, and pain in the fauces, with difficult deglutition, and a high grade of febrile excitement. On inspecting the throat, the organ is found to be considerably swollen, and of a uniform, cherry-red color.   The natural secretion is at first suspended, but after some time augments in quantity, becoming remarkably tenacious, and assuming a pale, cream-like aspect.   Seldom is the disease wholly confined to the tonsils.   In the generality of cases, it extends to the root of the tongue, the uvula, and the curtain of the palate, and occasionally even to the Eustachian tube, giving rise to pain in the ear, and partial deafness.

Tonsilitis often terminates, in a few days, in *suppuration*, the pus being always fetid, and not unfrequently blended with flakes of lymph.   The matter is commonly deep-seated, and occasionally works its way out under the angle of the jaw.   Now and then small ulcers form on the inflamed organ.   These are commonly preceded by minute, yellowish pustules, which, bursting, expose to view a very red and painful sore.   Patches of whitish lymph sometimes coat the tonsils, resembling superficial sloughs.

Gangrene, as a termination of this disease, is extremely

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* Bell, on the Teeth, p. 216.   Philadelphia, 1830.

rare. The event is announced by the fetidness of the breath, the livid state of the parts, and the dark, sanious discharge from the throat. On examining the tonsils after death, they will be found pulpy and disorganized, and of a deep gray, ash, or mahogany color. Ulceration and sloughing of these parts are very common in some of the exanthematous fevers, and in none more so than in scarlatina.

In syphilitic affections of the throat, the tonsils are often the seat of *ulceration*, of which several forms have been recognized by authors. The first is the excavated ulcer, which exhibits the appearance of a deep hollow, as if a portion of the organ had been scooped out, with a dirty ash-colored bottom, and red, elevated margins. In the second form, which usually coexists with papular eruptions on the arm and shoulder, the ulcer is narrow and superficial, sometimes, indeed, a mere fissure ; but the edges are often irregular, indented, and apparently coated with lymph. The tonsils in both these cases, are considerably enlarged, and preternaturally red ; yet there is rarely much pain, or difficulty of swallowing. A third form is the phagedenic, which commences in a small aphthous speck, surrounded by a deep erysepelatous blush, and rapidly proceeds over the organ to the neighboring parts, involving them often in one common slough.*

A not unusual effect of chronic inflammation is *hypertrophy* of the tonsils ; the disease, however, is sometimes congenital, and occasionally it would appear to be hereditary, being handed down through several generations. When induced by repeated attacks of quinsy, it is commonly associated with induration, which is sometimes so great as to have received the name of *scirrhus*. Genuine scirrhus, however, has probably never been observed here. At all events, if such a case exists in the records of pathological anatomy, I have not met with it.

Encysted tumors, supposed to be of the nature of acephalocysts, may be developed in the tonsils. These were first observed by the late Professor Dupuytren, of Paris, in the case of a person on whom he operated in the Hotel-Dieu. The gland had acquired a considerable magnitude, and exhibited all the appearance of ordinary hypertrophy. On cutting into it, he was surprised to find a large quantity of clear limpid

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* London Cyclopædia of Practical Medicine, vol. iv. p. 186.

fluid escape, which was ascertained to proceed from a loose cyst, of an opaline tint, and as elastic as a hydatid.   No other surgeon, I believe, has noticed these tumors, and little is known respecting them.   May they not depend upon the obstruction and consequent dilatation of some of the tonsilitic follicles ?

The tonsils are sometimes the seat of *calcerous concretions,* closing up the mouths of their follicles.   Their composition is phosphate of lime, agglutinated by a small quantity of animal matter.   They have usually a light brownish color, spherical figure, and finely tuberculated surface.   Their volume seldom exceeds that of a mustard-seed.

VII. The lesions of the *soft palate* do not differ, on the whole, from those of the tonsils, and any labored description of them would therefore be superfluous.

Polypes sometimes grow from this part.   Sir Astley Cooper relates * two cases of this kind, in one of which the excrescence was attached over the palato-pharyngeal muscle, and hung down like a sausage into the fauces: it was of considerable size, soft, and of a florid color.

Split-palate is a congenital defect, analogous to hare-lip, with which it generally coexists.   It occasionally affects only the soft parts, in which case there is no lack of substance, but the opposite halves recede from each other at an angle of about thirty degrees.   When the maxillary and palate bones are involved, the fissure always corresponds with the mesial plane, and is sometimes so great as to throw the buccal and nasal cavities into one large sinus.   In cases of this kind, there must be an entire absence, of course, both of the vomer and of the perpendicular lamella of the ethmoïd.   Even the cribriform plate of this bone may be deficient, the olfactory nerve wanting, and the cerebrum considerably malformed.

Of the diseases of the *uvula,* too little is known to enable us to give any satisfactory account of them.   Like the soft palate, it originally consists of two lateral pieces, which, in some instances, remain ununited at the raphe, thus forming a congenital defect parallel to hare-lip and split-palate.   This malformation, however, rarely exists singly.   The most common lesion of the uvula, undoubtedly, is *hypertrophy,* in which it becomes both longer and more bulky.   Its structure also is sensibly altered, being much harder than in the natural

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* Lectures by Tyrrell, p. 348.

state; its vessels are much enlarged, and its color is a light grayish, instead of a florid red. The consequences of such changes are but too well known. The part becomes troublesome in deglutition and talking, and causes a disagreeable tickling at the root of the tongue, attended with an annoying cough and frequent retching.

Gangrene rarely affects the uvula. In anginose inflammation, it is often completely incrusted with a thick membranous lamella, which is detached either piecemeal or in the form of a nipple-shield, a thimble, or the finger of a glove. In syphilitic sore throat, the uvula is sometimes entirely destroyed; at other times, it is perforated at its base.

VIII. The lesions of the *pharynx* resemble, for the most part those of the tongue and tonsils; but there are several which are peculiar, and which therefore demand separate consideration.

Acute *pharyngitis* is characterized, ordinarily, by redness and tumefaction of the affected part, with a secretion of thick, grayish mucus. In the more severe forms, however, there is additionally, an effusion of lymph, which appears either in small patches, or, as is more frequently the case, as a continuous layer over the whole surface of the reservoir. Hence, on the one hand, the exudation generally extends upwards over the tonsils and the soft palate; and, on the other, downwards into the œsophagus, the larynx, the trachea, and even the bronchial tubes. Much diversity obtains in regard to the color and consistence of these adventitious membranes. When first formed, they are usually of a light yellowish tint, and so soft that they can be easily wiped off with the finger; in a short time, however, they become grayish, and acquire considerable tenacity, forming pretty hard incrustations. In very intense cases, blood is apt to be exhaled, which, mixing with the exudation, imparts to it a dark brownish hue. The mucous membrane itself is of a deep livid complexion; the subjacent cellular tissue is infiltrated with serosity; and all the vessels are engorged to such a degree that it is impossible either to inject them or unload them by pressure and ablution.

This disease, which has been so ably portrayed by Dr. Bretonneau, of Tours, is by no means an uncommon attendant on small-pox and scarlet fever, but also occurs very frequently as an idiopathic affection in children, especially in such as are naturally weak, or who have become so by indis-

position or impoverished diet. The symptoms, as might be expected, are generally severe ; and, when the exudation extends down the air-passages, death is often induced by suffocation, precisely as in pseudo-membranous croup. Bretonneau, it should be observed, has bestowed upon this inflammation the title of *diphtheritic,* a Greek term, indicative of the pellicular, membranous, or skin-like excretion to which it gives rise.

The pharynx is occasionally the seat of tubercles, of scirrhus, and of encephaloïd. When the latter of these growths attain a considerable magnitude, as they sometimes do, they are apt to prove troublesome by their mechanical obstruction. Mayo records a case where a scirrhous tumor, attached to the laryngeal surface of the pharynx, gradually filled the passage, and at length produced death by inanition. Polypous growths are seldom met with in this situation. The only instance, indeed, of which I have any knowledge is that related by Professor Monro, of Edinburgh. It adhered to the fore part of the pharynx by a narrow root, and was of such a length that whenever the patient retched, it was thrown forward against the incisor teeth.

The pharynx is liable to become *sacculated,* a blind pouch being sometimes formed at its junction with the œsophagus. This is most apt to happen at the posterior part, and the disorder is chiefly inconvenient, as having a tendency to entrap particles of food in their descent from the mouth to the stomach. A bag capable of holding several ounces has been thus formed.

IX. The diseases of the *œsophagus,* though much less numerous than those of the mouth and fauces, are not less dangerous in their tendency, or less interesting to the student of morbid anatomy. Amongst the most important of these lesions may be mentioned diphtheritic inflammation, ulceration, softening, stricture, and scirrhous degeneration. In its structure, the œsophagus very closely resembles that of the intestinal canal, excepting that it is furnished with a distinct epidermis, which abruptly disappears at the cardiac extremity of the stomach. Its inner surface is of a whitish color, longitudinally wrinkled, and perforated by a great number of follicles, situated beneath the proper mucous coat.

Simple *œsophagitis* is marked by the usual symptoms of redness, pain, and tumefaction, with dryness of the part, and difficulty of deglutition. In violent cases, as, for example,

when the inflammation is caused by corrosive poisons, there is an abrasion of the cuticle, and an effusion of lymph. The diphtheritic form of the disease is often witnessed in hydrophobia; and there is reason to believe that it is sometimes caused by a suppression of the cutaneous perspiration. A remarkable instance of this is mentioned by Dr. Abercrombie, of a gentleman who caught cold in travelling to Edinburgh. The fauces were of a slight red color, and he complained of great soreness of the throat, with hoarseness of the voice, and considerable difficulty of swallowing. His case at length assumed a typhoid character, and at the end of about three weeks from the commencement of the disease he died. On examination, the whole of the œsophagus was found to be lined by a soft adventitious membrane; and a similar exudation was traced over the pharynx and epiglottis.

Last winter, Dr. Bamford sent me the stomach and œsophagus of a boy, thirteen years old, who suddenly expired in convulsions after an illness of three days. The patient complained of severe pain in the fauces, and had great difficulty of swallowing, every attempt of the kind being followed by spasm of the throat, especially when the substance was of a fluid nature. On inspecting the œsophagus, I found it lined throughout by a thin layer of lymph, closely adherent to the natural mucous coat, which was itself highly injected, and of a bright red color. The stomach was perfectly sound, the inflammatory appearances terminating abruptly at the cardiac orifice. Dr. Mount, who attended the lad, and was present at the examination, informed me that he traced the adventitious membrane also around the mouth of the larynx and over the whole of the fauces.

These membranes rarely become organized. When the inflammation subsides, they gradually lose their moisture together with their adhesive properties, and are either vomited up in small tubular fragments, or swallowed and digested, or passed by stool. Andral refers to a case where an exudation of this kind was found in the œsophagus of a newborn infant. It lined the tube for about a third of its extent, and seemed to be almost identical with its substance.[*]

Ulcers of the œsophagus most frequently occur at the upper part of the tube, near its junction with the pharynx. They may be of various forms and dimensions; and, in the

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[*] Pathological Anatomy, by Townsend and West, vol. ii. p. 172.

generality of cases, their edges are smooth and but little
thickened. When, however, as it sometimes happens, they
are associated with scirrhus, the surrounding structure is very
much elevated, and often consists of a dense fleshy sub-
stance, interspersed with gristly matter. These ulcers some-
times lead to perforation, though this is of rare occurrence.

Abscesses sometimes form between the coats of the œsoph-
agus, and, by compressing the trachea, affect the breathing.
When very large, they encroach upon the caliber of the gul-
let, and impede deglutition. Dysphagia also sometimes results
from enlargement of the thyroïd gland, projection of the dorsal
vertebræ, and aneurism of the aorta. In a man, forty-nine
years of age, whom I examined in 1827, the œsophagus and
aorta communicated by a large aperture, through which
more than half a gallon of blood suddenly passed into the
stomach, and thus caused death. The principal symptoms
were dyspnœa, spitting of blood, and pain in the inferior part
of the chest, in the region of the gullet.

Softening of the œsophagus, of the same nature as that of
the stomach, is sometimes observed. One of the most com-
mon effects of this lesion is a perforation of the walls of the
tube, and an escape of fluid into the thorax. The opening
usually occurs near the cardiac extremity of the œsophagus,

in connection with an inflamed, softened,
or perforated state of the stomach, though
occasionally there is no appreciable altera-
tion whatever in any of the surrounding
textures. No age seems to be exempt from
this lesion, and in one or two instances it
has been observed even in the new-born
infant.

Fig. 52.

Stricture of the œsophagus almost always
results from inflammatory thickening of the
submucous texture, with more or less altera-
tion of the proper linings. A sort of ring,
of variable depth and firmness, is thus
formed, (Fig. 52,) which encroaches upon
the channel, and produces great difficulty
in swallowing, aggravated frequently by
spasmodic exacerbations. In a case which
I examined some years ago, the tube was
so much contracted, that it would scarcely
admit a common-sized quill. The stric-

ture, which was about half an inch deep, and of gristly firm-
ness, was seated within three inches of the cardiac extremity
of the stomach, and the patient literally died from inanition.
The ordinary place of stricture, however, is not so low
down, but near the junction of the tube with the pharynx.
In the early stage, the disease is curable by the use of bou-
gies; but, if it be neglected, the contraction progressively
increases, and the œsophagus finally ulcerates, and opens into
the posterior mediastinal cavity, the trachea, or the lungs.
The part above the stricture is sometimes sacculated. Monro
describes a case, in which the enlargement was so great that
the patient could retain nearly a pint of fluid for ten minutes,
and in the mean time converse with his friends ; and in an-
other, mentioned by Purton, the sac was capable of holding
two quarts.*   Occasionally the stricture is of a spasmodic
nature, being produced by the contraction of the circular
fibres of the œsophagus.   In this case, the difficulty is
generally temporary, and may be easily overcome by a
bougie.
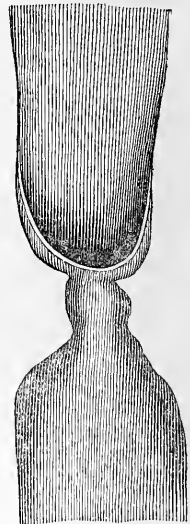
The walls of the œsophagus are sometimes of a *scirrhous*
hardness, or almost cartilaginous, and even ossified.   Cases
of this kind are referred to by Bonetus, Morgagni, and some of
our modern writers ; but there is reason to believe that they
are of very infrequent occurrence, especially when unasso-
ciated with stricture.

The œsophagus, finally, is liable to various congenital
malformations.   These, although not of frequent occurrence,
constitute a very interesting subject of study to the patho-
logical anatomist.   Nevertheless, a bare enumeration of them
is all that we can hope to do, with any prospect of success,
in the present state of our knowledge.   The following
arrangement will be found to embrace the most important
deviations which have hitherto been observed : 1. the œsoph-
agus terminates in a cul-de-sac, either within a few inches
below the pharynx, or at a short distance above the cardiac
extremity of the stomach ; 2. it is obliterated, contracted, or
converted into a solid cord ; 3. it is unnaturally dilated, or
even double ; 4. it is totally deficient, the pharynx ending in
a blind pouch, and the stomach having no cardiac orifice ; 5.
it communicates with the trachea.   Of the latter variety, a

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* London Medical and Physical Journal, December, 1821.

highly interesting and instructive case was observed by Dr.
Martin, of Marseilles, in an infant, that died thirty-six hours
after birth.   On dissection, there was found to be an entire
absence of the pharyngeal extremity of the œsophagus ; but
an aperture existed in the trachea, just above its bifurcation,
through which a probe could be passed into a thin, membra-
nous, elastic tube, of the diameter of a small quill, that led
to the stomach, and thus established a communication be-
tween the cavity of that organ and the air-passages.

CHAPTER VII.

Of the Stomach and Bowels.

SECTION I.

Organization of the Gastro-Enteric Mucous Membrane.

PREVIOUSLY to describing the different lesions of the subdiaphragmatic division of the alimentary tube, it will be useful to direct the attention of the reader, for a few moments, to the appearances which it presents in the normal state, as a knowledge of this kind will the better enable him to discriminate what is sound from what is morbid. The remarks, however, which I shall make, are designed to have more especial reference to the mucous membrane ; upon which, as is well known, the violence of almost all gastro-enteric affections is mainly spent.

In the sound state, the alimentary tube is perfectly smooth, semi-transparent, free from adhesions, more or less vascular, and covered internally with a thin, ropy mucus. The thick-

ness of its walls varies in different portions of its extent,
being greatest in the duodenum, the stomach, upper half of
the jejunum, and the rectum, and least in the ileum, the
lower half of the jejunum, and the colon.   In the latter situa-
tions, indeed, the tenuity is generally so considerable that the
bowel on being spread out upon a printed sheet enables us to
distinguish the letters, owing, doubtless, to the almost entire
absence of mucous folds and villosities.

  With regard to the stomach, the thickness of the mucous
coat varies remarkably in the cardiac and pyloric divisions.
In the former it is comparatively thin and delicate, especially
around the œsophageal orifice and in what is called the great
cul-de-sac ; but, as we proceed towards the right side, it
gradually augments in thickness, becomes more and more
opaque, and is studded with an immense number of follicles,
upon which these differences seem mainly to depend.

  But there is no portion of the alimentary tube in which the
mucous membrane is so thick and opaque as in the upper
two thirds of the duodenum.   From thence on it becomes
gradually thinner and thinner, until it reaches the lower divis-
ion of the small bowel, where it is so delicate as to give the
tube a semi-transparent appearance, except along the glands
of Peyer.   In the colon, the thickness of the mucous lining is
considerably less at the right side, and at the commencement
of the arch than in the descending portion or in the left half
of the arch.   The thickness appears again to diminish in the
sigmoïd flexure ; but, on arriving in the rectum, it suddenly in-
creases, and continues so to do until a short distance before it
terminates at the margin of the anus.

  The mucous membrane of the stomach and bowels has no
epidermic covering, in which respect it differs essentially from
that of the œsophagus.   The existence of such a structure
has, it is true, been admitted by numerous and highly re-
spectable anatomists, from the time of Haller until the present
moment.   The peculiar manner in which the œsophagus is
inserted into the stomach has induced many to believe that
the epithelic lining of that tube terminates at the cardiac ex-
tremity of that viscus precisely in the same manner as the
corresponding covering of the vagina at the lips of the uterus.
Haller and Bichat, acknowledging that it is impossible to
demonstrate the epidermis of the alimentary canal, neverthe-
less maintain that we may infer its presence from the mem-
braniform substances which are occasionally discharged from

the bowels. This supposition, however, may be very easily controverted by the fact that all such excretions are the product of inflammatory action, one of the effects of which is an effusion of sero-albuminous matter, which, having acquired a certain degree of consistency, is gradually detached from the free surface of the mucous tunic, and finally expelled in the form of a distinct membrane, not unlike that of croup.

Exudations of the kind here adverted to are by no means uncommon, either in the gastro-pulmonary, or in the genito-urinary division of the mucous system. I shall hereafter have occasion to refer to cases in which they were noticed even in the urinary bladder, the vagina, and the uterus; and shall therefore content myself, for the present, with remarking that these membranous productions, no matter in what part of the body they are found, are always of a similar nature, both as respects their physical properties and their chemical constitution.

Taking into consideration, therefore, the fact that these concretions are always the result of inflammatory action, and the circumstance, moreover, that they are essentially different from the epidermis in their appearance and composition, it is obvious that they cannot be adduced in favor of the opinion of the existence of such a structure in the gastro-enteric division of the mucous system. Did this membrane really exist here, is it not reasonable to suppose that it could be displayed by the same process that it can in the mouth, the œsophagus, or the vagina? But this has never yet, at least so far as I know, been done, the most careful dissection, maceration, and boiling having alike failed in accomplishing it.

The natural consistence of the mucous membrane of the alimentary tube is liable to considerable variation; but it may be stated, as a general rule, that it is in direct proportion to its thickness. Thus it is much more firm in the pyloric half of the stomach than in the cardiac; and it is in that situation, also, that it has the greatest degree of thickness. In the duodenum the rule does not hold good; for, although the mucous membrane is thicker and more opaque here than in any other portion of the digestive canal, yet, owing to the presence of the glands of Brunner, which are remarkably large and numerous, as well, perhaps, as to some peculiar mode of organization, the structure in question is exceedingly brittle, and can seldom be raised except in very small fragments. Lower down, the consistence of the membrane progressively

increases, so that, in the inferior third of the jejunum and in
the ileum, it may be torn from its connection, in pieces varying
from three lines to half an inch in length.   In the large
bowel, the cohesive property again diminishes, and the mem-
brane can be detached only in small shreddy patches.   It need
hardly be remarked that the normal consistence of the mu-
cous coat of the alimentary tube is much less in the infant
than in the adult.   At what period of life it attains its maxi-
mum developement in this respect, is a point concerning which
we cannot communicate any positive intelligence, as it is a
question which has not yet been determined.

The mucous membrane of the digestive organs is amongst
those tissues which do not readily yield to putrefaction.   The
softening that is produced under the influence of this cause
is always a very gradual process, and there can therefore be
little danger of confounding it with that which results from
the action of the gastric juice, or from inflammatory irritation.
The changes in the surrounding organs, as well as in the
other tunics of the alimentary tube, which must always, to a
greater or less degree, participate in the putrefaction, would
be alone sufficient to enable us to distinguish the difference,
and prevent any difficulty in relation to the subject.

The tissue which serves as a bond of connection between
the mucous and the muscular coats of the alimentary canal
is of a cellulo-fibrous nature, and deserves to be attentively
considered, from the important character which it plays in the
different lesions of this part of the body.   In the normal
state it is of a pale grayish color, very thin, yet so dense and
tenacious as to be capable of very great resistance.   Sending
a great number of minute processes between the muscular
fibres, it is attached to the middle much more firmly than to
the mucous tunic, and seems to consist of a very close, dense
net-work, the filaments of which may be separated from each
other by protracted maceration, by boiling, and careful dis-
section.   It is this structure concerning which so much is
said by the ancient anatomists under the name of the *nervous
coat*.

This coat — for so indeed it deserves to be considered —
is much more distinct in carnivorous animals than in her-
bivorous, or than in the human subject.   In the small
bowel of the lion and the bear, it forms a thick, opaque
lamella, of a whitish color, and of a fibrous consistence,
which adds very much to the strength of the tube, and re-

ceives the larger ramifications of the vessels, preparatory to their distribution to the mucous membrane.

The mucous membrane of the stomach and bowels is furnished every where with minute *glands*, *crypts*, or *follicles*, (Fig. 53,) the study of which, in a pathological point of view, is of the very highest impor-
tance. In the normal state, these little bodies are always recognized with great difficulty, but are rendered very evident in certain morbid conditions, especially in chronic diarrhœa, cholera, dropsy, and pulmonary phthisis. Seated in the submucous cellular tissue, they are covered over by the proper mucous corion, and are of an irregularly oval, rounded, or spherical shape, presenting each a minute orifice leading to a blind cavity. These glands, although they are found throughout the entire mucous system, have been most frequently examined in that part of the alimentary canal, where they occur in vast multitudes. In most situations, however, they are so much flattened, that they do not project sensibly upon the free surface of the mucous membrane, on which account they often appear to be much less numerous than they actually are.

Fig. 53.

In children, the gastro-intestinal follicles are naturally more developed than in adults, and consequently are much more easily recognized. In order to discern them distinctly, the mucous tunic must be thoroughly cleansed, and then held between the eye and the light, when they will appear like minute dots, of an opaque grayish color, and with a delicate, central aperture, the margins of which are often quite dark. The difficulty of distinguishing these little bodies will be much lessened if the part to be examined be previously steeped in warm vinegar, as was first suggested, I believe, by Willis. I have frequently tried this method, and always found it decidedly advantageous. Their structure, so far as it can be ascertained by careful microscopic inspection, seems to be very simple, being made up entirely by a congeries of
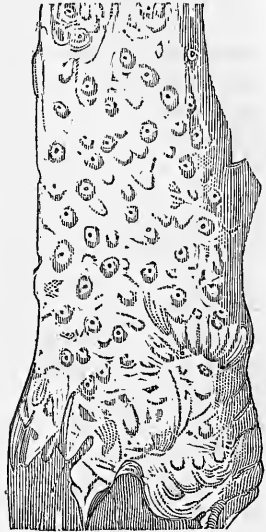
vessels, connected together by the most delicate cellular tex-
ture.   Their internal cavity, which can occasionally be beau-
tifully displayed by inflation with the blow-pipe, is perfectly
smooth and uniform, and constantly bedewed with a thin
mucous secretion.

In the stomach alone, the number of these glands amounts,
according to the recent calculations of Professor Horner, to
one million two hundred and sixty-six thousand; or, in
other words, estimating the area of the inner surface of this
organ at ninety square inches, he supposes that each cubic
inch has fourteen thousand and four hundred follicles.   In
the intestinal tube, their number appears to be still greater.
Allowing the area of the whole canal to be two thousand
square inches, and that there are about twenty-two thousand
of these little bodies on every inch, it would follow that the
entire number, in the small and large bowels, is from forty-five
to forty-eight millions.   If this evaluation be correct, the
mucous follicles must be infinitely more abundant than is
generally imagined : as all microscopic observations, however,
are liable to great deception, and more especially as all these
bodies can never be discerned at the same time, so as to
enable us to count them, it is not improbable, I think, that
the distinguished anatomist to whose name I have adverted,
has fallen into error, his estimate far transcending the natural
limits.

In their size, the mucous follicles vary in different parts of
the gastro-enteric membrane.   In the stomach, the largest
are about the twelfth of a line in diameter, the smallest about
the twentieth of a line.   In the duodenum, where they are
denominated the glands of Brunner, after a German anato-
mist who first described them, their volume is much greater,
most of them being a line in diameter ; and they are generally
so prominent, especially for the first four inches of that tube,
as to give the free surface of the lining membrane a peculiar
granulated aspect.   In the mesenteric portion of the small
intestines, their dimensions are greater than in the stomach,
but less than in the large bowel, where they are also more
easily recognized.

Besides these isolated crypts, there are other mucous folli-
cles which are limited to particular portions of the intestinal
tube, and which have recently attracted the special attention
of pathologists, from the appearances which they present in
certain diseased states of the system.   I need scarcely say

that I allude to the *glands of Peyer*, or, as they are now very generally called by the French writers, the *elliptical plates*. (Fig. 54.) They occur almost exclusively in the lower half of the ileum, none having yet been observed, except, in a few instances, in the jejunum or duodenum. Their number is very variable; but, as a general rule, it may be stated that there are from eighteen to twenty-five. More than these I have never seen, and but rarely so many. Louis tells us that there are from twenty to thirty; and Lelut asserts that he has several times counted from fifty to sixty.

Fig. 54.
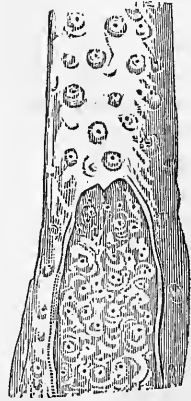
The shape of most of these glands is elliptical; whence the epithet which has been applied to them by the French anatomists. Not a few of them, however, are circular, and not unfrequently they are remarkably angular. They are *uniformly* situated opposite the attachment of the mesentery, and are from one half to two inches in length, by five or ten lines in width, becoming larger and more numerous as they approach the cœcum. Considerably elevated above the circumjacent parts, they impart to the finger a rough, mammillated sensation, and are easily distinguished by their opaque, grayish appearance. Often they are studded with minute dark-colored points, which indicate the mouths of the follicles which compose them, and of which there are in each patch, according to its dimensions, from twenty to several hundred. Dr. Lelut, a writer whose name I have already quoted, affirms that, by dessication, a thousand of these crypts may occasionally be demonstrated in a single gland.

The seat of these glands, like that of the isolated follicles, is in the submucous cellular tissue. What their precise structure is, is a point which has never been satisfactorily determined by anatomists. That it is different from that of the glands of Brunner it is perfectly reasonable to suppose; otherwise why should they display such peculiarity of arrangement, and be confined exclusively to one particular portion of the alimentary tube? Another argument, which may be adduced in support of their dissimilarity, is the fact that they are extremely prone to disease, and that they are frequently affected, nay, almost totally disorganized, and yet the isolated

follicles remain quite sound. Ignorant, thus, of their true nature and character, how can it be presumed that we should know any thing of their functions ? Are not the thousands and thousands of isolated follicles which every where stud the lining membrane of the ileum sufficient to furnish all the mucus that is required to lubricate its surface ? Or does this portion of the digestive canal, so differently organized from the rest, perform some peculiar office, and consequently demand some peculiar secretion ? All these are questions which, desirable as it would be, cannot be solved in the present state of the science.

Another distinguishing trait of the gastro-enteric division of the mucous membrane is the circumstance of its being covered with numerous *villosities*, which give it the feel and aspect of a piece of velvet. These are minute, delicate little bodies, which, although seen by Assellius and others, were first accurately described, in 1721, by an anatomist of the name of Helvetius. Extremely numerous in the small intestines, especially in the duodenum and upper half of the jejunum, they are supposed by some to be wanting in the stomach and the colon ; which, however, is not the case, as any one may assure himself by careful examination with the microscope, or even, in certain pathological conditions, with the naked eye.

The villosities are best seen by inverting a portion of bowel, and then immersing it in clear water, when they can be made to move gently amidst the fluid, in the form of minute processes, projecting from the free surface of the mucous membrane. About the fifth of a line in length, they are much larger in the upper than in the lower portion of the digestive tube, and, when injected, or rendered turgid, as they naturally are during chylification, they acquire almost double the ordinary volume. They are arranged very compactly, and, as there are about four thousand upon every square inch, Meckel supposes that the whole number of them may be estimated at more than one milion, — an evaluation, doubtless, far short of the truth. In their shape, some of these bodies are conical, some cylindrical, some bulbous. Their vascularity is extremely great, the base of each being encircled by a most delicate wreath of blood-vessels and lymphatics. Of their minute structure, as it has no relevancy to the subject before us, I forbear saying any thing on the present occasion.

Organized in the manner here stated, the gastro-enteric

mucous membrane is most liberally supplied with blood-vessels, with nerves, and with lymphatics.   If we examine a portion of bowel, and carefully trace its vessels as they creep along beneath the peritonæal covering, it will be seen that, as they approach the submucous cellular tissue, they gradually decrease in size as they augment in number, until finally they resolve themselves into a beautiful capillary net-work. These ultimate ramifications, which are divided to an infinite degree of minuteness, being much smaller than the finest hair, are spread over the adherent surface of the mucous corion, where they intersect one another in every conceivable direction ; thus giving the intestine, when they are filled with size and vermilion, the appearance almost of a piece of scarlet cloth.   The intervals of this vascular net are occupied by follicles and villosities, which are themselves, as before intimated, most abundantly supplied with vessels and nerves, every thing relating to their organization being of the most delicate and exalted character.

How the capillaries of the mucous membrane terminate is a problem which, although it has engaged a large share of the attention of the anatomists of all ages, has not yet been satisfactorily solved.   The thin sero-mucous fluid with which it is constantly moistened, induced Haller, and since his time Bichat, Sœmmering, and others, to infer the existence of arteries with open mouths, or, in other words, exhalant vessels.   But, as no such vessels have yet been discovered, or satisfactorily demonstrated, the most philosophical explanation that can be offered, in the present state of our knowledge, is, that the capillary arteries in question communicate directly with the capillary veins ; and this doctrine, I conceive, is amply sustained not only by the phenomena which are witnessed in the mucous membrane of the stomach and bowels of living animals, but likewise by what is observed in minute artificial injections.

But concerning no one subject is it of so much importance to have correct ideas as of that which relates to the *natural color* of the gastro-enteric mucous membrane.   Much as this point has occupied the attention of anatomists, it is to be feared that our information is still very far from being satisfactory.   Nor, indeed, considering the difficulties attending the investigation, could this be expected to be otherwise. Seated beyond our visual reach, it is only by accident, as it were, that we can at all approach the mucous membrane in

the healthy state ; and, although every opportunity has been diligently embraced to ascertain its normal appearances, yet so discrepant are the statements of the observers who have distinguished themselves in this field of physiological inquiry, that it is often extremely difficult to reconcile them, and sometimes impossible to draw from them any useful deductions.

That the color of the gastro-enteric mucous membrane should vary in the different periods of life, no one can doubt ; nor, considering that the physical cause of it is the accumulation of blood in the capillary vessels, can it appear strange that it should be influenced by the state of the general system, and by the state of vacuity, or repletion of the organs which this texture serves to line. Thus, then, may it be safely assumed as a general proposition, that the color of the villous coat of the stomach and bowels is different in the child from what it is in the adult ; that it is deeper in the strong and robust than in the weak and sickly ; and that it is several shades lighter when these reservoirs are empty than when they are distended with food.

In the fœtus, and the child soon after birth, the color of the mucous coat is of a light rose, interspersed with small milky spots ; in the adult, it is more of a whitish appearance, but still preserves some degree of its reddish tint ; towards middle life, it assumes a dull grayish aspect, which continues, gradually increasing, until finally, in decrepitude, it becomes quite cineritious.

During digestion, the mucous membrane of the stomach is of a light red color, approaching almost to vermilion, especially in the young subject, from the second to the tenth year. (Pl. I, Fig. 1.) The duodenum, and occasionally even the jejunum, participate in this increased vascularity, which always diminishes in proportion as the process of chymification advances to completion. Except from this circumstance, this portion of the small intestine never presents that red dye which has been ascribed to it by different writers. Although this redness uniformly exists, to a greater or less extent, during digestion, yet there is no doubt it is essentially modified by the quality, as well, perhaps, as by the quantity of the food.* (Pl. I, Fig. 2.) Dr. Gendrin, of Paris, ascer-

* Dr. Beaumont, of the United States army, who had the rare opportunity of inspecting the gastric mucous membrane through a fistulous channel in the ab-

Fig.1

Fig.8

Fig.2

Fig.3

Fig.4

Fig.6

Fig.5

Fig.7

Fig.16

Fig.17

Fig.11

Fig.14

Fig.13

Fig.12

Fig.18

Fig.15

Fig.9

Fig.10

E. W. Bouvé's Lith.y Boston.
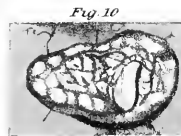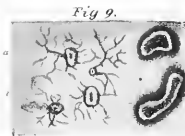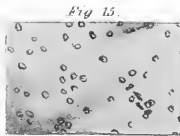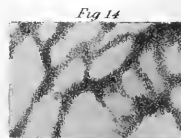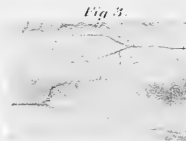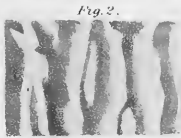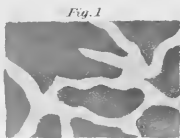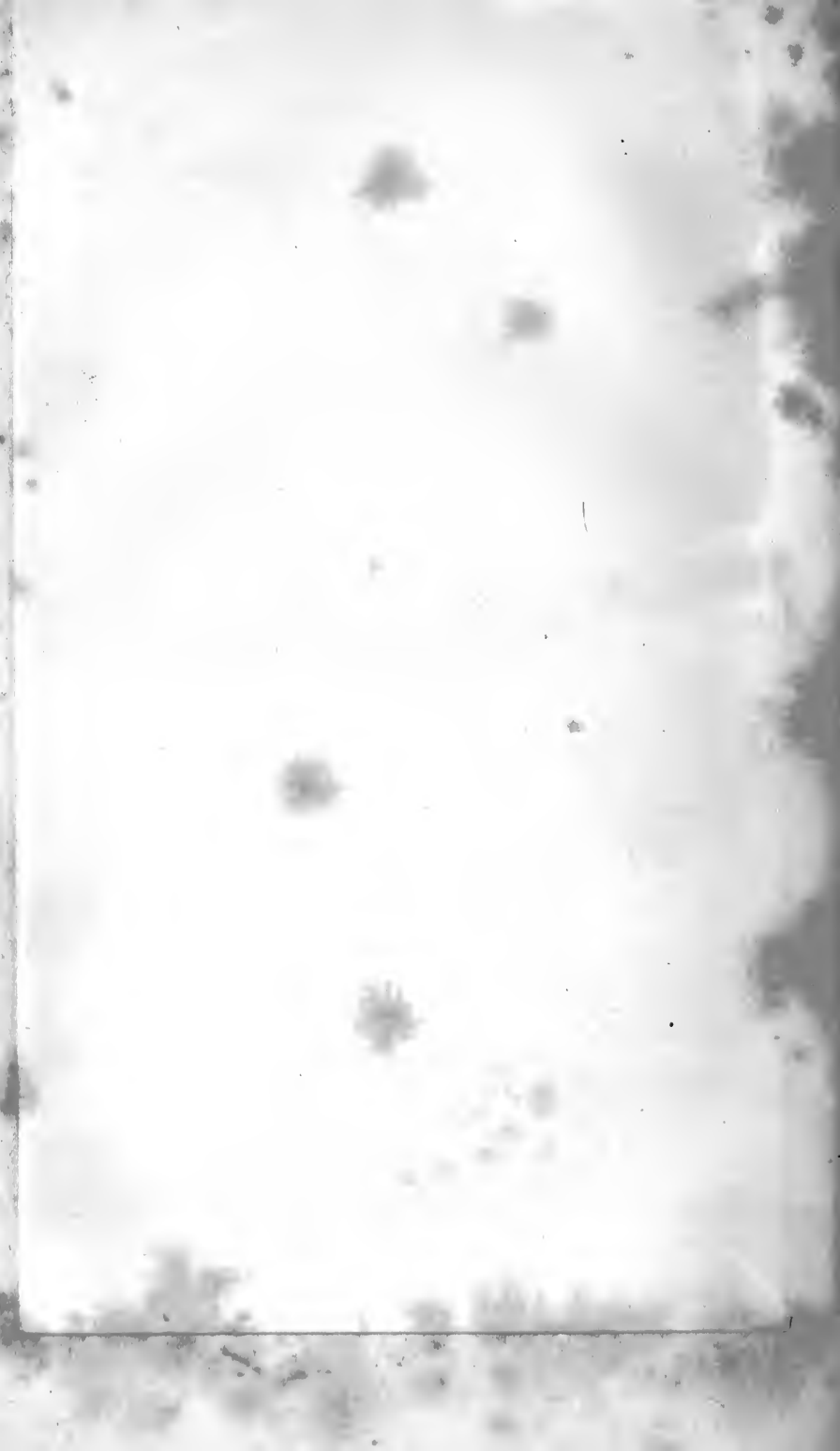
tained that if two dogs, of the same size and age, be fed, the one upon milk, and the other upon fatty broth, highly seasoned with salt and pepper, and both be killed an hour after, the mucous membrane of the stomach of the latter will be of a much deeper red than that of the former, at the same time that the augmented vascularity will extend much further down the small bowel. From this circumstance, which exerts so great an influence upon the rest of the alimentary tube, the ileum and colon experience little or no variation in their appearance.

The redness which supervenes during digestion is remarkably lessened, but never completely effaced by exsanguification. Of this, any one may convince himself by opening an animal during the process of chymification, and cutting across the aorta and vena cava, the latter especially, which, as is well known, has always the effect, when divided, of giving the surface of the alimentary tube a pale, blanched appearance.

The color of the gastro-enteric mucous membrane is considerably influenced by the kind of death. In general, the rosy tint very much diminishes, so that we commonly find in young children that have died of protracted diseases, an unnatural pallor, amounting sometimes almost to a milky whiteness. In persons who are drowned, hung, or otherwise asphyxiated, the inner surface of the stomach and bowels is often of a crimson color, occurring either continuously or in large patches. Dr. Yellowly, of England, who has devoted much attention to this subject, states that he has observed this condition of the mucous coat of the stomach successively in five executed criminals ; and Professor Monro, of Edinburgh, informs us that he has repeatedly, under similar circumstances, seen the gastric lining of a tile red. In a mulatto woman, who was executed in Kentucky, in the winter of 1835, and whose body I had an opportunity of inspecting soon after the event, the whole mucous surface of the alimentary tube was so deeply injected, as to present a deep lake color, especially distinct in the stomach, and in the inter-valvular spaces of the jejunum. Similar phenomena I have had occasion to witness in a female who was destroyed by manual strangula-

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domen, states that the color of the inner surface of St. Martin's stomach, when empty, was usually of a pale pink ; but that, on the application of food, the action of the vessel became augmented, and the color of the villous tunic considerably heightened.

tion, in a man who hung himself, and in dogs and rabbits asphyxiated for experimental purposes.

In an individual who died very suddenly from ossification of the coronary arteries, and whose abdominal viscera seemed to be in every respect sound, Professor Horner found the mucous coat of the stomach thrown into numerous folds, the sides and summits of which were of a bright brownish color, produced apparently by thousands of microscopic points of blood, detained in the capillaries : in the depressions between the wrinkles, the organ was of a dull pearl color.   The jejunum was of a still deeper hue, and of a more uniform tinge than the stomach.   The mucous coat of the colon was of a dull grayish color.   In another person, who died within half an hour after eating a hearty meal of soup, bread, and potatoes, the lining membrane of the stomach was, throughout, of a red crimson hue, and that of the intestines of a light brownish.

If an animal be kept without food for three or four days, and then killed, the stomach and bowels will be found to be of a red rose color ; the mesenteric vessels considerably distended with blood ; the isolated follicles enlarged ; and the villous membrane unnaturally rough, softened, and easily detached. Not unfrequently, indeed, the color of these organs, under such circumstances, will be of a cherry red, bright lake, or vermilion.   If the abstinence, however, be prolonged for a considerable period, then the mucous membrane, participating in the general anemia of the system, will be apt to be pallid, though cases occasionally occur, even in the human subject, in which the reverse of this obtains.

Various substances, when taken into the stomach, have the property of imparting to the mucous membrane a deep red color, which may be mistaken for the effect of poison.   Of this nature, are the infusions of logwood and red poppy, together with black currants, the tincture of cardamom, and the compound spirits of lavender.   A knowledge of these facts is of much importance in a medico-legal point of view : as a person, after having swallowed freely of some one or other of these substances, might suddenly expire, and from the mucous membrane of the stomach and bowels being found of a red tinge, the suspicion might arise that he had been poisoned.   Of this, a most instructive case is recorded by Foderé, in his learned treatise on juridical medicine.

It was stated in a previous part of this work, that the

nitrate of silver, when taken internally for a long time, had the effect of staining the external integument with a gray slate color. Similar results follow in regard to the mucous membrane of the alimentary canal. In a case examined by Dr. Rayer, of Paris, where the substance in question was taken for thirteen months, for the cure of epilepsy, consequent on disease of the brain, the internal surface of the whole alimentary tube, together with the interior of the mouth and sides of the tongue, was of a gray slate color. In the stomach the tint was extremely deep, and uniformly diffused; in the bowels, it was somewhat more faint, but still quite appreciable, and was interrupted here and there by minute vascular specks. The skin exhibited a precisely similar hue. The above case is by no means a solitary one.

In traumatic fever, caused by wounds of the head or extremities, the mucous membrane often assumes a bright reddish color, which, although it does not seem to be always associated with derangement of the digestive passages, cannot be easily removed by exsanguification. This fact, which seems to have been first experimentally ascertained by Dr. Gendrin, has been fully corroborated by the later researches of Mr. Swan, of London. The numerous observations of this distinguished anatomist have proved, in the clearest manner, that the insertion of any of the mineral poisons, or even mercurial frictions, on the back of a dog, after shaving off the hair, communicates a red color to the villous coat of the whole alimentary tube.*

SECTION II.

Of Inflammation of the Gastro-Enteric Mucous Membrane.

WITH these preliminary observations concerning the healthy structure and appearances of the gastro-enteric mucous membrane, designed to enable the young pathologist to avoid some of the many difficulties which beset this most interesting field of inquiry, I proceed, secondly, to take up the subject of its morbid anatomy. In entering upon this important

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* Monro, Morbid Anatomy of the Gullet, Stomach, &c. p. 313.

topic, I do not deem it necessary to consider the lesions of each portion of the alimentary tube separately ; to do so, indeed, would only lead me into useless repetitions, and compel me at each step to recount what has been already stated. Possessing the same structure, the stomach and bowels, small as well as large, must be liable to the same diseases, whether acute or chronic, whether simply inflammatory or organic ; and therefore, for all practical purposes, there can be no reason whatever why they should not be all described under one general head.   Nevertheless, the method that will be pursued in the following pages will be somewhat different from that which the plan here stated might be presumed to indicate.   Thus, after having discussed the subject of acute inflammation, together with its several terminations, with reference to the gastro-enteric mucous membrane generally, I shall proceed to speak of the various organic lesions as they affect each section of the alimentary passages in particular.   Adopting this method, I shall be enabled the better to point out, what may be deemed of no trifling utility, the pathognomonic symptoms, so far as they are known, of those chronic affections of the stomach and bowels which are such a stumbling-block to the young practitioner.

The signs which anatomically characterize *acute inflammation* of the mucous membrane of the alimentary tube are, increased vascularity, loss of transparency, dryness, thickening, softening, deposition of lymph, and the formation of small vesicles, with alteration of the natural secretion and effusion of serum into the submucous cellular tissue.   How far each of these phenomena is to be regarded as denotive of diseased action, I will now endeavor, as concisely as possible, to point out.

The first perceptible effect produced in the inflamed membrane is a change of color, resulting from an augmented flow of blood to the affected part.   The shades of tint induced by this species of irritation are extremely numerous, but may be properly referred to modifications of red, brown, slate, and black.   Of these, the first is by far the most common in acute inflammation, whilst the other three are more usually the product of a chronic process, in which the coloring principle of the blood, perfectly incorporated as it were with the mucous texture, is variously altered in its properties, either from simple stagnation in the minute capillaries, or from contact with the acid and gaseous contents of the alimentary tube.

The inflammatory redness, although sometimes widely dif-
fused, usually occurs in small irregular patches, separated by
considerable intervals of sound membrane.   Varying in diam-
eter from a few lines to several inches, they often project
sensibly beyond the level of the circumjacent parts ; and, in
violent cases, are always of a bright red color, looking a good
deal like so many pieces of scarlet velvet.   Connected with
this augmented vascularity, are commonly to be observed
certain changes in the mucous and subjacent textures.   In
the early stage of the disease, there is perhaps merely a slight
degree of opacity, with a rugose condition of the free surface
of the membrane.   Afterwards, however, as the inflammation
progresses, the reddened patches lose their tenacity, and be-
come covered with a thick, ropy mucus, elevated into small
vesicles, chapped, or fissured, or studded with flakes of lymph.
Should all or several of these phenomena be present, no
doubt can be entertained concerning the true nature of the
disease : they are signs which no one can mistake, and which
are as unequivocal as though they were drawn in characters
of gold.

But it is not always that the inflammatory redness is thus
distinctly marked ; and hence much difficulty is sometimes
experienced in discriminating between it and that which is
natural.   Attention has been already directed to the well-
ascertained fact, that stimulating viands or drinks received
into the alimentary canal produce an efflux of blood to the
vessels of this cavity, by which the color of the mucous
membrane is often so greatly heightened as to exhibit an ap-
pearance not unlike what is observed in inflammation.   This
circumstance should be constantly borne in mind in making
post mortem examinations, otherwise the most serious mis-
takes must frequently be the consequence.   How, then, are
these two conditions to be distinguished from each other ?
for upon the correct decision of this point hinges the pathol-
ogy of a large number of the diseases of the stomach and
bowels.   The answer is obvious, — by comparison.

Thus, the inflammatory redness has rarely that uniform tint
which is to be observed in the sound membrane ; on the con-
trary, it is usually somewhat mottled, and, instead of termin-
ating, as does the other, by insensible gradations, it almost
always stops abruptly.   Most frequently the inflammatory
discoloration occurs in small irregular spots, situated at differ-
ent points of the circumference of the tube ; whereas that

resulting from simple congestion is commonly diffused over
a large extent of surface, or is confined to the most depending
parts.   Another important trait is to be derived from the con-
dition of the abdominal vessels.   In inflammation, the dis-
tended capillaries seem as it were lost, or, in other words,
cannot be traced to any particular trunk ; the reverse of
which obtains when the redness is cadaveric, or caused by
mechanical obstruction.   The blood, too, in the former case,
cannot be pushed about so easily from one place to another,
from the great firmness with which it is impacted in the mi-
nute vessels, added, perhaps, to some preternatural viscidity
of its fibrin, or to the abstraction of some of its aqueous prin-
ciples.   For the same reason, also, maceration produces its
effects much more slowly than in the sound state, and minute
injections seldom succeed so well, many of the vessels giving
way in consequence of the difficulty of displacing their con-
tents.   These characters are not, of course, so well marked
in incipient as in confirmed inflammation ; still they almost
always exist to a greater or less extent.

Besides these diagnostic signs, it may be further stated
that the mucous membrane, when inflamed, is always deci-
dedly opaque, from the engorgement of the capillary vessels,
which exhibit the appearance of a fine net-work, more dis-
tinct generally at the adherent than at the free surface of the
mucous tunic.   In the healthy state, on the contrary, or even
when there is a slight degree of congestion, such as occurs,
for example, under ordinary circumstances, during chymifica-
tion, the membrane is diaphanous, or at least very nearly
so ; and if a portion of it be detached, and held before the
light, it will be found to have a uniform rose color.

The inflamed part offers considerable diversity in regard to
the mode of its vascularity.   Most commonly, it is *arbores-
cent*, the vessels being spread out like the branches of a tree.
(Pl. I, Fig. 3.)   This species of injection, however, is never
indicative of high inflammatory action, unless when conjoined
with softening of the mucous tissue, or deposition of lymph
upon its surface.   Hence it either soon disappears, with-
out producing any appreciable symptoms, or it loses its den-
dritic arrangement, and becomes capilliform.   A fine exam-
ple of the present variety of vascularity is often to be noticed
in the conjunctiva, when, from any transient cause, its mi-
nute vessels are made to convey red blood.

The *capilliform* injection (Pl. I, Fig. 4) always denotes,

as just intimated, a much higher grade of irritation than the dendritic, to which it succeeds. In this variety, the capillary vessels, excessively crowded with blood, intersect each other in such a manner as to form a most intricate net-work, often particularly conspicuous around inflamed ulcers, the isolated follicles, and the glands of Peyer. It is attended frequently with softening of the subjacent cellular tissue, and can be completely removed by maceration in water for twenty-four hours.

Either alone, or conjoined with one or another of the preceding varieties of vascularity, we occasionally find a singularly *speckled* appearance of the mucous membrane. (Pl. I, Fig. 5.) When the dots are numerous, the affected surface looks very much like the section of an inflamed brain. It may also be imitated, with great nicety, as has been observed by Andral and Hope, by scattering fine grains of powdered vermilion upon a moist sheet of white paper. The appearance is much more frequent in the stomach than in the intestines, though at times it is found in nearly every membrane of the body. I have seen it, in the same individual, in the pleura and pericardium, the stomach and bowels, the spleen, mesentery, and omentum. The specks are sometimes very closely set together; and they vary in diameter from the smallest pin-head to that of a mustard-seed, and in color from a light rose to a deep cherry red. This species of vascularity, which does not point out an intense degree of irritation, uniformly proceeds from slight extravasation of blood, caused by the rupture of a considerable number of capillary vessels, in consequence of the impulse with which the fluid is forced into them at the onset of the inflammation. When it is conjoined, as very often happens, with the diffused redness, the dots generally occupy a considerable extent of surface, and occasionally run into each other so as to give the part a striated, streaked, or linear disposition.

In the highest degree of inflammatory action, as in that, for instance, resulting from the administration of some of the acrid poisons, spots of extravasated blood, of considerable magnitude, are not unfrequently met with. (Pl. I, Fig. 6.) In such cases, the fluid seems to be poured out originally into the submucous cellular tissue, whence it extends into the proper villous membrane, forming patches of a dark livid hue. Dissection does not always reveal the true cause of these extravasations. Very frequently, they can be traced

directly to one or more ruptured vessels ; in many cases, however, the capillaries of the part seem to be in a state of the most perfect integrity : how far, under these circumstances, we are authorized to ascribe the phenomenon in question to simple vascular exosmosis, it is not easy to determine.   Judging from what we observe upon the free surface of the mucous and other membranes, where blood is often thrown out in considerable quantities, without any laceration of the vessels, it is not unreasonable to conclude that the ecchymoses here adverted to may occasionally have a similar origin.

This blood-shot appearance, indicative of the most intense irritation, is often attended with thickening and softening of the villous tunic, together with a deposition of lymph upon its free surface, an effusion of serosity into the subjacent cellular tissue, and the secretion of an inspissated and tenacious mucus, or even of purulent matter.

The brown, slate, and black color, with their various intermediate shades, are usually ascribable to a process of chronic irritation, or to inflammation of long standing.   They are seen, however, occasionally in cases of a high degree of acuity ; in such, for instance, as result from corrosive poisons, violent diseases of the bowels, and the more severe forms of bilious fever of warm climates.   The black color is often witnessed in protracted diarrhœa and dysentery, and is always characteristic of profound morbid action.

An interesting question here arises, — can an inflammatory redness exist, and yet wholly disappear after death ?   Bichat and Broussais, together with some others, think that it may ; and, as the doctrine is of much importance, from the dangerous use which may be made of it in pathology, it demands a brief examination in this place.   Those who have advocated the possibility of this occurrence, have adduced the fact, that in many cases the traces of erysipelas will greatly diminish, if not entirely disappear after death ; and the same circumstances, it is well known, is often observed with respect to the redness of tonsilitis, and other inflammatory affections of the throat.   This condition has been explained by some on the assumption that the injection of the capillaries ceases as soon as the irritation causing it becomes extinct ; whilst others have endeavored to account for it by supposing that, during the agonies of dissolution, the vitality of the affected part is so much diminished that it has no longer the power of

attracting the blood in preternatural quantity.   In regard to cutaneous diseases, this is unquestionably true ; but, even here, cadaveric pallor of parts previously inflamed is far from being a general phenomenon, the redness oftentimes remaining long after death, especially in high grades of erysipelas, in scarlet fever, in measles, and in old irritable ulcers.

But is this comparison strictly applicable to the mucous coat of the stomach and bowels?   Much as the skin and lining membrane of these hollow organs are related to each other by similarity of structure and function, and intimately as they are associated by sympathy, it is well known that their capillary injection is widely different under inflammatory irritation.   Even in the highest grade of erysipelas, the blood can be easily enough forced out of its vessels, so as to give the part a pallid aspect, but nowhere can this be done, so far as we have opportunities of observing the fact, in confirmed inflammation of the mucous membrane.   Pressure to a highly-irritated tonsil, or to a prolapsed rectum, never displaces the sanguineous fluid to so great an extent as in the skin, because it is impacted much more firmly into the minute vessels, the coats of which will often yield rather than allow their contents to pass along them.

Nor is this all.   The blood has not that natural tendency to recede from the mucous membrane during the last struggles of life that it has to recede from the skin : on the contrary, so far from this being the fact, we uniformly find the fluid accumulate in the interior of the body ; and, in many instances, if indeed it does not occur always, there is reason to believe that this process goes on for some time after the heart has ceased to act, and the vital principle fled.   The redness, therefore, of the inflamed membrane, so far from diminishing on the approach of death, would have a tendency rather to become heightened ; and this, indeed, may occasionally happen ; though, taking all the facts which have been adverted to into consideration, I would be disposed to assume, as a general proposition, that the color remains precisely what it was during life.

Yet, although this subsidence does not take place in the generality of cases, it may, nevertheless, occur under certain circumstances.   Thus, a high degree of irritation accompanied with deep redness, may exist in the lining membrane of the stomach ; but a severe dysentery supervening, a powerful revulsion will be the result, in consequence of which the

original disease, with its attendant vascularity, will in great measure subside; so that, on inspection, no trace whatever of gastritis shall be discernible. The same circumstance may occasionally occur in persons that are cut off, in the course of a few hours, by violent attacks of cholera morbus. In several instances of this kind, where, from the intensity of the symptoms, no doubt could be entertained whatever, of the existence of the most severe inflammation, I have not been able to detect the slightest vascularity of the mucous membrane after death. Life, in such cases, seems to be destroyed by some lurking poison, exerting its baneful impression peculiarly upon the nervous system, without leaving any visible alteration in the organs whence it radiates its influence.

Enough, surely, has been said, to enable the reader to distinguish the different kinds of inflammatory redness, not only from each other, but also from that which appertains to the mucous membrane in the normal state. As the discussion of this subject has been carried to considerable length, I shall content myself, in concluding this article, with a brief analysis of the other anatomical characters which are to be found, either alone or conjointly with this discoloration, in the acute variety of gastro-enteritis. These, it will be remembered, consist in opacity, thickening, softening, vesicular eruptions, and vitiated secretions.

One of the earliest effects, in addition to the alteration of color, of acute inflammation of the mucous membrane, is a diminution of its natural *transparency*. Even when there is but a slight degree of redness, the irritated spots lose, in great degree, their diaphanous aspect; but, should the discoloration be deep and uniform, the opacity will be complete, owing to the extreme injection of the capillary vessels.

At the onset of the disease, the secretion of the membrane is somewhat augmented in quantity, but thinner and less viscid than in the normal state; the mucous follicles are also perceptibly engorged, and more prominent than usual, being encircled by a beautiful vascular wreath. When the inflammation is at its height, the secretion is almost suppressed, and the membrane consequently dry, as happens in inflammation of the Schneiderian lining of the nose; but, as this period is always of short duration, the secretion is soon reëstablished, and often discharged in considerable abundance, being of a thick, ropy consistence, and of a grayish opaline color; occasionally, also, it is of a greenish

tint, or dark and sanious.   The orifices of the mucous follicles
are enlarged and patulous ; and if, under these circumstances,
the membrane be carefully washed, it will be found to ex-
hibit a granulated aspect, not unlike a pale fungous ulcer.
Towards the decline of the disease, the secretion sometimes
assumes a puriform character, and is often quite copious, — a
phenomenon which was long ago adduced by John Hunter
and his disciples, as exemplifying suppuration without solu-
tion of continuity.

   Dryness of the mucous membrane, as a result of inflamma-
tion, is much less usual than in some of the other textures of
the body.   The phenomenon is by no means uncommon, for
instance, in the arachnoïd tunic of the brain, and is always
indicative there of a very intense degree of irritation.   The
same circumstance is occasionally witnessed in the alimentary
tube, and sometimes to a very considerable extent.   Thus, in
a case mentioned by Professor Horner, the whole cœcum was
so dry as to be almost crisp, like a bladder that has been sus-
pended for some time in the air.   Most commonly, however,
this lesion occurs in small spots, from one to six lines in
diameter.

   The surface of the inflamed membrane loses much of its
natural softness ; it becomes rough, from the turgid condition
of its villosities and follicles, and, in very intense cases, it is
not unusual to find it chapped, cracked, or fissured.

   Increase of *thickness* is a pretty constant attendant on acute
inflammation, the tumefaction appearing either cotemporane-
ously with, or soon after the redness.   Effusion of serum into
the submucous cellular tissue, added to injection of the capil-
lary vessels, seems to be the main cause of this anatomical
character, which is never so well marked in the stomach and
bowels as in the larynx, conjunctiva and fauces.   Occasion-
ally, the thickening proceeds almost wholly from the mucous
follicles, which may be so much enlarged as to give the sur-
face of the affected membrane, as already stated, a rough,
granular appearance.

   At an early period of the attack, the density of the mem-
brane is commonly somewhat augmented ; but, in its progress
to its height, as well as during its decline, it is always *pre-
ternaturally softened*.   In this condition, which is deserving
of a considerable share of attention, both the mucous and sub-
mucous textures are frequently infiltrated with serum, muco-
purulent matter, or even with blood ; at the same time that

they become so pulpy and disorganized as to allow themselves to be scraped away with the finger-nail or the handle of the scalpel. Inflammatory softening, as I shall endeavor to show hereafter, is much more common in some parts of the alimentary tube than in others, or, what is remarkable, is seldom attended with any decided redness, the part, which is opaque, and elevated, having every appearance as if the blood had ceased to penetrate it for some time prior to the extinction of life. Thus, then, whenever the irritation is of a high grade, the submucous cellular tissue uniformly participates in the disease.

A singular *vesicular eruption* is sometimes met with in this disease. It is indicative of the very highest grade of inflammatory action, and has hitherto been noticed chiefly in dysenteric affections and Asiatic cholera. The eruption consists in the developement of minute spherical vesicles, very little elevated, but discharging, when punctured, a small quantity of clear limpid fluid. Their walls are perfectly transparent, and few of them exceed the diameter of a grain of mustard. Very often these vesicles occur in thick clusters, hundreds of them being found upon a surface not larger than a square inch.

No part of the alimentary tube seems to be exempt from this eruption. It is observed, however, by Professor Horner, who has repeatedly witnessed it in Asiatic cholera, that it manifests a peculiar predilection, so to speak, for the valves of the jejunum, along the roots of which it is sometimes perfectly confluent, like the eruption of small-pox. In the ileum and colon, they are more scattered, and consequently much less numerous. Dr. Abercrombie has seen the whole surface of the large bowel thickly covered with these vesicles.

Generally this vesicular eruption is associated with a chapped or excoriated condition of the mucous membrane, preternatural vascularity, deposition of lymph, and effusion of sero-albuminous, bloody, or purulent matter. How it is produced, it is not very easy to determine. I cannot agree with Professor Horner, in supposing that they consist simply in an elevation of the epidermis of the stomach and bowels, for the obvious reason that no such structure as that exists; and it will be much more reasonable, therefore, to conclude that it is formed directly by the mucous corion itself, in consequence of some specific inflammatory irritation, not unlike what we see in erysipelas and anthrax. The subject, how-

ever, is still open for discussion, and will no doubt receive
the serious attention of pathologists.

We now come to the consideration of *lymphy exudations*,
(Pl. I, Fig. 7,) as signs of inflammatory action.   In the
stomach and bowels, the deposition of this substance is much
less frequent than in the supra-diaphragmatic portion of the
alimentary canal.   In children, the mouth, pharynx, and
œsophagus are sometimes completely lined with it ; but even
in them it is far from being common, and seldom extends
along the rest of the digestive tube.   In attestation of the
truth of this remark, it will be sufficient here to state, that
out of two hundred and fourteen cases of aphthous disease
that occurred in 1826, in the Foundling Hospital of Paris,
Billard noticed only three in which there were false mem-
branes in the stomach, and only two in which they existed in
the intestines.

After puberty, these exudations are equally uncommon, as
well in the stomach as in the intestines ; but much more so
in the former than in the latter of these organs.   In the
stomach, I have witnessed this phenomenon only in a single
instance, but in the rest of the alimentary tube repeatedly,
both in children and in adults.   By Dr. O'Brien and Dr.
Cheyne, of Dublin, it is described as a frequent appearance
in the epidemic dysentery of Ireland ; and by numerous ob-
servers, such as Horner, Ferris, Corbyn, Gendrin, Gerardin,
and Gaimard, it has been noticed in Asiatic cholera.   This
exudation is of very common occurrence in the large intes-
tine of persons who die of dysentery and bilious fever in the
Western States.   I have noticed it in a very great number
of cases, in every part of the tube, but more particularly in
the rectum, and ascending portion of the colon.   The ileum
is also frequently affected in these diseases, but I have never
observed the exudation extend into the jejunum, duodenum,
or stomach.

The inflammation giving rise to this lymphy exudation
appears occasionally to assume a sort of epidemic type.   Of
this, Dr. Gendrin makes mention.   In the spring of 1817,
an abdominal phlegmasia, as he informs us, prevailed exten-
sively in Paris, in which nothing was more common than to
see pseudo-membranous matter discharged both by the mouth
and anus.   In most of the patients who were admitted into
the wards of the Hotel-Dieu, the inflammation, especially
during the decline of the epidemic, commonly affected at

first the stomach and small bowels, from whence it gradually descended into the colon and rectum. In a large proportion of those who died of this disease, the pyloric half of the stomach was covered by an adventitious membrane, and the whole gastro-enteric lining of an erythematous red color. The mucous corion was sensibly thickened as well as softened ; and, in many places, there were small brownish-looking zones, likewise studded with albuminous matter.

The membranous exudation usually takes place, in the first instance, in small whitish specks, separated by considerable intervals : these, gradually coalescing, form large patches ; and these, again, continuous lamellæ, which often cover a very great extent of surface. A few years ago, I met with a specimen, in a young man who died of acute enteritis, after an illness of two weeks, in which nearly the whole of the lower half of the ileum was lined by a false membrane, in many places fully half a line in thickness : it adhered with considerable firmness to the surface beneath, which was extensively fissured, and of a dark, gangrenous color. The patient, in this case, suffered under all the symptoms of the most intense inflammation.

Is this substance susceptible, when thrown out upon the surface of the stomach or bowel, of becoming organized ? Upon this subject the opinions of anatomists can scarcely be said, in any way, to accord. Dr. Gaimard and Dr. Gerardin, two Russian physicians, affirm that, in cholera subjects, they have several times seen the finest capillary vessels shooting into it from the natural membrane ; but no other writers, so far as I know, have been so fortunate. That the thing is possible, may be readily supposed from what occasionally happens in the larynx, the womb, and urinary bladder : that it is extremely infrequent, must be equally plain, especially when we take into consideration the heterogeneous contents of the alimentary tube, and the tendency which they would have to thwart a process of such delicacy and refinement. Whether organized, however, or not, the adventitious membrane is always sooner or later detached, either in small semi-concrete masses, or, as sometimes happens, in long, lobular pieces.

I will not stop here to discuss the question, agitated by some highly respectable pathologists, whether these exudations are the result of a peculiar disease, the essential nature of which is still unknown, or whether they are the effect

simply of acute inflammation. I will merely observe that it is a well-ascertained fact, that such depositions are never present without some of the phenomena which indicate the existence of phlegmasial disturbance. Nay, indeed, it can scarcely for a moment be supposed that the mucous membrane, either of the alimentary canal, or of any other part of the body, could pour out lymph-like matter, and yet not be inflamed. Standing in the light of cause and effect, the thing is impossible.

Does any one deny this, let him remove this lymphy exudation, and carefully inspect the natural membrane. He will find, as might be anticipated, that the affected part is highly vascular, reddened, thickened, more or less softened, chapped, or perhaps even excoriated; the villosities, of a deep crimson hue, are turgid with blood; the follicles enlarged and prominent; and the submucous cellular texture weakened and extensively infiltrated with serous or other fluids. Thus have we not only the anatomical characters of acute disease, but of the most intense inflammation.

When acute inflammation runs so high as to give rise to bloody infiltrations beneath, and within the substance of the mucous coat, or even to small ecchymoses, it occasionally terminates in *purulent effusions.* Under such circumstances, it is by no means rare to meet with considerable abscesses, either in the walls of the digestive passages, or in the contiguous portions of the mesentery, produced by an extension of the irritation, and opening most generally into the bowel. The mucous membrane thus bathed and infiltrated with pus, is commonly of a reddish gray color, very soft, and yielding, being sometimes wholly disorganized, and converted into a dirty-looking, pultaceous substance. Frequently, considerable quantities of pus are thrown off by the inflamed tunic, without any solution whatever of continuity. Rarely does it come away pure, but is almost always mixed with vitiated mucus, bloody, and fecal matter.

Blood, either pure or mixed with the mucus and other contents of the alimentary tube, is oftentimes thrown out in violent attacks of this disease. This exhalation, for such in truth it generally is, is almost constantly present in dysentery and yellow fever, both of them high grades of inflammation, affecting, in the one case, the mucous coat of the colon, in the other, the mucous coat of the stomach. No doubt can be any longer entertained that the matter of black

vomit is merely a transudation of blood, altered in its phys-
ical and probably also in its chemical properties, by contact
with the gastric acid.   That it is a secretion from the vessels
of the stomach, is an opinion which was promulgated by the
late Dr. Physick, during the yellow fever in Philadelphia, in
1798, and which is the conclusion now generally embraced
by the medical profession in different parts of the world.
The quantity of this singular looking matter, once supposed
to be nothing but vitiated bile, is sometimes excessively great ;
and yet, upon examination, no structural lesion whatever, ex-
cepting lymphy exudation, and perhaps softening of the mu-
cous membrane, is to be found in the organ which is its seat.

The changes which the blood experiences, when brought
in contact with the acid and gaseous contents of the stomach
and bowels, are curious and important.   When thus effused,
the fluid is speedily deprived of its natural color, and con-
verted into a soft, black substance, resembling thin pitch.
(Pl. I, Fig. 8.)   Very much the same appearance is some-
times observed when the blood becomes stagnant in the
villous and follicular structures of these organs, from the in-
fluence, probably, of the same cause.   This discoloration
will be much greater always, there is reason to suppose, in
proportion to the quantity and vitiated condition of the gastric
juice.   Hence the reason, perhaps, why it generally has that
peculiar coffee-ground appearance in yellow fever.

Thus, then, an exhalation of blood, either pure, or vari-
ously altered by the gastric contents of the alimentary tube,
is another effect of acute inflammation of the mucous mem-
brane, and this by no means, an infrequent one.   The red-
ness which accompanies it is generally patch-like or diffuse,
and not unfrequently there are considerable-sized ecchymoses.
Conjoined with these appearances, may be softening, excoria-
tions, and thickening of the villous tunic, with vesicular
eruptions, and depositions of lymph.   It should be observed
here, that it does not necessarily follow, when abrasions exist
on the mucous coat, that the blood should issue merely from
them.   Very often, indeed, there is reason for believing that
they have nothing at all to do with the hemorrhage.

Produced by the same process is the thin *rice-water secre-
tion*, which forms so prominent a feature of Asiatic cholera
and violent diarrhœa.   The essential character of this secre-
tion is sero-albuminous, and the quantity poured out is often
very great, several quarts being occasionally discharged in

the course of a few hours. For the most part, the fluid is inodorous, whitish, and of an aqueous consistence, with numerous flakes of lymph floating through it, which frequently impart to it a turbid, milky aspect ; in diarrhœa, it is seldom so pure as in cholera, and it is also more apt to be offensive, from the union of feculent matter and vitiated mucus. It is partially coagulable by heat, alcohol, and acids.

The most prominent lesions connected with this sero-albuminous secretion are, softening of the villous membrane and hypertrophy of the follicles, with occasional depositions of lymph. What is remarkable, there is sometimes a complete absence of redness of the lining membrane, both of the stomach and bowels, — a circumstance which may be satisfactorily accounted for, by supposing that the immense rice-watery discharges relieve the vascular engorgement prior to dissolution, so that, upon inspection, no discoloration whatever is perceptible.

The function of *absorption*, so vigorously carried on by the mucous membrane in the normal state, is generally much diminished, sometimes totally suspended, in acute inflammation. The distinguished Dr. Gendrin, of Paris, in order to satisfy himself concerning this interesting circumstance, repeatedly applied poisonous substances, such as strychnine and prussic acid, to the mucous membrane of the nose and vagina of animals, in which these tubes had been previously irritated by tincture of cantharides and other fluids, and he invariably found that no injurious results were manifested by their contact. He farther ascertained that the more corroding poisons produced their specific effects only after they had wrought their way through the inflamed textures to which they had been originally applied.

In addition to this interruption of the absorbent faculties, there is almost always, when the inflammation runs high, a suspension of the digestive process, so that if food be taken into the stomach it will either immediately be thrown off by vomiting, or it will pass into the bowels, and be finally evacuated by stool. Highly interesting as these facts are, in a physiological point of view, they are still more so in a practical light, as showing the extreme folly of employing any but the very blandest kinds of food and drink in the treatment of gastro-enteric diseases. It is to a knowledge of them, doubtless, that Broussais and his followers are mainly indebted for the success which is said, in France, to characterize the

exhibition of diluents in phlegmasial disorders of the stomach
and bowels, in the almost total absence both of medicine and
food.

Inflammation of the lining membrane of the alimentary
tube frequently produces, even when it is entirely confined
to the mucous corion, a well-marked injection in the other
tunics.   When the disease is very extensive and intense, the
vascular injection may not only pervade the whole thickness
of the stomach, small or large bowel, but even reach to the
mesentery.   Under such circumstances, the distended state
of the neighboring vessels, the purple discoloration and arbo-
rescent appearance of the peritonæal covering, either alone or
in conjunction with globules or flakes of adherent lymph,
generally afford abundant evidence of the probable extent of
the internal lesions.   The mesenteric glands are sometimes
swelled and inflamed, though seldom so much as in ulcera-
tion.

In active inflammation, the digestive tube is ordinarily
dilated ; which continues only so long, however, as the
irritation is limited to the mucous lining ; for, as soon as it
extends to the muscular tunic, the canal becomes invariably
contracted ; sometimes to so great a degree as to render it
impracticable to evacuate its contents.

One of the most singular circumstances connected with
acute inflammation of the digestive passages, is the develope-
ment of gas which we occasionally meet with.   This phe-
nomenon has been variously explained by different patholo-
gists ; some supposing that it arises merely from a species of
fermentation of the fluids which may be contained at the
time in the stomach and bowels ; others, that it is the result
of a peculiar secretion, with the nature of which we are still
unacquainted.   Without denying the truth of these explana-
tions, both of which are, perhaps, to a certain extent well
founded, it may yet be doubted, I think, whether they are
sufficient to account for the fact that this evolution of gas is
present in some cases and absent in others.   With a view of
deciding this question, Dr. Gendrin irritated a portion of
bowel in several dogs by caustic, alcohol, or boiling water,
and then intercepted the inflamed part between two liga-
tures, having previously exhausted the air with a syringe.   In
two out of five of the animals thus treated, the gut was dis-
tended, in twelve hours after the operation, with an inodor-
ous gas, the inflammation in both being rendered evident by

the lively redness of the villous tunic ; in the other dogs, although the discoloration was equally conspicuous, and produced by the very same substances, no air whatever was to be found.   Is it probable that this fluid is disengaged from the blood-vessels of the affected part ? This is not unlikely, when it is recollected that carbonic acid gas is evolved in great quantity from the same source, in the lungs during respiration.

Not unfrequently we find that the disease, instead of invading the villous texture, properly so termed, begins in and is confined exclusively to the *mucous follicles*, which occur every where in such profusion in the alimentary tube.   As an independent lesion, it was particularly described, in 1811, by two distinguished Parisian anatomists, Dr. Petit and Dr. Serres, who denominated the accompanying constitutional disorder *entero-mesenteric fever*.   Dr. Bretonneau, of Tours, to whom we are likewise indebted for a very valuable memoir upon this interesting affection, more recently published, calls it *dothin-enteritis*, from a Greek compound, literally signifying furuncular inflammation of the intestines.   Both these appellations, however, as well as that of *follicular enteritis*, lately proposed by Professor Andral, are objectionable, on the ground of their not being sufficiently specific, since the disease is by no means confined, as these terms would lead us to infer, to the bowels, but also occurs in the stomach.

The subject of follicular inflammation is much agitated, at this moment, by the profession, in relation to the pathology of typhous fever.   From the investigations of Louis and Chomel, well known as two of the most shrewd and diligent cultivators of morbid anatomy, of the present day it clearly appears that this formidable malady is either caused by or gives rise to inflammation of the intestinal follicles, especially the glands of Peyer, which finally terminates in their destruction.   How this question will be ultimately settled it is impossible to foresee ; I have very little doubt, however, that it will be in favor of the opinion which attributes typhoid fever to a primitive lesion of the mucous glands ; and in this belief I am justified by the severe constitutional disturbance which is so constantly present whenever these bodies are seriously affected.

In the inceptive stage of this variety of inflammation, the isolated follicles look like little boils, moderately projecting beyond the level of the surrounding surface.   (Pl. I, Fig. 9.) Varying in size from a small pin-head to a mustard-seed, they

are generally of a spherical shape, soft, and of a reddish glossy aspect, each being marked by a minute, central aperture, indicating its natural orifice. At this period of the disease, the glands are already quite injected; and, if they be closely examined, it will be found that they are encircled by a beautiful wreath of vessels, so fine as to be almost undistinguishable by the naked eye. At a more remote stage, their color is of a light brown; their bulk is considerably augmented; and their surface, instead of being lubricated, as before, by an abundant mucus, is nearly dry, their secretory functions being in great degree suspended. This state, however, which soon disappears, is followed by a copious flow of fluid. When, as often happens, the villous membrane between the follicles participates in the disease, it gradually loses its natural characters, and exhibits some of those appearances which have been pointed out as denoting acute inflammation. The glands themselves are often very much softened, or so greatly disorganized as to give the surface of the digestive tube a singularly cribriform aspect.

Not unlike the preceding are the changes which the glands of Peyer undergo in acute inflammation. (Pl. I, Fig. 10.) In the normal state, these bodies, it will be remembered, are seldom very distinct; when affected, however, by disease, they are rendered quite prominent, being considerably raised above the surrounding surface, in the form of elliptical, ovoïdal, or circular patches, from a few lines to several inches in diameter. In this state, they are of a bright florid color, from the injection of their capillaries; and their surface has an uneven, granular, or honey-comb appearance, from the projection of their follicles. The submucous texture is also considerably thickened, and the intervening membrane more or less altered, according as it participates or not in the inflammation. Ulceration often follows this process.

Acute inflammation, whether affecting the villous or the follicular textures, or both at the same time, may either terminate by resolution, or it may pass into the chronic form, or else proceed to disorganization. When it goes on favorably, the infiltrated fluids are gradually absorbed; the vascularity diminishes; the natural secretions are restored; the absorbing faculties become more and more vigorous; and, at length, the functions of the part are entirely reëstablished, — the only alterations which remain being a thickened, and occasionally a slightly indurated state of the mucous and submucous tex-

tures. If the follicles have been principally involved, the affected surface exhibits, after the lapse of some time, numerous dark dots, which have been compared, not unaptly, to those of a newly-shaved beard.

With regard to acute inflammation, it may be observed, in conclusion, that its relative frequency is much greater in some parts of the alimentary tube than in others. The inferior half of the ileum, the stomach, and the commencement of the colon, are, without doubt, most commonly engaged, either alone or conjointly. This latter circumstance has given rise to the term *gastro-enteritis*, in such frequent use amongst the French pathologists, but which is not always applicable, inasmuch as the coincidence is by no means universal, or even perhaps general.

Although acute inflammation occasionally terminates in *gangrene*, yet this effect is by no means so common as was at one time supposed by pathologists. By a reference to the works of the older anatomists, it clearly appears that they were constantly in the habit of compounding high discoloration, whether proceeding from simple congestion, effusion of blood, or melanotic deposition, with mortification of the mucous texture. Since, however, a more accurate method of investigation has been introduced into science, it has been abundantly established that this lesion is of very rare occurrence, being scarcely met with in one case out of ninety-nine of gastro-enteric disease. This remark applies, of course, solely to the idiopathic variety of inflammation, and not to that which is occasioned by strangulation, intussusception, external violence, or corroding poisons.

It is now well ascertained that some parts of the mucous membrane of the alimentary tube are much more liable to gangrene than others. The inferior half of the ileum is the section most commonly affected, and next in point of frequency stands the colon, particularly the ascending portion. It is an extraordinary fact that the stomach, jejunum, and duodenum are seldom implicated. Why these structures should enjoy this remarkable immunity, both from this and other affections, has never been explained ; but such as has just been stated is the fact, no matter what may be the cause of it.

Large portions of the mucous membrane are sometimes deprived of their vitality. Professor Horner refers to a case in which the gangrene implicated nearly the whole, both of the small and large bowel ; and, in several instances which have

come under my own observation, I have seen the greater portion of the ileum and colon involved. But, generally, the lesion is much less extensive, occurring in small patches, of an irregular shape, and from one to several inches in diameter. The textures primarily affected are, the mucous and follicular, from which the disease may gradually spread to the other tunics, converting them into soft, dark-colored sloughs, incapable of resisting the slightest distention from fecal matter. Hence it not unfrequently happens, if the patient lives sufficiently long, that the intestinal tube gives way in one or more places, and discharges its contents into the abdominal cavity, as in perforation from ulcerative action.

The color of the sphacelated part is variable. (Pl. I, Fig. 11 and 12.) Occasionally we find it of a dark-drab, dirty-ash, or greenish tint; but more commonly it is of a mahogany-brown, black, or livid, from the imbibition of the ichorous matter, which is often poured out in such abundance during the height of the inflammatory stage of the disorder. The mucous membrane which surrounds the slough is generally very considerably injected, and of a red mulberry color, indicative of excessive irritation.

With this change of color, the mucous membrane is considerably altered in its consistence, being so much softened, indeed, that it can be removed by simply passing over it the handle of the scalpel. In many instances, the gangrenous part is remarkably offensive: frequently it is covered with flakes of lymph, and occasionally, though this is very rare, there are little phlyctenæ, not unlike those which are witnessed in mortification of the skin and cellular tissue. An emphysematous condition of the submucous cellular tissue is also sometimes found; but this, in the majority of cases, is to be regarded rather as the result of putrifaction than of inflammation.

When the gangrene seizes upon the glands of Peyer, which, however, is not often the case, the sloughs are of a dark brownish color, soft and fetid, very much as in the preceding case; and, on being detached, deep excavations are formed, with loose, ragged edges. Although in the generality of cases these excavations do not extend beyond the submucous coat, yet occasionally they invade the whole thickness of the ileum, and thus give rise to perforations and fatal effusions. Sometimes, even when the gangrene stops short at the mucous and subjacent cellular textures, considerable

blood-vessels, branches of the mesenteric arteries and veins, are laid open, and the patient falls a victim to the hemorrhage. Appearances very similar to these are to be observed when the gangrene invades the isolated follicles, except that the surrounding parts are usually less red and injected.

I shall close this subject with the following case, which came under my notice about eighteen months ago. A colored man, twenty-seven years old, of a stout, athletic frame, was affected for three days with all the symptoms of a severe bilious colic, for which he was attended by Dr. Dodge, of this city. At the end of this period, when I saw him, in consultation, the tongue and extremities were quite cold, the pulse almost imperceptible at the wrist, and the stomach excessively irritable, with a constant disposition to vomit, intense thirst, and a countenance expressive of the most intense distress. The abdomen was somewhat tympanitic, and the bowels, although perfectly torpid, were almost free from pain. In this condition the patient continued for about forty-eight hours, when there was an appearance of slight reaction, though still no evacuation from his bowels. In a short time, however, the symptoms again became worse, and he expired, in a state of complete collapse, on the seventh day from the attack.

On examination, the great omentum, excessively loaded with fat, was found glued to the colon and right side of the abdomen, the points of attachment being in a black, fetid, gangrenous condition. The mesentery and small bowel were gorged with dark blood, and the latter adhered extensively to the bladder and rectum by a thick mass of lymph. The cœcum, vermiform appendage, and inferior fifth of the ileum were externally of a livid color, and internally black in patches from one to two inches in diameter. Here and there, the surface of the mucous membrane was covered with flakes of lymph, and the same substance was found in considerable abundance upon the exterior of these portions. The whole intestinal tract was much distended with gas and feculent matter; and the stomach, which contained about a pint of thin, greenish liquid, presented well-marked signs of inflammation, especially at the great tuberosity. All the other abdominal viscera were natural.

Chronic inflammation of the mucous membrane of the alimentary tube is much more frequent than acute, of which it may be either the consequence, or it may exist as an origi-

nal and independent disease.   It is very common in dispepsy,
diarrhœa, dysentery, and infantile cholera, of which and of
almost all protracted fluxes of the bowels, it is the principal
cause, these affections themselves being merely the symp-
toms.   Though not so immediately dangerous as acute in-
flammation, this disorder is usually very difficult to be dis-
lodged, from the strong hold which it takes of the part, and
from the insidiousness of its attack, weeks, nay months some-
times elapsing before it induces any decided constitutional
disturbance.

The anatomical characters of chronic inflammation differ,
in many essential points, from those of the acute variety of the
disease.   As a general proposition, it may be stated that the
appearances vary according to the duration of the malady,
and the nature of the exciting cause, together with several
other circumstances which it is unnecessary to specify.
Thus, when the disease is of recent standing, we usually find
the mucous membrane of a dusky red, inclining to mahogany ;
whereas, in the opposite state, especially when the attack is
one of considerable intensity, it is of a livid, purple, or mul-
berry aspect.   Though occasionally the discoloration is
diffuse and uniform, yet in the great majority of cases it
occurs in small patches, stripes, or bands, leaving the inter-
vening surface of the natural hue.   As in the acute form of
the disease, so in this, the color, whatever be its nature, is
closely identified with the mucous texture, and therefore al-
ways removable with much difficulty by maceration ; artifi-
cial injection, also, is no longer practicable, at least not to
any degree of minuteness.   The vessels upon which this
discoloration depends are generally disposed in arborescent
lines, and, what is remarkable, and serves to distinguish this
from mere congestive vascularity, is, that they cannot be
traced to any particular trunks, but seem as if they were lost
in the midst of the inflamed tissues.

But it is not always that the diseased membrane is height-
ened in its color.   Often, indeed, it is preternaturally pale, as
if it had been bleached and drained of its fluids, and in such
cases, also, it is generally very flabby and relaxed.   Examples
of this kind have been reported by Andral and Louis, and
have repeatedly been witnessed in my own dissections : they
occur with considerable frequency in chronic diarrhœa and
in infantile cholera.

A very common appearance in this disease is a slaty bluish

or blackish discoloration, occurring in spots, from the size of a five cent piece to that of a dollar. (Pl. I, Figs. 13, 14.) The parts in which it is most frequently met with are the colon and the rectum, where it is sometimes diffused over a large extent of surface. In the stomach and small bowel, where it is usually more limited, it is commonly most distinct along the temporary folds and winking valves, for what reason it is not easy to say. The discoloration which runs through a great variety of shades, from a light slate to a jet black, is seldom witnessed except in cases of long standing, or in such as are characterized by a considerable degree of intensity, and it probably always results from an extravasation of blood into the submucous cellular texture. Its seat, however, is not, as might be supposed, confined to this substance : often, indeed, it involves in a special manner the mucous membrane, the follicles, and even the villosities ; and cases are not wanting, though they are uncommon, in which it penetrates all the tunics at the same time, tinging the tube externally of a greenish, brownish, or sooty dye.

In chronic inflammation, the substance of the mucous membrane is generally thickened, and its density augmented, so that it can no longer be torn with the same facility as in the normal state. The mucous follicles (Pl. I, Fig. 15) are also more or less enlarged, forming, in many instances, hard, granular bodies, which project considerably above the level of the surrounding parts. Nor is the hypertrophy — for such it really is — always confined to these structures. The villosities, small as they naturally are, are often involved in the disease, and sometimes attain quite an astonishing developement. Owing to these alterations, the surface of the mucous membrane is usually rough, and occasionally even cellulated, like a honey-comb. This, however, is by no means a uniform occurrence ; for cases are frequently witnessed, and even those of long standing, in which the part is perfectly smooth and polished, not a gland or villosity being any where perceptible.

When, as sometimes happens, the disease passes into the acute form, the mucous texture undergoes still further changes, or, more correctly speaking, it assumes very different characters. It loses its hardness and tenacity, and is converted into a soft, thick, pulpy substance, which is infiltrated with various kinds of fluids, such, for example, as serosity, pus, or blood, either alone, or in combination. If the morbid action be of long continuance, the mucous tunic is apt to

give way, and to form ulcerations, which extend, by degrees, to different depths in the tube. If, on the other hand, the disease retrogrades, the membrane, although it loses its dark complexion, yet it remains preternaturally soft, spongy, and tumid.

In chronic as in acute inflammation, the vessels of the part always retain their unnatural volume for some time after the main disease has subsided ; and cases are occasionally observed in which the veins have quite a tortuous and varicose disposition, forming thick whorls underneath the mucous tunic. This appearance is particularly apt to attend chronic inflammation of the stomach, colon, and rectum.

On some occasions, fungous excrescences are to be noticed, hanging from the free surface of the membrane like so many little warts ; and nothing is more common than to find the submucous cellular tissue indurated and hypertrophied. But of these lesions, as well as of ulcerations, we shall speak more particularly in the following pages, under the head of organic diseases, which will presently engage our attention.

The secretions in this disease present several important varieties. Most generally they consist of a thick, ropy, inodorous mucus, discharged in considerable quantity by stool ; not unfrequently, however, they are of a thin, gleety nature, and the cases are not uncommon wherein they are serous, sanious, purulent, or fibrinous. Occasionally, again, though I believe this is very rare, the evacuations are thin, greasy, and of a singularly cadaverous smell.

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SECTION III.

Of Softening of the Gastro-Enteric Mucous Membrane.

Softening of the mucous membrane of the alimentary tube, a subject already incidentally referred to in the preceding section, was first described, as a distinct pathological condition, in 1829, by the celebrated Dr. Louis, of Paris, a gentleman to whom morbid anatomy is under so many obligations. Since that period, the disease has attracted the attention of numerous observers both in Europe and in this country, and, as might be expected, our knowledge concerning its anatomi-

cal characters, however deficient it may be in relation to its symptoms, is already of a very high order, nearly, indeed, if not quite perfect.

Softening of the mucous texture from inflammation, that variety to which we shall at present restrict our remarks, is most commonly noticed in the lower third of the ileum, the cœcum, the right and left portions of the colon, the stomach, and the rectum, — the frequency of its occurrence being in the order, very nearly, here enumerated. In the majority of cases, it is confined to particular parts of the digestive tube; but, in some rare instances, it extends through its entire length, from the cardiac orifice to the anus. Although occasionally the softening seems to be limited to the mucous corion, villosities, or follicles, yet most generally it occurs in all these structures at the same time, converting them into a pulpy, homogeneous substance. Under certain circumstances, it is supposed to be capable of invading all the tunics of the stomach or intestines, proceeding successively from the mucous membrane to the subjacent cellular texture, and from the latter to the muscular and serous layers, so as to give rise to perforations with a discharge of the contents of these reservoirs. This opinion, however, has been contradicted by some very able pathologists, under a belief, in all probability well-founded, that, when the lesion is thus extensive, it depends, not on inflammation, but on the chemical action of the gastric juice. The reasons for this belief will be more fully adverted to in the course of this article.

Inflammatory softening is usually somewhat gradual in its progress, running through several well-marked *stages* before it attains its full developement. In the first stage, the mucous membrane is remarkably brittle, and breaks as soon as it is seized with the forceps, allowing itself no longer, as is the case in a sound state, to be detached in small, narrow strips; in the second, the cohesive powers are so far destroyed, that, by merely sweeping the finger over it, it may be converted into a soft, grayish pulp, very analogous to thick cream; and, in the last stage, the disorganization is such that the mucous membrane may be easily removed by a small stream of water poured upon it from the height of a few inches. When the softening has attained this degree of developement, it is not uncommon to find considerable portions of the mucous membrane detached, by the passage simply of the fluid contents of the alimentary tube; and in this way may be produced

numerous abrasions, of a circular, oblong, or linear configuration, and from the size of a split pea to that of a Spanish dollar, or even the magnitude of the hand. The edges of these abrasions are generally clean and even, and their surface is formed by the submucous cellular tissue, itself often in a state of partial disorganization. The denuded patches, especially when small and circular, have occasionally the appearance of ulcers ; but, as has been justly remarked by Professor Carswell, in all cases of doubt, the handle of the scalpel, carried lightly over the part, will enable us to determine their true nature. If the membrane sloughs away to a very great extent, as sometimes happens, the margins of the sore, instead of being rounded, as in the former case, will be irregularly levelled off, running insensibly into the surrounding parts. In cases of this description, too, it is not unusual to find shreds of the mucous membrane stretched across the denuded surface, so soft as to render it impossible to lift them with the forceps.

Considerable diversity prevails in respect to the *color* of the softened membrane, different shades of tint marking different cases, and even the same case in different regions. (Pl. I, Fig. 16.) In the generality of instances, the membrane is of a pale bluish aspect, one or two degrees lighter than in the normal state ; and not unfrequently it is of a dead white, like milk or cream. This variety of softening is very common in consumption, in mesenteric disease, and in all affections attended with much emaciation.* In other cases, again, the membrane presents various shades of red, brown, or purple, or, perhaps, even retains its natural hue. Occasionally the discoloration is rigidly limited to the part affected, and this is especially the case in the pale variety ; but in most instances it extends to the neighboring parts, which at the same time exhibit all the phenomena of ordinary inflammation.

The blood-vessels in this disease have a singularly flattened appearance, and many of them are partially obliterated, no doubt from their participating in the softening. Injecting matter can no longer be forced into them, and their contents often escape so as to form small dark-colored ecchymoses, resembling the black spots observable in the stomachs of those who die of yellow fever.

The lesion now under consideration is an exceedingly

* Carswell, London Cyclopædia of Practical Medicine, vol. x. p. 15.

common one in this city, so much so, indeed, that I rarely
make an examination without meeting with it.   Although it
is occasionally limited to some particular portion of the ali-
mentary tube, yet, in by far the greater number of subjects,
it occurs simultaneously in the stomach, the ileum, and large
bowel.   In some instances, it involves an immense extent of
surface, one third, a half, or even two thirds, of the gastro-
enteric lining.   It may be the only disease, or it may exist
with other affections, such as ulceration, extenuation, or thick-
ening ; but, however this may be, the anatomical characters
do not differ from those we have just pointed out.   Inflam-
matory softening of the mucous membrane is frequently wit-
nessed in bilious and typhoïd fevers, in dyspepsy, in phthisis
and pneumonitis, in diarrhœa and dysentery.   I have like-
wise noticed it repeatedly in infantile cholera, especially in
the chronic form of that disease, of which it often constitutes
the principal evidence.   In nearly all the dissections which I
have made of subjects who died of this malady, the soften-
ing was particularly observable in the mucous lining of the
colon and stomach.   In a few instances it was also noticed
in the lower half of the ileum.

The *symptoms* of this disease do not differ materially from
those of other gastro-enteric affections.   Generally, with
more or less protracted indisposition, there are epigastric
pains, with loss of appetite, nausea, vomiting, disorder of the
bowels, failure of the strength, and progressive emaciation.
These phenomena are particularly distinct when the lesion is
confined to the stomach, when the patient, besides, often ex-
periences a degree of tightness at the upper part of the abdo-
men, as if a bar or heavy weight were stretched across it.   The
pains are always augmented by pressure, and, during their
existence, the countenance is usually expressive of much un-
easiness, very dull, and haggard.   But these symptoms are
not pathognomonic, and I therefore forbear any further re-
marks concerning them.

The species of softening now described is caused, it will
be remembered, by a process of inflammation, either acute or
chronic, and may occur in any part of the mucous system,
not only of the alimentary tube, but of the rest of the body :
it is characterized, moreover, by the circumstance of its being
limited to the mucous textures, and by its *never* affecting the
muscular and peritonæal tunics.   Another variety, resulting
from a very different cause, and which frequently produces

extensive erosions and perforations, remains to be noticed.
I need scarcely say that I allude to the softening occasioned
by the *gastric juice,* or, more correctly speaking, the gastric
acid. (Pl. I, Fig. 17.)

The celebrated John Hunter, it is well known, communi-
cated, at an early period of his professional career, his obser-
vations on the chemical solution of the mucous and other
coats of the stomach, in a paper first published in the London
Philosophical Transactions,* and subsequently in his work
on the animal economy. He describes this species of softening
as a digestion of the tunics of the stomach, produced by the
solvent powers of the gastric juice after death ; and the reason
which he assigns why this effect does not occur during life,
is the constant resistance of the vital principle to its action.
These observations were confirmed shortly afterwards by
Spallanzani, of Italy, Dr. Adams, of London, and Mr. Allan
Burns, of Glasgow, the latter of whom contributed some very
valuable information on the subject, more particularly rela-
ting to the chemical solution of the stomach in individuals
who died of protracted diseases ; for it should be recollected
that Mr. Hunter, having met with this lesion only in healthy
animals, and in persons who had been suddenly deprived of
life, by external violence, he advanced the opinion that a state
of perfect integrity immediately prior to death was absolute-
ly essential to its production.   Very important additions have
since been made by Baillie, Chaussier, Jœger, Gairdner, Cars-
well, and other writers, some of whom agree in the opinion
of the great British anatomist, that the effect under consider-
ation is the result of the action of the gastric acid ; whilst
others maintain that it is an idiopathic affection ; and some,
again, especially Cruveilhier and Louis, that it is caused by
a high state of inflammatory irritation, which, occasioning a
slow and protracted effusion of serosity, produces infiltration,
distention, and ultimate disorganization of the delicate tex-
tures of the mucous membrane, leading finally to complete
perforation of the intestinal tube.

It is not of little consequence that correct views should be
entertained in regard to this subject, as it is one of much im-
portance, not only in pathology, but also in juridical medicine.
The French anatomists, it seems to me, have attributed en-
tirely too much to inflammation ; and, in their eagerness to

* Vol. lxii. p. 444.

deride the doctrine of John Hunter and his disciples, have
lost sight of the physical and chemical properties of the gas-
tric acid, which, it cannot be denied, is often fully compe-
tent to the production of extensive mollescence of the mucous
membrane.   When it is remembered, indeed, that softening,
with erosion and perforation of the stomach and intestines, is
frequently found after death in persons who, during life, do
not evince the slightest gastro-enteric derangement, — that it
occurs at any period of existence, alike almost in infancy, in
manhood, and decrepid age, — and, finally, that it is witness-
ed equally almost in those who are destroyed suddenly by
external violence and those who die from chronic diseases, —
we are fully warranted, I think, to conclude that, if the gas-
tric acid is not the sole agent in the production of this lesion,
it is certainly the most frequent and efficient cause of it.

But there are other reasons, of a still more cogent and un-
answerable character, which justify us in attributing this
effect to the agency of the gastric acid, and to nothing else.
Mr. Hunter, in the paper already referred to, distinctly ob-
serves that the power of this fluid is not confined to the
stomach alone, but that, after dissolving this organ in the
usual place, which is at the great cul-de-sac, it would gradu-
ally extend to the spleen, intestines, and diaphragm, eroding
them, and reaching as far sometimes even as the lungs.   The
truth of this statement derives additional force from the re-
searches of Professor Carswell, who, with a view of finally
putting this question to rest, instituted a series of the most
patient experiments, which he modified in almost every pos-
sible shape, and the results of which go directly to substan-
tiate the doctrine of the solvent powers of the gastric acid.
The queries which this distinguished philosopher wished
more particularly to solve were the following : first, are the
lesions noticed by various authors, under the appellations of
softening, erosion, perforation, and digestion of the coats of
the stomach, the same, or different morbid effects ? second-
ly, are they produced during life or after death ? if in the
latter case, are they the result of the chemical action of the
gastric acid ? and, thirdly, what are the conditions and prop-
erties of the fluid to which they are to be ascribed ? *

In the prosecution of these researches, Professor Carswell
ascertained the interesting and important fact that these le-

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* Cyclopædia of Practical Medicine, vol. iv. p. 17.

sions can frequently be produced at pleasure, simply by re-
moving the stomach of a healthy animal, cleaning it of its
contents, and putting in contact with it a small quantity of
gastric acid. In one instance, he placed the stomach of a
recently killed rabbit, containing digested food, under a glass
globe, and taking care to keep it moist with a little tepid wa-
ter, he observed, in a short time, that the fundus of the organ
became pale, then soft, thin, and transparent, and finally, at
the end of four hours, there was a perfect dissolution of all
the tunics, followed by an escape of the chyme. When the
softening was allowed to take place in the abdomen, and the
gastric acid came in contact with the surrounding organs, as
the liver, diaphragm, spleen, or intestines, the same lesion
was frequently observed in them as in the stomach, portions
of these structures being more or less macerated and broken
up. In a few of the experiments, the mollescence extended
as far as the œsophagus, pleura, and lungs.

From the foregoing facts, Professor Carswell justly con-
cludes that softening, erosion, and perforation of the alimen-
tary tube, whatever may be their extent, seat, or form, are
caused by the solvent properties of the gastric acid, and not,
as has been asserted by the French pathologists, by inflam-
matory irritation ; and, lastly, that whenever observed to-
gether, these lesions are invariably produced after death.
Results similar to those of the British anatomist, it may be
here stated, were obtained as early as 1818, in a set of exper-
iments on the same subject, by Dr. Camerer, a German phy-
sician. In one of these experiments, a drachm of gastric
acid, taken from two children who died of mucous molles-
cence, was introduced into the stomach of a man, soon after
death, and kept at a temperature of 170 of Fahrenheit for the
space of twelve hours. At the expiration of this period, the
mucous and muscular coats were found to be dissolved
through to the peritonæum, wherever the fluid got in contact
with them. The same liquid, conveyed into the stomach of
a living rabbit, produced no sensible effect ; but, after the an-
imal was killed, its corroding properties soon manifested
themselves. This observation, it will be perceived, striking-
ly illustrates the influence of the vital principle, so often ad-
verted to by Mr. Hunter when speaking of the digestion of
the coats of the stomach.

The *rapidity* with which softening, erosion, and per-
foration of the stomach may take place in the human sub-

ject, is well illustrated in a case which I had an opportunity of examining, about a year ago, along with Dr. Mount. It occurred in a female infant, seven weeks old, who was found dead one morning in her mother's arms, having expired apparently without a struggle. A month previously, this child had had a severe cough, which continued for eight or ten days, when it gradually abated. It was also harassed, every evening for several weeks, with regular paroxysms of retching and vomiting, attended with occasional colicky pains, and latterly with diarrhœa.

On inspection, *nine* hours after death, numerous apoplectic effusions, from the size of a currant to that of a pea, were discovered in the pulmonic tissue, which, together with the universal engorgement, the injected condition of the bronchiæ, the distention of the right cavities of the heart, and the absence of any structural lesion, save a slight degree of hepatization of the inferior lobe of the left lung, made it sufficiently clear that the child had died of suffocation. In the great cul-de-sac of the stomach existed a rounded opening, with ragged edges, about the size of a Spanish dollar, through which had escaped a small quantity of mucus and gastric acid. The concave surface of the spleen was of a pale color, and the contiguous portion of the omentum was slightly softened, and the latter in two places perforated. The mucous membrane around the opening in the stomach was of the natural complexion and consistence, nor was there any where the slightest appearance of disease.

The question may be asked here, — why is it that these effects, so conspicuous in some cases, do not occur, to a greater or less extent, in all? Professor Carswell, who, as was before hinted, has endeavored to solve this problem by an appeal to direct experiment, thinks that the difference depends upon some altered condition of the gastric juice ; or, in other words, that in proportion precisely to the *acidity* of this fluid will be its solvent and eroding properties. The accuracy of this conclusion is sufficiently confirmed by the fact, that if the liquid in question be neutralized by a small quantity of magnesia, no softening whatever will happen in the stomach of an animal that has been just killed. The sour smell of the gastric juice is often remarkable, and the effect which it has, under certain circumstances, of setting the teeth on edge, as it is vulgarly termed, is familiar to every one. The presence of free muriatic acid in this liquid has been fully estab-

lished by the researches of numerous chemists, and its
macerating and corroding properties were long ago pointed
out by Spallanzani, Stevens, and other physiologists.

With respect to the *situation* of this species of softening,
it is a matter of some moment to know that it always takes
place at the great cul-de-sac of the stomach, in consequence
of its depending position favoring the accumulation of the
gastric acid, as well, perhaps, as from this fluid being secreted
here in larger quantity than elsewhere.   The only exception
to this rule arises where there is an enlargement of the spleen,
or some tumor pressing this part of the organ up, and thereby
rendering the pyloric extremity the lowest point.   When
there is softening of the intestines, with erosion and perfora-
tion, it invariably occurs in the loops lodged in the epigastric
region, in close proximity with the stomach.   Under no cir-
cumstance, at least so far as my own observation extends, has
this variety of mollescence been noticed in the more depend-
ent portions of the digestive tube, or in the urinary bladder.

The *extent* of the lesion is very variable, being either lim-
ited to a small portion of the stomach and bowels, or occupy-
ing the whole surface of the former, with a considerable por-
tion of the latter.   Occasionally, it is observed entirely in the
intestines, which can only be explained on the assumption that
the gastric acid, having left the stomach, has accumulated in
inordinate quantity in the latter organs.   When the softening
is accompanied with perforation, it may extend, as was before
stated, to the œsophagus, liver, spleen, diaphragm, and even
the lungs, all of which viscera may therefore be affected in
the same individual, and exhibit various degrees of dissolu-
tion.

Not unworthy of brief notice is the *form* which the soften-
ing presents in different parts of the digestive tube.   When
confined to the fundus of the stomach, the lesion generally
occurs in irregular patches, varying much in size, the edges
of which are formed by the mucous membrane, and their
surface by the subjacent cellular texture.   Very generally the
margins of the erosions are thin, soft, ragged, and transparent.
When the softening penetrates beyond the muscular tunic,
the margins are beveled outwards, and terminate in delicate
and irregular processes, which exhibit a tattered, shred-like
appearance on being immersed in water.   The same form
precisely is perceived when the lesion affects the peritonæum.
This patch-like softening usually takes place whenever the

mucous membrane happens to be stretched; but should it be thrown into folds, it will assume a different shape, and occur in stripes and bands of a light bluish tinge, forming thus a striking contrast with the sound surface, which is either of the natural color, rosaceous, or of a light vermilion. These stripes and bands, it should be stated, always have the situation and direction of the mucous wrinkles, the intervals between them being very slightly or perhaps not at all changed in their consistence, — a circumstance which may be easily recognized by floating the parts in clear water. Occasionally, though I believe very rarely, the softened membrane is of a light orange hue; and the vessels traversing it, provided there be any, which is not always the case, are filled with black blood, which, as I have repeatedly witnessed, is unsusceptible of any change upon its exposure to the atmosphere. Redness of the affected texture is never observed; its existence being incompatible with the chemical action of the gastric acid.

The *degree* of softening presents several important varieties. At first the membrane has very much the same consistence as in mollescence from inflammation; but, as the process advances, it is gradually converted in a grayish, pulpy substance, which can be easily removed with a sponge or by a stream of water, leaving the submucous cellular tissue of a dark silvery color. Instances occur, especially in young children, in which the membrane is reduced to the consistence of a hot solution of starch, arrow-root, or isinglass.

SECTION IV.

Of the Diseases of the Stomach.

THAT *ulceration* of the stomach should occasionally occur, is not at all surprising when we take into consideration the great extent of its surface, the delicacy of its organization, the variety of its functions, its important sympathetic connections with other organs, and the heterogeneous nature of its contents. Yet, that this event is much less frequent than was at one time supposed, is abundantly proved by the general ex-

perience of the profession.   Extensively as I have been en-
gaged in pathological researches, it may be safely asserted
that I have never met with this lesion in more than three or
four instances.   Nor have I been wanting in proper precau-
tions with regard to the cleansing and minute inspection of
the mucous coat.   True it is, my observations were not con-
ducted formerly with so much patience and accuracy as they
have been for the last three years ; still, every thing confirms
me in the belief that ulceration of the stomach is decidedly
amongst the rarest diseases to which this important organ is
subject.

Ulcers of the mucous membrane of the stomach are seldom
either large or numerous.   Most generally, indeed, there is
only a single one, which is then of considerable size.   Occa-
sionally, however, they are extremely numerous, as in the
case mentioned by Dr. Louis, of Paris, in which there were
as many as eighty.   When they are seated in the glands of
Brunner, as was probably the case in the instance just re-
ferred to, they are almost always much smaller than when
they affect the intervening texture, their magnitude rarely
exceeding that of a split pea.   In the other variety, they
often attain the size of a Spanish dollar, especially when
solitary ; and instances are not wanting in which they were
much larger.

Not less variable are the shape and depth of these erosions.
Their most common appearance is that of depressed breaches
of continuity of the mucous corion, of a roundish form, with
edges slightly elevated above the level of the internal sur-
face.   Not unfrequently, however, they are remarkably irreg-
ular, their margins hard and thick, fissured, or even granu-
lated.   Appearances like these are especially observable in
old chronic cases, but are very rare in such as are recent.
In several instances I have seen the edges partially under-
mined, so that, upon being floated in water, they presented
that ragged, shreddy aspect, which is so often witnessed in
erosions of the small intestines.

The bottom of the ulcer may be formed by the cellular
tissue, or it may erode through this and the muscular layer,
so as to lie upon the peritonæal covering.   In the latter case,
it is not uncommon for perforations to take place, and for the
contents of the stomach to escape into the abdominal cavity
or into some one of the neighboring organs.   Most generally
a communication is established with the arch of the colon,

the walls of which are firmly cemented with those of the stomach, as the erosive process extends by means of lymph. In this way, the individual may sometimes live for years, with very little inconvenience. Oftentimes the bottom of the sore is hard and thickened, from the hypertrophous condition of the subjacent textures, or, as more rarely happens, from a deposition of small patches of lymph. Its color is usually pale ; but cases are sometimes observed in which it is of a light rose tint, brownish, or crimson, every capillary vessel being loaded with florid blood. Under no circumstances, scarcely, is the base of the sore of so deep a hue as the edges.

One of the most interesting and instructive circumstances connected with ulceration of the mucous membrane of the stomach is, that the sores thus induced occasionally undergo a process of reparation, similar to the cicatrization of ulcers in other parts of the body. (Pl. I, Fig. 18.) The possibility of such an occurrence has been questioned by some very able pathologists, — more, perhaps, however, from their having been governed by speculative views than by actual observation. The facts published by the French, English, and German writers leave, indeed, no longer any doubt upon the subject. Reil, Meckel, Troillet, Andral, Graves, and Cruveilhier have each given well-marked examples of it. The latter of these distinguished anatomists has delineated several cases in which ulcers of the stomach, of considerable size, were completely healed, with the contiguous mucous corion in a contracted and puckered state. The cicatrix was always of a bluish color, and of a dense, fibrous texture, very different from the characters of the natural tissue.* In 1832, I examined the body of a young lady, about thirty-three years of age, who had been laboring for a long time under all the symptoms of chronic gastritis, attended with extreme emaciation. In the posterior wall of the stomach, nearly midway between the great tuberosity and the pyloric extremity, was an old ulcer, about the size of a five franc piece, the edges of which were puckered, thickened, and completely cicatrized. All the tunics were destroyed ; and the contents of the organ were prevented from escaping by the manner in which it was glued to the anterior surface of the pancreas, which thus formed the bottom of the erosion. The rest of the stomach

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* Anatomie Pathologique de l'Home, Livraison, x. p. 7, plates 5 and 6.

was perfectly sound, excepting that its coats were much
thinner than usual, and remarkably blanched. A case, in
many respects similar, has been described by Professor Re-
camier, of Paris.

Another equally conclusive instance of this sort of repara-
tion is furnished in the case of the celebrated Beclard, author
of the well-known "Elements of General Anatomy." When
this individual died, a completely cicatrized ulcer, about the
magnitude of a quarter of a dollar, was discovered in the
small curvature of the stomach, a few lines from the cardiac
extremity. Its surface, considerably depressed, was traversed
by a central band of white fibrous matter, on each side of
which was a shallow cavity, formed by the peritonæal tunic.
The rest of the organ was perfectly healthy.

It thus clearly appears, from the foregoing observations, that
ulcers of the mucous membrane of the stomach, even when
of considerable magnitude, are susceptible of healing. Such
a reparation, however, is always difficult, from the surface of
the sore being constantly exposed to the irritating contents
of the organ, by which the salutary efforts of nature as a
necessary consequence, must be very frequently baffled. The
first step in the process seems to be the effusion of fibrin, by
which the loose margin of the ulcer is tied to the subjacent
parts. By degrees, a similar substance is deposited upon the
bottom of the sore, which in time is transformed into a gran-
ulating surface, bathed with a thin muco-purulent fluid.
Thus, day after day, the process proceeds until the cicatri-
zation is completed, the ulcer in the mean time diminishing
in size, and acquiring a bluish, puckered appearance. The
new product, it should be observed, although it occasionally
attains the consistence and thickness of the natural mem-
brane, is yet essentially different, being less smooth, less vas-
cular, more easily destroyed by subsequent attacks of disease,
destitute of follicles, and incapable, therefore, of secreting
real mucus.

The portions of the stomach most liable to ulceration are
the cul-de-sac and great curvature, from their being more
constantly in contact, perhaps, with our food and drink. No
part of the organ, however, is exempt from it.

The *signs* which denote the existence of gastric ulceration
during life, are not always well marked. Occasionally, in-
deed, the disease is entirely latent, manifesting no phenomena
whatever by which we can recognize its presence. Most

commonly, however, the patient complains of the ordinary symptoms of chronic gastritis, such as nausea, with occasional vomiting, difficult digestion, colicky uneasiness, gnawing pain in the epigastric region. With these signs are usually conjoined, when the ulcers are large, deep, and numerous, great emaciation, considerable fever especially in the evening, constriction of the features, and coldness of the extremities. In many cases, there are repeated attacks of vomiting of blood ; and a symptom upon which Professor Cruveilhier lays a good deal of stress, is the existence of a *dorsal stitch*, or a severe and steady pain in the neighborhood of the lower vertebræ of the back. Occasionally, large-sized vessels are exposed by the ulceration ; and, in this way, exhausting and fatal hemorrhage may take place.

The period which elapses from the commencement of the inflammation until the supervention of ulceration, must vary, of course, in different cases and under different circumstances, so as to render it impossible to lay down any definite rules. In general, however, it will not be going too far to say that erosions do not begin to form under several weeks after the establishment of the disease which gives rise to them. Nay, very often there is reason to suppose that the antecedent inflammation is not only remarkably tardy in its progress, but of an extremely low character.

Hypertrophy of the stomach is by no means so uncommon as was formerly supposed by pathologists. Excepting the peritonæal, it may invade all the tunics simultaneously, or be confined to a single one, which is, in fact, most generally the case. Sometimes the enlargement particularly attacks the mucous follicles, giving the internal surface of the organ a rough, *mammillated* fulness, the widened orifices of the glands identifying the seat of the affection. This state of the mucous membrane of the stomach is of very frequent occurrence in chronic inflammation : I have several times met with it as a complication of diabetes, and Louis has often observed it in pulmonary phthisis. The mammillated prominences, which are generally of a rounded, conical shape, and from the size of a currant to that of a filbert, strongly resemble the granulations of an old ulcer, and are occasionally separated by deep narrow grooves, running in different directions. Their length is subject to much variety. In some instances, it does not exceed half a line ; but, in others, it has been known to be more than a third of an inch. In my own dis-

sections, I have invariably found this mammillated appearance of the mucous coat most conspicuous in the inferior half of the organ.

The mucous membrane in this affection is usually of a pale reddish color, like the surface of an indolent ulcer; occasionally, however, it is almost white, and still more frequently it is grayish. In most cases, it is abnormally firm and thick, allowing itself to be raised in large shreds. The villosities, also, are sometimes much augmented in size, and truly hypertrophous. There are no diagnostic signs of this disease. In some of M. Louis's patients, there was merely an impairment of the appetite; in others, epigastric tenderness, with nausea and vomiting.

To the same class of lesions are to be referred those singular looking *warty excrescences* which are sometimes to be observed upon the mucous membrane of the stomach. Their shape is generally rounded; their size inconsiderable; and, in most cases, they adhere by a narrow footstalk, of considerable length. Much diversity prevails in regard to their internal structure, which is sometimes fibrous, sometimes fungous, and sometimes vascular and erectile. Their color varies in different cases. For the most part they are grayish, but occasionally reddish, brownish, or blackish.

Hypertrophy of the *fibro-cellular tissue* is characterized by considerable thickening and induration, with or without change of structure of the other tunics: the areolar texture is destroyed, and replaced, as it were, by a dense albuminous substance, which may be so firm as to prevent the stomach from collapsing when opened. There is some variety in the color of the affected part. Occasionally it bears some resemblance to a mixture of bees-wax and tallow; more commonly, however, it presents the appearance of a piece of well-boiled tripe, with some sections of it more transparent than others. Nor is the hypertrophy always limited to the submucous cellular tissue. Cases are frequently met with in which it involves the subserous substance, and even that between the muscular fibres, rendering the latter pale and thin, or else, as we shall presently see, hypertrophous.

Hypertrophy of the *muscular coat* has been particularly described by Dr. Louis, and sometimes amounts to an enormous degree, both as regards thickness and the extent of surface which it occupies. Rarely does it pervade the whole organ; on the contrary, it usually occurs in considerable

sized patches, either alone, or in union with hypertrophy of the cellular tissue. In this affection, the muscular fibres are unnaturally large and distinct, harder, more dense and florid, forming frequently thick, membranous intersections. In most instances of this species of hypertrophy, the patient labors under cancer, or some disease or other which forces the organ habitually to reject its contents. It is also noticed sometimes in great eaters.

Less frequent than the affection here noticed is the extreme attenuation of the coats of the stomach, constituting what is denominated *atrophy.* In making microscopic examinations, cases sometimes present themselves in which the walls of the stomach are remarkably thin, pale, and emaciated, being reduced to a soft, flabby substance. Under such circumstances, the peritonæal covering seems as if it had been bleached ; the muscular fibres are scattered, and almost colorless ; and the mucous membrane is diminished in thickness, pallid, deprived of its villosities, and scarcely capable of being separated from the subjacent textures. A degree of atrophy like this, however, is extremely rare, and has occurred to me only once. Partial attenuation is more commonly observed at the great cul-de-sac than in any other portion of the stomach. In several instances, I have also seen it immediately below the cardiac extremity. How far atrophy of this organ has any connection with chronic irritation, it is difficult to say ; but that there is some dependency of this sort, most pathologists, I believe, are ready to admit.

The stomach is sometimes much reduced in size, from prolonged fasting ; from cancerous affections, or protracted pressure ; and cases occasionally happen, in which, from excessive gluttony, or the effects of disease, it is enormously enlarged. Some very interesting examples of this latter lesion are to be found in different works on morbid anatomy ; but the most instructive instance with which I am acquainted has been recently published by Dr. Yvan, of Paris,* who exhibited the specimen to the Royal Academy of Medicine of that city. The subject of it was a soldier, who for some years had had a large scrotal hernia, attended, during the last month of his life, with the most intractable vomiting, although there was no strangulation. On examination after death, the stomach, situated parallel to the axis of the body, was found to be of

* Archives Générales, January, 1830.

an enormous volume, and to be divided by a circular depression into two portions, the one lying in the abdomen, the other in the hernial sac. The length of the great curvature was three feet, the circumference at the widest part twenty inches, and the capacity nearly a gallon and a half. The muscular fibres, as well longitudinal as circular, although considerably attenuated, were yet quite distinct throughout the greater part of the organ.

A part of the stomach is occasionally formed into a *pouch.* Of this I have never seen an example ; but Dr. Baillie mentions one which came under his own observation, and which had been produced by the swallowing and subsequent retention of five half-pennies. The walls of the pouch were considerably attenuated, but not inflamed nor ulcerated.

Pieces of *cartilage* are sometimes, though I believe very rarely, noticed in the stomach, when they grow either between the mucous and muscular tunics, or between the latter and the peritonæal. Occasionally they appear in the form of small, irregular tumors, projecting upon the inner surface of the reservoir. They are most common towards the pyloric extremity, and are frequently connected with cancerous formations. De Haen has described a bony deposition in the stomach, of what extent he does not inform us.*

Various kinds of *tumors* have been repeatedly observed in this organ. Ruysch mentions that he saw a morbid growth, from the stomach of a man, which contained hair, together with several large grinders. *Polypous tumors* are very rare. The only well-authenticated case of which I have any knowledge, is to be found in Dr. Monro's Morbid Anatomy of the Gullet, Stomach, and Intestines. The patient was a lady, forty-five years old, who had complained of indigestion and pain in the epigastric region, and died much emaciated. On examining the body, a tumor, of an oval shape, and about the size of an orange, was observed to adhere by a short neck to the villous membrane of the stomach ; its surface being quite smooth, and the internal texture so firm, solid, and tough as to offer considerable resistance to the knife. This section of it exhibited a uniform appearance.

Authors make mention of *steatomatous tumors* as of occasional occurrence within the stomach. They are usually encysted, and, when cut into, are found to contain a semi-con-

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* Rat. Medend, t. iv. cap. i.

crete substance, resembling suet, tallow, or soft wax. This morbid product is extremely rare, and has never been well described. Perhaps the best account is that by Vic D'Azyr; but even this is so meagre as to offer us nothing satisfactory upon the subject.

In making post mortem examinations, opportunities occasionally present themselves of observing *carcinomatous tumors* in the stomach. Old age is the period of life in which this frightful malady is most frequent; and the parts most prone to it are, first, the pylorus; secondly, the cardiac extremity; and, thirdly, the body of the organ. Cases are sometimes observed in which nearly the whole stomach is involved in this affection, its coats being transformed into a dense, gristly substance, intersected by whitish membranous bands, without any vestige scarcely of the normal structure.* Most generally, however, the disease appears in the form of distinct tumors, varying in size from a small nut to a fœtal head. Their surface is often remarkably rough, irregularly mammillated or marked off into numerous lobules; and, on cutting into them, they are found to exhibit a great diversity of texture, some parts being fibrous, some cartilaginous, some osseous, some mammary, some lardaceous, some fungoïd, some medullary, some gelatiniform, some hæmatoïd. But it is not always that these substances are thus combined. Cases not unfrequently occur in which they are observed separately, or in which two or three alone are met with. In their primordial condition, they are generally entirely fibro-cartilaginous; and afterwards, as their developement proceeds, other textures are either superadded, or such as previously existed are modified and transformed.

The mucous membrane, in carcinomatous diseases of the stomach, is variously affected. In the generality of cases, it is very much thickened, sometimes as much as a fourth of an inch, indurated, elevated into irregular masses, and of a light grayish color. In others, again, it is of a dull yellowish,

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* Of this variety of cancer died Napoleon Buonaparte. His body was inspected on the 6th of May, 1821, at Longwood, St. Helena. The internal surface of the stomach, says the report of the examiners, through nearly its whole extent, was a mass of cancerous disease, intermixed with portions of scirrhus; the cardiac extremity, for a small space around the œsophagus, being the only part that was healthy. The pyloric extremity adhered freely to the concave surface of the liver, and about one inch from its orifice presented an ulcer, which penetrated the coats of the organ, and was sufficiently large to allow the passage of the little finger. Thus perished the conqueror of the world!

greenish, or light mahogany tinge, soft, pulpy, or almost brain-like, vascular, ulcerated, or partly destroyed. Several of these morbid alterations are generally met with in the same specimen. The submucous tissue is also usually more or less changed, the most common appearance being a dull yellow lardaceous degeneration. The muscular fibres are apt to be unnaturally distinct and florid; and the peritonæal tunic, although it does not always participate in the disease, is often much thickened, and almost of a gristly consistence. In this affection the capacity of the organ is commonly much diminished; and there is almost always considerable swelling of the neighboring lymphatic glands, with occasional extravasations of blood into the submucous and subserous cellular tissue. Such a diseased stomach usually contains a very offensive gas, and also a quantity of dark-colored fluid, like coffee-grounds.

I shall conclude this imperfect sketch of carcinoma with the following case of diseased *pylorus*, which was communicated to me, about eighteen months ago, by my friend Dr. Asa Spalding, of Flushing, Long Island. The patient, a literary gentleman, was twenty-five years of age, during the last four of which he had suffered under all the symptoms of a chronic affection of the stomach, such as dyspepsy, nausea, and torpor of the bowels, with sallow and constricted features. On inspection, the pylorous was found to be converted into a thickened, scirrhous mass, partly cartilaginous and partly bony, of a pale bluish color, with the orifice so much contracted as scarcely to allow the passage of a common goose-quill. The coats of the stomach and duodenum, in the immediate vicinity of the disease, were hypertrophied, vascular, and almost of a gristly hardness. The pancreas, indurated, and of a pale grayish hue, was enlarged to three or four times its ordinary bulk; and in the left lobe of the liver was a big abscess, partially filled with thick, yellow pus, which communicated, by means of an irregular, ragged outlet, with the arch of the colon.

In the college museum is a specimen of scirrhous pylorus, taken from a female, thirty-seven years old, in which the opening is still smaller, if possible, than in the case of Dr. Spalding. The disease was complicated with extensive lesion of the duodenum and gall-bladder, and, what was particularly remarkable, was the slight emaciation which had taken place. The pylorus in this specimen is transformed into a

thick, hard, gristly ring, above and below which there is ex-
tensive thickening of the mucous coat. Several cases, of near-
ly a similar character, are recorded in the valuable treatise
of Dr. Abercrombie, a work which should be in the hands of
every student of pathology. In some of these, the pylorus
was encircled by large masses of scirrhus, of a firm, cartila-
ginous hardness, and of the size of a big apple.

The *symptoms* of carcinomatous disease of the stomach
are often extremely obscure, and, what is singular, are never
so urgent when the lesion is seated near the cardiac extremity
as when it involves the pylorus. In most cases, the signs
are those of chronic irritation ; that is to say, the patient is
afflicted with indigestion, lancinating pain, constant acidity
and flatulence, and occasional vomiting. There is considera-
ble emaciation, with gradual wasting of the muscular powers ;
the eye is sunk, the complexion sallow, and, towards the last,
the matter ejected from the stomach has a very offensive
smell, and is of a dark color, like coffee-grounds. These
symptoms, it is obvious, are not diagnostic ; nor should they
ever be so regarded, unless the scirrhous tumor be at the same
time perceptible by the hand placed upon the abdomen.

SECTION V.

Of the Lesions of the Duodenum.

THE organic lesions of the duodenum are in many respects
so peculiar, that they deserve to be considered separately.
Nor are they uninteresting on another account. From the
close proximity of the organ to the stomach, liver, gall-
bladder, and small intestine, with all of which it may be said
to be directly continuous through the intervention of its mu-
cous lining, disease can hardly ever exist in one of these
structures without implicating the other. Nowhere, indeed,
is there a more striking instance of the operation of what
Mr. John Hunter and his followers have denominated con-
tiguous sympathy, than in the viscera now under considera-
tion. What takes place in the conjunctiva of the eye, in
severe inflammation of the Schneiderian membrane of the
nose, may be supposed to occur precisely in the inner coat of

the gall-bladder, common and hepatic ducts, in acute duode-nitis.   Here disease is directly propagated from one part to another, because of the similarity of structure of the lining membrane ; nor is it uncommon to find that the organ which is secondarily involved, is obliged to bear the brunt of the irritation.   In this manner are produced, there is reason to believe, many of the cases of the *congestive fever*, as it is vaguely called, of the South ; the disease, in the first instance, being probably merely an acute inflammation of the mucous membrane of the duodenum or stomach, which, by propaga-tion, involves the mucous membrane of the liver, gall-bladder, and small bowel, and thus produces that universal obstruc-tion in the portal circle so much spoken of by some writers.

True it is, the question has not yet been settled by post mortem inspection ; but let any one reflect coolly and dis-passionately upon the subject, and all the difficulties which would seem at first sight to environ it will speedily vanish. Who does not know that the whole liver is lined by a mu-cous surface, the area of which, could it be properly esti-mated, would, in all probability, be found to be quite as great as that of the stomach ; at all events, certainly as great as that of the duodenum, with which it is directly continuous ? Should any one say that this is impossible, let him but re-flect for a moment upon the large size of this organ, and the immense number of its granules, and then take into consid-eration the fact that each of these bodies are provided with an excretory tube, lined by a mucous membrane, and all skepticism will at once fly from his mind. He will no longer regard the liver simply in the light of a parenchymatous structure, but as a viscus essentially composed of mucous follicles, subject merely to the same diseases as the duodenum which adjoins it, and which sends into its interior, one of its own most important tissues.   Thus may we perceive how disease may be propagated from one of these organs to the other ; how an irritation, seated in the mucous membrane of the duodenum, may affect that of the liver ; how the func-tions of the latter may be impaired by the former ; and, con-versely, how an inflammation of the liver may be transferred to the duodenum, the stomach, and the mesenteric portion of the small intestine, and do the most serious and extensive mischief.

" The leading peculiarity of disease of the duodenum, as far as we are at present acquainted with it," says Dr. Aber-

crombie, " seems to be, that the food is taken with relish, and
the first stage of digestion is not impeded ; but that pain
begins about the time when the food is passing out of the
stomach, or from two to four hours after a meal.   The pain
then continues, often with very great severity, sometimes for
several hours, and generally extends obliquely backwards, in
the direction of the right kidney.   In some cases, it gradually
subsides after several hours, and, in others, is relieved by
vomiting." *   This account has evidently reference to or-
ganic disease, not to such as is acute.   In acute duodenitis,
whether simple or complicated, the most prominent symptoms
are, pain in the right hypochondriac region, spasmodic, deep-
seated, and augmented by pressure and full inspiration ; more
or less nausea and vomiting ; and a yellow state of the skin
and eyes.   Frequently the pain is of a dull, gnawing charac-
ter ; and in no case can the patient swallow solid food with-
out the utmost aggravation of all his sufferings.   Duodenitis
is almost always present in yellow fever ; and jaundice, as is
now well known, frequently depends upon the same affection,
either in its acute or chronic form.   But let no one deceive
himself concerning the diagnosis of the diseases of this por-
tion of the alimentary tube.   Nowhere is it more difficult to
form an intelligent judgment.   Nor will this appear strange,
if we remember the deep situation and the important organs
by which the duodenum is covered and surrounded.

Ulcers of the duodenum, whether originating in its mucous
membrane, or in its follicular structure, are extremely rare,
and run pretty much the same course as those of the stomach.
In ninety-two cases of ulcerated bowel, observed by Andral,
only one occurred in the duodenum ; and if this be taken as
an average estimate, it would appear that this portion of the
alimentary tube is peculiarly exempt from such lesions.   That
they are infrequent, my own experience abundantly confirms.
Seldom is there more than one erosion ; nor is it very com-
mon to observe them below the insertion of the choledoch
duct.   It is not improbable that the ulcers may heal ; never-
theless, owing to the irritating nature of the bile which lies
so constantly in contact with this portion of the small bowel,
they manifest a remarkable tendency to extend their ravages
from the mucous to the other tunics.

The peculiar characters of ulceration of the duodenum are

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* Pathological and Practical Researches, p. 119.

well illustrated by a case related by my friend Dr. W. F. Irwin, of Pittsburgh.* The patient was sick for several years, and during the last six months of his life was liable to daily paroxysms of pain and vomiting. His bowels were habitually constipated, and could never be moved without the agency of purgative medicines. What was remarkable, and what may be almost regarded as pathognomonic of duodenal disease, was, that the digestive process usually went on well for two, three, or four hours after taking food. He was then attacked with violent pain and vomiting, which regularly continued until the stomach was thoroughly freed of its contents. In this way he lingered on until he finally expired, in a state of great emaciation. On inspection, the duodenum was found to be in a hard, firm, cancerous condition, much enlarged, and the whole internal surface covered with ragged ulcerations. Numerous tubercles were also observed. They varied from the size of a hazelnut to that of a hickorynut, and the largest of them contained a white, friable matter, resembling dried cream. The quantity of pus found about the diseased part of the bowel was upwards of a gill. The stomach, though enormously enlarged, was apparently quite healthy, as were also the small and large bowels, the liver, and spleen. The pancreas, reduced to one half its natural bulk, was in a state of scirrhous induration.

When perforations take place, the contents of the tube may, as in the case of the stomach, escape either into the peritonæal cavity, or into some of the surrounding organs. In a preparation in the college museum, the duodenum communicates with the fundus of the gall-bladder ; and in another, taken from a gentleman sixty-eight years old, with a large pouch formed by the convex surface of the liver, and the contiguous portion of the diaphragm. Without entering into all the particulars of this remarkable and, so far as I know, unique case of disease, it may be briefly stated that the outlet of this extraordinary sac was a circular opening, about the size of a half guinea, with thick, rounded, and well-defined margins, which was situated one inch below the pylorus, on the upper wall of the duodenum, which, as well as the arch of the colon, adhered extensively to the anterior border of the liver. Leading from this aperture, in a direction obliquely upwards and outwards, was a narrow tortuous sinus, which,

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* Philadelphia Journal of the Medical and Physical Sciences, vol. viii. p. 406.

after a course of about one inch and a half, communicated by means of a small, elliptical slit, with the pouch previously adverted to.   This artificial reservoir, formed in the manner before mentioned, was flat, circular, a little more than six inches in diameter, and capable of holding about ten ounces of fluid, although perfectly empty at the time of the examination.   It was lined throughout, however, by a thick, dense layer of lymph, of a yellow-greenish color, from the intermixture, probably, of fecal matter, which must have passed into it at different times from the perforated duodenum.   On cutting into this substance, the hepatic texture was found to be perfectly sound, excepting for about the fifth of an inch in depth, where it was somewhat softened, and of a dark bluish tint.   The diaphragm, dark-colored and deeply injected, adhered firmly all around the anterior surface of the liver, the adhesion extending about an inch beyond the longitudinal fissure, leaving the remainder of the left lobe perfectly free, and healthy.   The liver, it should be further stated, was of the natural size, and, with the exception specified, quite sound. The gall-bladder and other abdominal viscera presented nothing worthy of special notice.   The right lung was in a state of purulent infiltration ; the cartilaginous rings of the trachea and bronchiæ ossified ; the heart softened ; the parotid glands enlarged and suppurated.

The subject of this remarkable lesion had been liable, throughout life, to attacks of rheumatism, but had otherwise enjoyed good health.   A few years before his death, he gradually lost flesh, his complexion assumed a dark sallow aspect, the skin became dry and bloodless, the bowels were torpid, and the pulse was weak and intermittent.   In the month of April, 1837, he was suddenly seized with excruciating pain in the epigastric region, attended with reduction of temperature and great prostration of strength.   Large doses of stimulant and narcotic medicines, with counter irritants, afforded some relief, and produced a certain degree of reaction, with a paroxysm of emesis.   His bowels were opened with cathartics, and he was bled at the arm, but the pulse sunk under the operation.   Much debility ensued, with occasional flushes of fever, cough, and dyspnœa.   After a few days, the parotid glands became swollen and indurated.   Finally, hiccup supervened, and continued to recur until he expired, which happened on the 13th of May, nineteen days after the attack of epigastric pain.   For an account of the symptoms of this

case, and for the opportunity of making the post obit exam-
ination, I am indebted to my friend, Professor Drake, whose
zeal in the cause of pathological science is surpassed only by
his urbanity.

Cases are occasionally observed in which the duodenum is
ruptured, apparently without any previous lesion. Of this a
highly interesting instance has been detailed by Professor
Drake, in his Medical and Physical Journal for April, 1839.
The patient was a cordwainer, thirty-eight years of age.
The symptoms were those, in the first place, of violent colic,
and afterwards of acute peritonitis, — death occurring in sixty
hours from the commencement of the attack. On inspection,
the duodenum, at the pylorus, was found to be ruptured
more than half way round, the fissure exhibiting the appear-
ance of a clean cut. Through this the contents of the tube,
as well as of the stomach, had escaped into the peritonæal
sac, and excited fatal inflammation. No ulceration existed
any where, nor had any part suffered gangrene ; in short,
there was not the slightest organic change of any kind that
could account for the laceration.

Broussais mentions the singular case of a man, sixty-three
years of age, in whom an ulcer was discovered in the upper
portion of the duodenum, which had formed a communi-
cation with the hepatic artery. The intestinal canal was
found full of blood.* In a case described by Dr. Streeter, of
England, the duodenum opened externally, between the
seventh and eighth ribs, by means of a canal two inches and
a half in length, through which articles of food and drink
were frequently discharged. The tube was greatly con-
tracted beyond the seat of the communication, and the patient
lived about a month after it took place.†

Carcinomatous and other tumors are occasionally found in
the duodenum ; but I suspect they are extremely infrequent ;
and, thus far, no instance has fallen under my own observa-
tion. When seated in the neighborhood of the outlet of the
choledoch ducts, such tumors, by preventing the flow of bile,
may cause distention of the gall-bladder and congestion of
the biliary passages, with all the contingent phenomena of
jaundice. In the same manner may arise obstruction and
enlargement of the pancreas.

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* Sur la Duodenite Chronique.
† Mitland Medical and Surgical Reporter.   November, 1829.

The duodenum is sometimes enormously *enlarged*. Cases have been recorded in which it equaled in volume the stomach. Its tunics are also liable, though much more infrequently than those of the rest of the alimentary tube, to thickening and attenuation.

SECTION VI.

Of the Diseases of the Small Bowels.

AMONGST the most common organic affections of the small intestines, properly so called, are *ulcerations*. Comparatively infrequent in the upper portion of the tube, they always increase as we approach the cœcum; and, in the great majority of cases, it is not unusual to find them entirely confined to the inferior half of the ileum. In their shape they may be circular, elliptical, or linear, the frequency of their occurrence being in the order here enumerated. Their dimensions vary from a line to several inches; their margins, which are ordinarily elevated and ragged, are grayish, pink, or rose-colored, more rarely brownish or blackish; their cavity is generally formed by thickened and indurated cellular tissue, sometimes by muscular fibres, sometimes by peritonæum. Perforations are not infrequent, and the consequences which they occasion, are of the same nature as in the stomach, duodenum, or large intestine.*

When the ulcers are seated in the isolated follicles, their number is sometimes immense, hundreds of them being scattered in every direction. Under these circumstances, they are generally of small size, rounded, and exhibit every variety of disorganization, from incipient erosion to the complete removal of the gland.

In the glands of Peyer, the ulcers are not unfrequently seen in thick clusters, resembling the confluent eruption of the skin in small-pox. Their surface is often remarkably uneven, granular, or honey-combed, — appearances which are owing, as well to the partial destruction of these follicles as to the hypertrophied condition of the intervening cellular tis-

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* For specimens of ulceration of the isolated follicles and glands of Peyer, see Plate I, Figs. 9 and 10.

sue. Frequently I have seen them present an eroded, worm-
eaten aspect, with reddened, elevated, and indurated margins.
The configuration which these ulcers assume generally re-
sembles that of the glands in which they are situated ; that
is, they are oblong, elliptical, or circular, and occasionally, as
in a case which fell under my observation not long since,
they are T-shaped. When several of the patches run to-
gether, they are commonly very irregular, and their dimen-
sions are also much greater, the eroding process going on
until the mucous membrane is destroyed over a very consid-
erable extent of surface. Occasionally, all the glands of Peyer
are in a state of ulceration ; more commonly, however, not
more than five or six are involved, and sometimes only a
single one.

Follicular ulcers are exceedingly common in the small
intestines of phthisical subjects. Dr. Louis observed them
in different proportions, in nearly five sixths of all the cases
which he examined at the Charity Hospital in Paris. Andral
found the small bowel sound in only about one fifth of all
the consumptive patients who entered the wards of Lerminier
during a period of five years. This proportion differs re-
markably from that of Bayle, who met with this lesion in
only two thirds of his cases ; but it may be satisfactorily
accounted for, by the greater care which Louis and Andral
employed in cleansing and thoroughly scrutinizing the whole
alimentary tract. Every one who is at all extensively en-
gaged in pathological researches, must fully admit the fre-
quency of this complication. So commonly have I met with
it, that I never examine a phthisical individual without
expecting to find ulceration of the small or large bowel, or
both.

Ulcers of the small bowel, whether originating in the
mucous or in the glandular texture, can often be recognized,
if they are deep, even before the tube is laid open, from the
translucent and discolored state of the peritonæal covering.
Often the free surface of the bowel is covered with globules,
shreds, or patches of lymph ; and, in a few instances, I have
seen it studded with small granulations, which accurately
defined the seat of the disease. These remarks are equally
applicable to deep ulcers of the stomach, duodenum, and
large intestine.

I need scarcely say that these ulcers are susceptible of
healing. (Pl. I, Fig. 28.) In the college museum are sev-

eral preparations which beautifully illustrate this subject. In one of these, the ulcer, about the size of a half-penny, is of a bluish color, and completely cicatrized, with a smooth, slightly-depressed surface. In the same specimen are several other erosions, some of them perfectly raw, others in a state of partial reparation. Very recently, in examining a female who died of phthisis, I found a small ulcer in the ileum, the cavity of which was nearly filled up with hard, solid lymph, of a yellow-greenish color, from the intermixture, doubtless, of fecal matter. For the account of the process by which this cicatrization is effected, the reader is referred to what was said upon the subject, under the head of organic disease of the stomach.

Another fact worthy of remark, relative to ulceration of the small bowel, as well, I may say, as of the large, is, that the influence of the disease is frequently propagated to the mesenteric glands. The irritation seems to be spread, in this case, from the mucous membrane along the lymphatic vessels in the same manner as in chancre. This occurrence is especially common in ulceration of the ileum, from the close proximity of the glands under consideration. I need not now particularly describe the appearances which these bodies assume when thus affected; suffice it to say, that they may exhibit every grade of inflammation, from the slightest serous infiltration to perfect suppuration. Large numbers, very much increased in bulk, are sometimes involved; and instances occur in which they are all consolidated into one general mass.

Not unfrequently the ulceration of the mucous membrane seems to be consecutive, the suppuration commencing in the subjacent cellular tissue, and elevating the mucous membrane into little abscesses, about the size of a split pea. After a while the covering breaks, and thus an ulcer is formed, which runs the same course as in the preceding case. When several of these purulent collections exist in close proximity, they may communicate by means of fistulous tracts, in the same manner as abscesses of the subcutaneous cellular tissue.

Ulcerations of the small bowel do not give rise to any symptoms that can be considered as pathognomonic. In most cases, there is intractable diarrhœa, with tenseness of the abdomen, emaciation, and gradual failure of the strength. The countenance has a withered, wo-begone look; the appetite is variable and capricious; and the patient is harassed

with indigestion and great uneasiness after eating.   There is
seldom any decided pain in the region of the affected bowel,
but often considerable tenderness on pressure, with griping
and tenesmus.   Sometimes there is a peculiar rawness of the
mouth and fauces ; and cases occur in which these parts are
covered with numerous aphthous incrustations.   The alvine
evacuations are extremely variable.   Generally they are thin,
watery, and highly offensive ; sometimes mixed with blood,
sometimes with pus.   When the ulceration is combined with
thickening and induration of the coats of the intestine, there
may be the most obstinate constipation, from the loss of
power of the muscular fibres.

The stealthy and insidious manner in which ulceration of
the small bowel sometimes extends its ravages, and finally
leads to fatal perforation, is strikingly illustrated by the fol-
lowing case, for the particulars of which I am indebted to
my friend Dr. Dodge, of this city.   It occurred in a young
merchant, twenty-four years of age, who was apparently in
perfect health until a short time before his death.   Early one
evening, after having eaten a hearty supper, and spending a
part of the afternoon in horseback exercise in company with
a sister, he was suddenly seized with excruciating pain in the
region of the abdomen, followed by great irritability of the
stomach, and excessive prostration of the vital powers.   Un-
der these symptoms, which continued with scarcely any
abatement, he sank in about thirty-six hours from the com-
mencement of the attack.

On examination of the body, thirty hours after death, Dr.
Dodge found the whole peritonæum in a very red and in-
flamed condition, with all the viscera perfectly agglutinated
together by plastic lymph, which was effused in such quanti-
ties as to fill up every inter-intestinal groove.   The abdominal
cavity contained about half a pint of thin, feculent matter,
which had escaped through a small oval ulcer, less than two
lines in diameter, which was situated in the ileum, eight
inches from its junction with the colon.   Several other ero-
sions were discovered in the mucous membrane close by, but
the other tunics were perfectly sound, as were also the other
abdominal and the thoracic viscera.

The above case, of which we have given a brief outline,
is certainly one of great interest, and of real value to the
practitioner.   The individual, as was before stated, was appa-
rently in the enjoyment of perfect health, yet the structural

lesion which produced his death must have been going on for a considerable period, gradually extending from the mucous membrane, in which it doubtless began, to the cellulo-fibrous, the muscular, and peritonæal tunics. Notwithstanding all this, however, there was not the slightest symptom by which its presence could be suspected, either by the patient or his physician. Such cases are probably of much more frequent occurrence than is generally imagined by the profession.

I shall say a few words here respecting *laceration* of the bowels from external violence, more especially as the subject closely connects itself with ulcerative perforation, and is one, moreover, of no little interest in a medico-legal point of view, apart from any pathological consideration. All the membranous viscera, properly so termed, appear to be liable to this lesion, though not in an equal degree. Accidents of this kind are usually produced by kicks or blows, and, as they are always followed by an extravasation of the contents of the affected organ, they speedily terminate the existence of the patient. The few remarks which will be offered on this subject will be confined exclusively to laceration of the intestinal canal, as it is in this portion of the body that this injury most frequently occurs.

It is a remarkable fact, and one for which it is not easy to offer any satisfactory explanation, that most of the cases of this accident of which we have any record, affected the jejunum, or the superior portion of the ileum. Another circumstance worthy of notice is, that the bowel may be very much lacerated by external violence without any discoloration or bruises of the abdomen. The subject may be further illustrated by examples, of which I select the following, as having fallen under the immediate observation of two of my medical friends. A coachman, twenty-two years of age, received a kick from a horse upon the left side of the abdomen, between the diaphragm and the crest of the ileum, of which he died in thirty hours. There was no sign of contusion on the skin ; but, on dissecting up the integuments, Professor Drake found an extravasation of blood between the oblique muscles, near the junction of their fleshy and aponeurotic parts, which at once indicated the spot upon which the blow had been inflicted. A large quantity of gas escaped from the abdominal cavity, which, moreover, contained upwards of two quarts of fluid feculent matter, of a turbid yellowish

color, without any admixture of blood. The peritonæum was universally inflamed; the bowels were closely agglutinated to each other and to the surrounding parts; and in the upper portion of the jejunum, about eighteen inches from the duodenum, were two rents with thickened, ragged, and everted edges, one of which extended one third, the other nearly entirely, across the tube. The mucous membrane was but little inflamed. The cellular substance over the second and third lumbar vertebræ was infiltrated with blood, and the left psoas muscle had a swollen and lacerated appearance.*

In the other case, that of a young man of twenty, the injury was occasioned by the blow of a brick-bat, thrown from a short distance. Death occurred in forty-two hours. No mark of external violence was discoverable either on the skin or in the abdominal muscles. On opening the peritonæal cavity, Dr. Joshua Martin, of Zenia, to whom I am indebted for a history of the case, as well as for the morbid specimen, detected an oval aperture, about three quarters of an inch in diameter, in the superior division of the ileum, through which had escaped a large quantity of fecal matter, giving rise to violent inflammation of nearly the whole of the serous membrane. The bowels were every where incrusted with coagulating lymph, and the same substance thickly adhered to the everted margins of the wound, as well as to the mucous membrane immediately around.

In both these cases, as well as in every other of which I have any knowledge, the symptoms which supervened upon the injury were of the most urgent kind, and such, precisely, as accompany perforation of the bowels from ulcerative action; that is to say, rapidly developed and speedily fatal peritonitis.

Conjoined with ulcers of the small intestine, or occurring without them, are occasionally to be observed small *tubercles*, seated either in the submucous cellular tissue, amongst the muscular fibres, or between them and the peritonæal covering. Varying in size from a mustard-seed to a common pea, they are often equally dispersed over the circumference of the bowel, and are almost always most numerous in the lower half of the ileum. What is remarkable, these small bodies are extremely rare in the stomach, duodenum, and colon, — so

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* Western Journal of the Medical and Physical Sciences, vol. i. p. 550.

much so, that some writers have denied, though without reason, their existence. Dr. Louis, who has given a very able account of intestinal tubercles, has distributed them into classes, founding his division upon their difference of density. This, to say the least, is an unnecessary degree of refinement ; for that all tubercles, no matter where occurring, are at one period solid, is as fully established as that they have a tendency ultimately to become soft. Thus, then, cases will frequently present themselves in which some of those bodies are semi-cartilaginous, whilst others are in a state of suppuration.

These bodies are very common in phthisical subjects. Louis observed them in thirty-six patients out of ninety-five, or in upwards of one third of all his cases. I cannot think, however, that they are so common in this country : in my own dissections, I have met with them only twice ; nor can I perceive that they have been often witnessed by the Philadelphia pathologists, whose reports of examinations are decidedly superior, in point of accuracy and copiousness of detail, to those of any other physicians in the United States. In the human subject, these bodies, as has been already intimated, seldom attain any considerable magnitude : in some of the inferior animals, however, especially in the horse, they may acquire the bulk of a small orange, their interior being hollow, or, as is more generally the case, partially filled with sebaceous matter, resembling that of the cutaneous follicles.* When the covering of intestinal tubercles gives way, a corresponding number of ulcers is formed, with white, opaque, and indurated edges. Such erosions are always peculiarly loth to heal ; in which respect they afford a striking analogy with those produced by the same cause in the lungs. There are no symptoms which are peculiar to intestinal tubercles.

Tubercles of the intestines are not peculiar to the human subject. I have noticed them in different classes of quadrupeds, particularly in the horse, ox, and sheep, in the latter of which they are exceedingly common, especially in the Western States. The number of tubercles in this animal is sometimes immense : they occur throughout the whole length and breadth of the intestinal tube, and, as in the human subject, most of them are situated in the submucous cellular tissue. Their volume varies between a millet-seed and a pea ; but, by

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* Andral, Pathological Anatomy, vol. ii. p. 113.

their agglomeration, they often form large nodules, which are particularly conspicuous along the line of attachment of the mesentery and meso-colon. In their color, these bodies are usually of a greenish gray; and, in their consistence, they range between soft putty, fibro-cartilage, cartilage, and bone.

In making post obit examinations, opportunities occasionally occur for observing different morbid growths in the small intestine. Amongst these, the most important are polypous, fungous, and carcinomatous tumors; none of which, however, as they do not differ materially from such as occur in the stomach, need be here particularly described. They are all extremely rare, and I have never met with them.

No mention has yet been made of the *milt-like tumor* of the mucous membrane, so well described by Professor Monro, of Edinburgh. I do not know whether it has ever been found in the stomach; but, as it has been repeatedly seen in the bowels, especially in the small, the present seems to me to be the proper place for making a few remarks upon it. In color and consistence, this tumor bears a striking resemblance to the milt of a fish, whence its name. It has an irregular surface, adheres but slightly to the part upon which it grows, and is wrapped in a thin, delicate membrane, in which are to be seen numerous vessels filled with blood. Its consistence is such that it very readily falls to pieces; and, on being squeezed in water, it forms with it a turbid mixture.

This species of tumor generally attains a considerable volume, and, in some instances, almost fills the intestinal tube. Its progress is usually very slow, and hence the individual may live for years, the bowel gradually widening and accommodating itself to its pressure. Its attachment is effected by a number of small, fibrous processes; and, when these are divided, it is not unusual to find the villous coat exhibiting a honey-comb appearance. Such is a brief outline of what Professor Monro has been pleased to denominate the milt-like tumor, — a morbid product, which, although I have never seen an example of it, is, in all probability, merely a variety of medullary sarcoma.

Melanosis is occasionally observed in the alimentary tube. The most common situation of this substance is in the small bowel, but it may occur indiscriminately throughout the whole intestinal tract. The quantity deposited is various; in general, however, it is very trifling. The black matter

assumes different shapes, occurring either in thin, stratified patches, or in the form of small, flat, rounded tumors, some of which are occasionally encysted. Most usually this substance is accumulated in the cellular tissue between the peritonæal and muscular tunics; sometimes, however, it is found upon the free surface of the bowel, and instances have been known where it was seated in the submucous texture.

Small, brownish, mahogany, or slate-colored stains are sometimes met with in the villous and follicular structures of the intestines, produced either by a stagnation of the blood, or by this fluid having been subjected to the action of some acid. They are often seen in cases of chronic irritation, and are apt to be particularly conspicuous in the glands of Brunner and of Peyer, the former of which are occasionally completely encircled by them. These stains are liable to be confounded with those resulting from melanotic infiltration, but may be easily enough distinguished from them by the fact that they do not, like the latter, soil the finger when washed in clear water.

Another affection which requires consideration in this place, and which not unfrequently proves fatal, is *intussusception.* (Fig. 55.) This consists in the invagination of one portion of bowel within another, thereby filling up its cavity, and dragging along with it usually a part of the mesentery. Although, generally speaking, there is only one such invagination, yet sometimes there are as many as six or a dozen. The bowel manifesting, if the expression may be permitted, a peculiar diathesis to this sort of displacement. Much diversity obtains respecting the length of the invaginated portion. Most commonly it does not

Fig. 55.
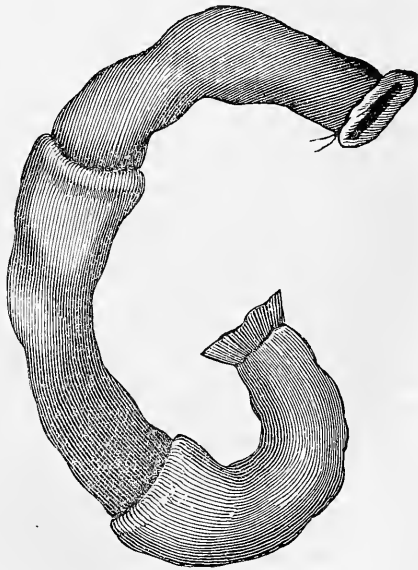
exceed two or three inches ; in other cases, however, it may
be as much as one or two feet.   Dr. Abercrombie makes
mention of a case, in which the inverted intestine measured
thirty-eight inches ; and instances are to be found in which
nearly the whole of the large, together with a considerable
portion of the small bowel, was thus invaginated, the ileo-
cœcal valve descending as low as the anus.   Sometimes,
though very rarely, there is a double intussusception, one
inverted portion of intestine slipping within another.

The included portion of bowel may be variously affected,
and give rise to the most terrible results.   In children, in
whom this lesion is much the most frequent, the invagina-
tion is occasionally disentangled, either by the natural energy
of the muscular fibres of the intestine, or by the influence
exerted upon them by purgative remedies.   When the in-
carceration continues for any length of time, the part usually
manifests strong signs of inflammation, and either contracts
adhesions to the surrounding gut, or else it dies, and is evac-
uated.   In this way may be discharged large pieces of the
alimentary tube, and the patient live for years afterwards, in
the enjoyment of perfect health.   In the former case, that is,
when the bowel remains invaginated, its coats are very apt
to become thickened, and lay the foundation of permanent
stricture.

In thirty-five cases, collected from the writings of different
pathologists, by Dr. Thompson, of Europe,* the length of
the eliminated pieces varied from six inches to upwards of
three feet : they generally came away entire, and almost
every one had a portion of mesentery attached to it.   In one
instance, there was a mesenteric ganglion ; in another, a frag-
ment of the omentum.   The average duration of the disease
was between four and five weeks.   In twenty-two of the
cases, the evacuated portion appertained to the small bowel,
in the other, to the large, or jointly to this and to the former.
The cœcum was affected alone only in a single instance, the
colon in two, the jejunum in three, the ileum in eleven.

Intussusception may take place in any part of the aliment-
ary canal, but is most common in the ileum, near its inser-
tion into the colon, owing doubtless to the vast difference of
size between these two portions.   The greater frequency of
this lesion in this situation than in any other, was long since

* Edinburgh Medical and Surgical Journal, October, 1835.

insisted on by Dr. Baillie, and the same kind of testimony is borne by almost every succeeding writer. Another fact deserving of notice in this place is, that the invagination does not always occur in the natural direction of the intestine, but sometimes from below upwards ; which sufficiently disproves the theory, at one time so much in vogue, that this complaint is always caused by one part of the tube falling within another, simply on account of its weight. Concerning the proximate cause of this disease, very little indeed is known. Nevertheless, it may be conjectured that it is in some way or other connected with inequilibrious action of the muscular fibres, by which one portion of bowel, contracting energetically, forces itself within another that is stationary, fixed, or passive. If this explanation be not satisfactory, I confess my inability to offer a better one. The lesion, it may be here reiterated, is also much more common in infancy than in manhood, — a circumstance affording additional proof in favor of the supposition that has just been advanced, inasmuch as the muscular coat of the intestine, being much more lax and irritable in the young than in the old, is liable to greater irregularity of action.

The prominent *symptoms* of this complaint are, violent pain in the bowels, generally increased by pressure, urgent vomiting, tumidity and tenderness of the abdomen, and the most obstinate constipation, every endeavor to evacuate the alimentary tube proving unavailing. The pulse is from one hundred and twenty to one hundred and fifty in the minute, small and feeble, and the features have a singularly shrunken and collapsed appearance. The pain in the abdomen, although constant, is aggravated by paroxysms, and is sometimes almost intolerable.

There is a species of intussusception very different from the one just described, inasmuch as it is entirely unattended by inflammation. I have repeatedly observed it in young children, as well as in adults ; and, so far as I can judge, it appears to occur during the last struggles of life, from some irregularity in the peristaltic movements of the muscular fibres. The invagination in this variety of the lesion is always limited, according to my own experience, to the small bowel.

The subject next in order to be discussed is that of *hernia*, of which there are several distinct varieties, both as regards the contents of the tumor and its situation. The most com-

mon place of rupture is at the inguinal and crural rings.
Cases, however, are often witnessed in which the bowel pro-
trudes at the navel, or some other part of the abdominal wall;
and, in a few rare instances, it has been known to pass into
the thorax, through an opening in the diaphragm.   There is
also a species of rupture in which the intestine descends into
the scrotum, in consequence of imperfect closure of the in-
guinal canal.   This constitutes what is termed *congenital
hernia*.   The bowel in this case lies in the vaginal sac; and
how it gets there may be easily accounted for by referring
for a moment to what takes place in the descent of the
testicle; until the end of the seventh month of utero-gestation,
the testicle is situated in the pelvic cavity, immediately be-
neath the kidney.   About this period it begins to advance
towards abdominal canal, along which it passes, until it finally
reaches the scrotum, carrying with it a tubular process of
peritonæum.   As the descent is being completed, the serous
sac here mentioned is gradually obliterated, and the commu-
nication between it and the abdomen closed.   This usually
occurs a few weeks before the child attains to maturity.   But
it is not always that things thus proceed.   In many cases the
abdomino-scrotal sac remains open through life, and allows
the bowel to pass down in contact with the testicle, forming
the variety of hernia in question.

To enter into a minute detail of every thing relating to
these different varieties of hernial tumors, would be incon-
sistent with the scope of the present work; and I shall there-
fore restrict my remarks rigidly to the morbid appearances
which are usually to be witnessed in the protruded parts, re-
ferring those who may feel anxious for further information
upon this interesting topic to our treatises on surgical anat-
omy.   In the congenital hernia, the mechanism of which has
just been described, the intestine generally retains its natural
characters, with the surrounding sac scarcely at all altered;
and hence, when the patient assumes the recumbent posture,
it always has a tendency to glide back into the cavity of the
abdomen, descending again when he rises.   In chronic cases,
however, although the protruded parts themselves may not be
particularly affected, the sac, in consequence of the constant
pressure that is exerted upon it, is apt to become indurated
and thickened, from the deposition of lymph.   Shreds of the
same substance occasionally adhere to the enclosed bowel, and,
by gluing it fast, prevent its return into the abdomen.   Simi-

lar appearances are sometimes witnessed in the other varieties
of long-standing ruptures.   In such cases, the sac is often as
much as the eighth of an inch in thickness, and evidently
consists of a number of well-organized layers.   The shape of
the bag is either oval, rounded, or more usually pyriform, the
narrower part being above, the broader below.   The neck is
sometimes quite long, and so narrow as to allow only a small
fold of intestine to pass out at a time.   The outer surface of
the sac is rough and irregular ; the internal smooth, polished,
and slightly lubricated by serosity.   Such are the ordinary
appearances to be observed in old and congenital ruptures.
    In recent ruptures, the sac is generally thin and opaque,
differing very little from healthy peritonæum. When strangu-
lation occurs, a new state of things supervenes.   For not
only does the sac evince signs of inflammation, but the pro-
truded part, whether it be the bowel or a portion of omentum,
is so excessively irritated that it frequently mortifies, whilst
the patient either dies, or is doomed to drag out a wretched
existence with an artificial anus.   The morbid appearances
of strangulation of the bowel are well shown by the sub-
joined case, which I add so much the more willingly, as it
admirably illustrates the obscure character which sometimes
attends slight hernial protrusions.   The patient was a married
woman, forty-five years old, who had labored for several
days under obstinate constipation, with slight vomiting, and
occasional pain in the epigastric region.   Dr. Ridgely, who
now saw her, prescribed several doses of active cathartic
medicines, and in about twenty-four hours succeeded in pro-
curing a copious alvine evacuation.   This, however, afforded
only transient relief.   The vomiting became more urgent ;
the abdomen, although neither swollen nor hard, was some-
what tender on pressure ; no further discharge could be ob-
tained from the bowels ; and she died, gradually exhausted,
on the fourth day after sending for her physician.   On ex-
amination, the cause of these symptoms was found to be a
protrusion of a portion of the ileum, scarcely a third of an
inch in length, which had got into the internal ring, where it
seemed to have been strangulated by a fold of peritonæum,
stretched tightly across its upper border.   That this was the
case, is abundantly proved by the fact, that the stricture still
remains in the preparation, although it consists solely of in-
testine and peritonæum.   The portion of bowel between the
ring and ileo-cœcal valve was about four feet in length, quite

empty and contracted, and without any any sign of inflammation. Above this point, the ileum was greatly distended with gas and fecal matter, and bore all the marks of high irritation, the redness, which was of a violet hue, occurring in small patches in different parts of the circumference of the tube. Externally, the bowel was covered with numerous globules of lymph ; and the incarcerated part itself was in a state of incipient gangrene, as was shown by its dark color, and by its want of proper tenacity. No shreds of fibrin were to be seen around the margins of the ring ; and the stricture was so slight that the strangulated gut was easily withdrawn from its unnatural situation. The colon was sound, but extremely contracted throughout the greater portion of its extent, being scarcely large enough to admit the little finger. The rectum was in the same condition. All the other abdominal organs, as well as those of the thorax, were in a normal state. The peritonæum was natural, excepting immediately around the seat of the stricture, where it was very vascular and inflamed. No external tumor whatever, either before or after death, could be perceived in the inguinal region.

Another occurrence of the intestinal coats is *atrophy*. Bonetus informs us that he has seen the bowels as thin as a cobweb ; and Professor Chapman states that he has found the ileum so much wasted away that there was scarcely any thing left excepting a most delicate peritonæal covering, expanded over a few pallid and widely-separated muscular fibres. Such an extreme attenuation of the coats of the bowels I have never witnessed ; nor can it be supposed to be of frequent occurrence. A sort of general atrophy seems occasionally to pervade the alimentary tube. Tartra describes the case of an individual who died three months after swallowing a considerable quantity of nitric acid, in whom the bowels were reduced to a very small volume, their coats shriveled, and indurated, and their caliber throughout not larger than a common goose-quill. Large quantities of lymph effused from the peritonæal surface, and agglutinating the bowels together, is sometimes another source of atrophy of these organs.

Not less rare is *hypertrophy* of the coats of the small bowel. The affection is generally the result of chronic irritation, leading to an effusion of lymph into the connecting cellular substance. Dr. Monro relates a case in which the intestinal tunics were half an inch thick, and of almost fibro-cartilagi-

nous hardness. The part of the small bowel most subject to hypertrophy is the lower end of the ileum, where it commonly occurs in particular spots. The affection is often attended with stricture, carried to such a degree sometimes as almost to close the natural passage. In these cases, the gut above the seat of the contraction is often enlarged to three or four times the ordinary capacity. One of the most extraordinary examples of this dilatation perhaps on record was related some years ago by Dr. M. H. Leon, of Columbia, South Carolina. It occurred in a young woman, aged twenty-five, who had labored for a considerable period under scirrhus of the rectum and uterus, and who had not had any alvine evacuation for the last nine weeks preceding her dissolution. On examination, the whole intestinal tube was found to be enormously dilated, the colon measuring thirteen inches and a half in circumference ; nor were the duodenum and ileum any less. Every where marks of high inflammation were discovered, and the valvular structure was completely effaced. The quantity of feces amounted to nearly seven gallons, and the long retention of it was no doubt the immediate cause of this extraordinary enlargement. The stomach was much contracted, and its coats highly inflamed and thickened.*

In another case, the particulars of which are given by Dr. Mason L. Weems, an eminent physician of Washington city, the dilatation was limited to a small portion of the ileum, which was expanded into hollow, ovoïdal sacs, from three to five inches in diameter. The parietes of these pouches were upwards of six lines in thickness, of a white pearly color, and remarkably friable in their texture, exhibiting, when torn, a fibrous, striated arrangement. The subject of this case was a boy between six and seven years of age. No cause could be assigned for the diseased state of the bowel.†

Concretions occasionally form in the alimentary tube, but much less frequently in the human subject than in some of the inferior animals. Their size is extremely various. Sometimes they do not exceed a garden pea ; at others, however, they are as large as an orange ; and Professor Monro refers to a case where a body of this kind, taken from the colon of a woman, weighed four pounds. In the inferior animals, their bulk is occasionally enormous. Thus, Dr. Voight, a German

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* American Journal of the Medical Sciences, vol. ii. p. 334.
† American Journal of the Medical Sciences, vol. xvi. p. 246.

writer, gives an instance of an alvine concretion in a horse which weighed thirteen pounds.

Although there are seldom more than two of these concretions, yet in some cases they are quite numerous, as many as ten or fifteen being found in one person. They are generally of a globular shape; and, when there are a good many of them, they are apt to be a little flattened at the sides, probably from the friction which they exert upon each other. They are of a brownish color, feel soft, but are too hard to be compressed, and have altogether a porous, spongy appearance. On breaking a section of them, these concretions are found to be composed of an immense number of small fibres, which are intimately interwoven with each other, like the felt of a beaver hat, the intervals between them being filled up by earthy matter. In most cases, these fibres are arranged in distinct lamellæ, the external of which are about two lines in thickness, and are generally of a lighter color than the internal. Each concretion is commonly provided with a central nucleus.

In their chemical constituents, these concretions present considerable variety. Mr. Children gives an account of some which were composed of albumen, common salt, phosphate of lime, and phosphate of soda. Dr. Marcet describes them as possessing the properties of soft cheese, and Mr. Brande as being made up entirely of the carbonate of magnesia. Thus, then, their ingredients may be supposed to differ in different cases, being scarcely ever precisely alike in any one instance.

These concretions are most frequent in Scotland, where they owe their origin to the oats that are so much employed by the lower orders as an article of food. But almost any extraneous and indigestible substance may serve as a nucleus to these bodies. Dr. James Murray, of Dublin, in an interesting paper upon this subject, states that alvine concretions often accumulate around fragments of almonds, nut-kernels, grape and cherry-stones, pieces of radishes, and even tea-leaves.* Occasionally they are caused by the long-continued use of magnesia. Mr. Brande has published a case in which this substance was impacted in the colon to the amount of three pounds.

Other concretions are sometimes found in the intestinal tube, very different from those just described. They are

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* Medical Lancet, July, 1836.

mostly observed in dyspeptic subjects, or in those who suffer habitually from a torpid state of the bowels and derangement of the assimilative functions. What their precise constitution is has not been ascertained, nor do we know any thing satisfactorily respecting the nature of their origin or the mode of their developement. These concretions are, in some instances, of an irregular shape, of the consistence of inspissated tallow, slightly translucent, and of a grayish drab color; in others, they are of a globular form, nearly or quite opaque, of an adipocirous or waxy character, and of a pale yellowish, whitish, or cineritious hue. In size, they vary between a small pea and a large grape ; and they rarely if ever have any proper nucleus, though they are often much harder at the centre than at the circumference.

In the above account of calcareous and other concretions, may be added a few remarks on *fatty discharges* from the bowels. Although this subject was incidentally noticed by some of the earlier physicians, as Tulpius and Fabricius Hildanus, it does not seem to have attracted the special attention of the profession until within a comparatively recent period. For our knowledge concerning it, we are principally indebted to two distinguished English pathologists, Dr. Bright and Dr. Elliotson, whose excellent papers on this disease, first published, I believe, in the Medico-Chirurgical Transactions of London, comprise a great mass of highly interesting and valuable matter, of which I shall freely avail myself in this brief notice.

The form in which this fatty matter presents itself is exceedingly various. Sometimes it has all the properties, apparently, of oil, being perfectly liquid, specifically lighter than water, and of an inflammable nature ; at other times, it is semi-concrete, or of the consistence of tar, thick treacle or jelly, and of a pale straw color. Very frequently, it comes away quite fluid, but acquires an immediate increase of consistence on exposure to the atmosphere. The quantity evacuated is also liable to considerable diversity. In the interesting case below, communicated to me by my friend Dr. J. B. S. Jackson, Boston, it amounted, on an average, in the twenty-four hours, to about eight ounces, during more than four months. The quantity is often much less ; and, on the other hand, it may be much greater. In a case recorded by Dr. Johnson, in the Medico-Chirurgical Review, the patient ejected, in a short time, the enormous amount of thirty

pounds : he had fasted for several days, when he eat vora-
ciously of indigestible food, which soon excited vomiting, at
first of blood, and subsequently of fatty matter.   He recov-
ered in less than a month, but not without great loss of bulk.

I am not aware that any analysis has been made of this
fatty matter.   In a specimen examined by Dr. Prout, it pos-
sessed all the properties of human fat ; and, in another case,
it is said to have formed good soap on being mixed with
alkali.   In the generality of instances, it has a fetid odor ;
but occasionally it is perfectly pure, wholly devoid of smell,
and capable of protracted preservation.

Although these fatty discharges have been observed at
different periods of life, yet it would appear from an attentive
examination of the cases of it on record, that they are much
more frequent in the aged than in the young.   What their
source is, or the particular condition of the system which
favors their occurrence, are points concerning which we are
in total ignorance.   In nearly all the cases published by Dr.
Bright, there was a remarkable similarity in the pathological
phenomena.   The most prominent symptoms were jaundice,
enlargement of the liver, and evacuations of fatty matter
from the bowels.   On dissection, organic lesion was found in
the pancreas, liver, and duodenum, with obstruction of the
gall-duct.   In a case mentioned by Mr. Lloyd, of England,
there was disease of the head of the pancreas, with closure
of the Wirsungian duct, by calculous concretions, and con-
traction of the duodenum.   During life, the same symptoms
were noticed as in the examples reported by Dr. Bright.
Instances of a similar nature have been published by Scott,
Elliotson, Babington, and other writers.   In a few cases, the
fatty substance coexisted with pulmonary phthisis, hysteria,
and diabetes, and proceeded simultaneously from the bowels
and urinary bladder.

To what source, then, are these singular discharges to be
ascribed ?   Do they proceed from the pancreas, from the
liver, or from the gastro-enteric mucous membrane ?   Dr.
Bright, from his dissections and observations, is inclined to
believe that they are the result of a morbid secretion of the
pancreas, — an opinion which has since been adopted by sev-
eral highly respectable pathologists.   Others, again, refer
them to the liver, alleging that they are merely an abnormal
increase of the fatty secretion which that organ performs in
the healthy state.   Without entering at all into the merits of

these questions — which my limited space does not admit of —
it will be sufficient to observe that there are numerous ex-
amples of this disease on record, which cannot possibly be
explained by a reference to either of these organs.   We have
already alluded to the interesting case of Dr. Lloyd, in which
the pancreatic duct was completely obstructed by calcareous
matter, and we shall have occasion, presently, to mention
another of a similar description, by Dr. Jackson.   That they
do not proceed from the liver, is abundantly shown by the
fact, that, in persons who labor under this affection, the
biliary channels are sometimes so completely choked up as to
prevent any thing from passing along them to the duodenum.
Since, then, this fatty matter is not furnished by the pancreas
and the liver, whence does it emanate ?   Is it poured out by
the mucous membrane of the stomach and bowels ?   Here,
again, the pathologist is at a loss for proof.   Nevertheless, it
appears highly probable, when we take into consideration the
circumstance that these evacuations are occasionally attended
by very great and rapid emaciation, that they are the result
of a sort of metastasis of the secretion of fat of other parts
of the body, in which it is naturally deposited, to the surface
of the alimentary canal.   This opinion, which has been
ingeniously advocated by Professor Stokes,* of Dublin, al-
though not free from objection, affords, perhaps, the best
explanation that can be offered in the present state of medical
science.   My own idea about these fatty discharges is, that
they are a morbid secretion of the mucous membrane of the
stomach and bowels, which is often greatly modified and
influenced by organic disease of the liver, the pancreas, and
the duodenum.

I shall close this subject with the following case, already
several times alluded to, and which exhibits, in detail, the
symptoms and autopsic condition ordinarily observed in the
disease under consideration.   I shall present it in the lan-
guage, nearly, of the intelligent physician, Dr. J. B. S. Jack-
son, who kindly communicated it to me, and whose zeal in
the pursuit of pathological science is well known to the pro-
fession.   The patient, a laborer, forty years of age, died on
the 16th of September, 1837.   Thirteen years before, he had
an attack of hemorrhage from the bowels, by which he was
greatly reduced, and to which he always referred his disease.

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* London Medical and Surgical Journal, March, 1834.

Little was known of him from that time till about three years before death, when he had a second attack: the discharges of blood, which were very large, continued more or less for six or eight weeks, with diarrhœa, from which he recovered so far as to resume his work. He had constantly, however, great soreness and tenderness in the epigastric region, so that, at times, he could not bear the weight of the bed-clothes, and he always had his dress made loose, that it should not press on the stomach. He had also frequent returns of diarrhœa and bloody discharges from the bowels, which last, he said, usually afforded him temporary relief: his appetite was good, and the digestive function not particularly impaired. Thus he continued till December, 1836, nine months before death, when, after working all day in a damp cellar, with his coat off, he was seized with symptoms of fever, pain, and obstinate constipation, the latter of which, after persisting for several days, was followed by severe diarrhœa. The evacuations from the bowels were one half blood, and there was great pain, with extreme tenderness in the epigastric region. In about a fortnight, he began to have discharges of fatty matter in a liquid state, resembling, when cold, yellowish tallow, and estimated by himself to amount, on an average, to eight ounces in the twenty-four hours. This substance accompanied every dejection, but there was none in the urine, and it continued until May, when it entirely ceased: the feverish symptoms disappeared in two or three weeks, but not so the pain and tenderness. He, however, went to work, taking laudanum whenever there was a paroxysm of pain. After eating, no matter how small the quantity, there was always a sense of fulness and tightness in the stomach, followed by the most excruciating pain, copious perspiration, dyspnœa, nausea, and often vomiting. These attacks usually lasted from four to five days, required large doses of laudanum for their relief, and always went off gradually; recurring, at first, every eight or ten days, but afterwards, as the disease progressed, at shorter intervals. The discharges from the stomach and bowels, in whatever way produced, were uniformly light-colored and clayey from December until he died. The appetite, for the first five months was generally good, — indeed, often craving; after that, it became indifferent; five weeks before death, the skin assumed a yellowish cast. A physician, who was called in about the last of August, found the abdomen extremely tender, with a tumor in the

epigastric and right hypochondriac regions, extending nearly to the umbilicus ; the perspiration, urine, skin, and conjunctiva, were of a yellow color, the latter deeply so ; the dejections were free from bile ; and the lungs presented signs of advanced tubercular disease. From this time on, there was little pain ; the cough was slight ; and the man sat up every day till a short time before death. When in bed, he always lay on the right side, with the body bent forward. On the 16th of September, he was comatose, but could still be roused, and said he felt better. Early in the afternoon of that day he expired.

On opening the cavity of the abdomen, a large fluctuating tumor, of a regular oval form, was at once seen below the right lobe of the liver, with which it was closely connected by old adhesions : it was situated between the intestines and the posterior parietes of the abdomen, and extended towards the left side a short distance beyond the spine ; the duodenum ran over, and almost around it. On making a free incision into it, the tumor was found to contain, by estimate, from ten to fourteen ounces of a red fluid, without coagula, not viscid nor greenish, and without any appearance of fatty matter. Branches of the cœliac artery were traced, and found healthy. The tumor or cyst, after removal from the body, measured four inches by three, — its walls being from one to three lines thick, of a reddish color, membranous, and fleshy to the feel. Nothing could be discovered like the structure of the pancreas, yet the parietes of the cyst were evidently formed by a dilatation of that organ, as they contained several very minute calculi. The inner surface was for the most part firm and smooth, but on the side towards the duodenum, it was to a small extent irregular, soft, and apparently disorganized : two calculi adhered to it near the opening of the duct, which was entirely obliterated : they were several lines in diameter, rough on the surface, and had the usual characters of pancreatic concretions. There was a third, also, but much smaller. The remainder of the pancreas, forming the left extremity of the organ, was about two inches in length by two thirds of an inch in width, contracted, irregular, and very hard, as if filled with small calculi. The duct itself was considerably enlarged, and opened freely into the cavity of the sac. There was no appearance of malignant disease about the tumor, nor, indeed, in any part of the body. The stomach was small and pushed high up in the abdomen ;

contained some thin liquid of a light but decidedly yellow-
ish color, (bile?) About seven feet of the ileum were
opened, but there was no trace of bile. The liver was small,
dark-colored, and thrust high up by the tumor. The gall-
bladder was large and distended with moderately thick bile,
of a dark green hue. The biliary ducts were dilated and full
of bile, without any particular obstruction. The common
duct was traced freely into the duodenum : on slitting it
open, a portion of it, which formed a part of the parietes of
the cyst, was found in a very sloughy condition, similar to
the contiguous portion of the morbid mass. The gangrenous
part was about an inch long, without involving the whole
caliber of the tube, of a grayish-brown color, extremely
soft, ragged, and ready to give way.

<div align="center">———————</div>

<div align="center">SECTION VII.</div>

<div align="center">*Diseases of the Large Bowel and Anus.*</div>

Ulcers of the large bowel very much resemble those
of the small, except, perhaps, that they are more frequently
of a linear shape. This, at least, is the form in which I
have hitherto more particularly met with them. When be-
ginning in the mucous follicles, they are more apt to be
rounded : in this case, too, their edges are often remarkably
ragged, thin, and undermined, — a circumstance which gives
them the appearance of being much larger at the base than
at the top. In such instances, moreover, the glands are some-
times entirely removed, or portions of them are left in the
midst of the ulcerated surface, in a state of induration. Oc-
casionally nearly the whole of the large bowel is thus af-
fected ; but the sections most frequently diseased are the
coecum and ascending colon, together with the right half of
the transverse arch, whilst the rectum and the remainder of
the gut are comparatively seldom implicated. In ninety-two
cases of intestinal ulceration, reported by Andral, only one
occurred in the rectum.

The size of these ulcers is sometimes very considerable.
I have repeatedly seen them of the diameter of an American
dollar, and, on several occasions, between three and four inches

in length by one and a half in breadth. When of these dimensions, the abrasions are generally formed by the agglomeration of a number of smaller ones. In the linear variety, I have, in a few instances, found the ulcers extending almost completely around the circumference of the bowel, constituting narrow grooves, of variable depths, with rough, elevated, and indurated edges. As in the rest of the alimentary tube, the ulcerative process may successively invade the different tunics, and finally lead to perforation ; in which case the contents of the gut may be effused into the peritonæal sac, or else find their way into the surrounding hollow viscera. A fistulous opening sometimes forms through the walls of the abdomen, in the right iliac fossa, or in the groin just above Poupart's ligament.

It is a singular fact, and one for which I cannot offer any satisfactory explanation, that ulcers of the large bowel are much less liable to *cicatrize* than those of the small. Never, indeed, in a single instance, have I seen complete reparation in this situation, though it has occurred to me on several occasions to notice partial efforts of this sort. Thus, in the ascending colon of a married woman, thirty-three years of age, who died, gradually exhausted, after an illness of nine weeks, I found the mucous membrane very much thickened, and of a dark red color, with a deep linear ulcer two inches and a half in length by three lines in width, the surface of which was covered with small masses of plastic lymph, so firmly adherent that it was difficult to scrape them away. In this case, it is obvious, there was an attempt at cicatrization ; and, had the patient lived long enough, it would, no doubt, have gone on to completion. In another instance, that of a man twenty-two years old, who died of chronic diarrhœa, a small circular ulcer existed in the sigmoïd flexure, the centre of which was coated with a thick layer of lymph, which had evidently been deposited only a short time previously to death.

The *vermiform appendage*, although in its structure closely resembling the rest of the intestinal canal, may, nevertheless, be considered as a distinct organ, possessing peculiar anatomical relations, and executing functions different from those of the rest of the alimentary canal. It is about three inches in length by three lines in diameter, slightly convoluted, and often considerably larger at some points than at others. Its coats are as thick as those of the cœcum, and composed pre-

cisely of the same anatomical elements. No little variety exists in relation to the size and situation of this tubular diverticulum. Whilst occasionally it is very diminutive, I have seen it, at other times, nearly half a foot long, and fully as large as the little finger, without any apparent disease. The appendage is occasionally deficient, even when the rest of the bowel is perfectly normal; and not unfrequently it deviates remarkably from its accustomed position. In inflammation of the peritonæum it is often firmly glued to the neighboring organs, as the uterus and urinary bladder; and, under such circumstances, it has been known to produce strangulation of the small bowel. Of this, a very interesting example fell under my notice, some years ago, in a young married female, twenty-two years of age, whom I attended, along with the late Dr. Herron, of this city. Up to the period of her confinement, she had enjoyed excellent health; but, twelve days after this occurrence, she was seized with severe peritonitis, attended with excessive irritability of the stomach, and the most obstinate constipation of the bowels. These symptoms persisted, without any decided abatement, until the ninth day from the attack, when she died in a state of complete exhaustion. On dissection, the serous membrane of the abdomen was found to be extensively inflamed : there was a copious deposit of lymph upon the pelvic viscera; and the vermiform appendage, the extremity of which was firmly agglutinated to the side of the uterus, passed over a loop of the ileum, and thus effectually intercepted its contents.

The usual contents of the vermiform appendage are of a mucous nature, and of a soft, semi-fluid consistence. Fecal matter rarely finds its way into it; when it does, it is very apt to become impacted, and to produce mischief. Not a few cases are recorded where the most violent inflammation was thus induced, followed by gangrene of the tube and general peritonitis. But the most common cause of disease, undoubtedly, is the ingress of some foreign body, such as a bean, a cherry-stone, or biliary concretion, producing local irritation, which rapidly spreads from the mucous to the other tunics. Severe peritonitis is soon lighted up, lymph is poured out, and the appendage speedily falls into a state of mortification. In another series of cases, the disease assumes a milder character, the serous membrane is comparatively little affected, there is scarcely any albuminous exudation, and the inflammation finally passes into suppuration; or adhesions are

formed between the cœcal appendage and the adjacent parts, and the extraneous body, exciting ulceration, at length escapes to some other situation.

Inflammation originating in the vermiform appendage is ordinarily characterized by bold and well-marked symptoms. "Very acute pain, tumefaction, and tenderness are complained of upon the invasion of this form of the disease ; first in the right iliac region, and subsequently more or less over the abdomen, with excruciating tormina, obstinate constipation of the bowels, a very frequent, small, or contracted pulse, heat of skin, dry tongue, great thirst, sometimes with numbness of the right leg, or pain shooting down the thigh, and retraction of the testicle." * Vomiting at length sets in, with or without relaxation of the bowels, the patient manifests great restlessness, the countenance assumes a sunken aspect, and death generally takes place from the third to the sixth day, preceded, observes Dr. Copland, by the symptoms ushering in dissolution from intestinal peritonitis. In a letter lately received from Dr. J. B. S. Jackson, of Boston, he informs me that he has seen four dissections, besides two recent specimens of gangrene and perforation of the vermiform appendage, in which the symptoms corresponded sufficiently well with the descriptions of the distinguished pathologist just quoted.

The more insidious form of this disease is well illustrated by the following case, communicated by my friend, Dr. Richards, of this city, who had the kindness to send me the diseased bowel : the patient, a gentleman thirty-five years of age, had enjoyed good health up to the 24th of August, 1837, when he was attacked with bilious fever. His tongue at this time was considerably coated ; there was headache, with pain in the back and limbs ; the skin was hot and dry ; the pulse ninety in a minute ; and there was, moreover, a slight hacking cough, which, however, had been present, at intervals, for the last ten months. Under an active course of treatment, these symptoms gradually disappeared, and, by the fifth of September, just a fortnight from the invasion of the disease, the patient was to all appearance convalescent ; the pulse being slow and soft, the tongue clean, and the appetite quite good. On the evening of the same day, however, after partaking pretty freely of indigestible food, he was suddenly

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* Copland's Dictionary of Medicines, article *Cæcum*.

seized with severe pain in the abdomen, accompanied with slight distention of the hypogastric region, and great tenderness on pressure : the pulse became feeble, beat one hundred and forty strokes in a minute ; the surface was cold, and bathed with profuse perspiration ; and there was considerable embarrassment of breathing. These symptoms gradually increased in severity until the seventh of September, about forty-two hours from their first manifestation, when the man expired, in a state of complete collapse. On dissection, the following appearances were noticed : the omentum, with nearly the whole peritonæum, was in a highly inflamed condition ; the bowels were distended with gas, and extensively agglutinated by coagulating lymph ; the pelvis was filled with fecal matter; and there was a large, ragged ulcer in the vermiform appendage, which had perforated all the coats. Through this ulcer the fecal matter had escaped, inducing violent and fatal peritonitis. The mucous membrane of the stomach was highly inflamed, incrusted with patches of lymph, but that of the intestines was perfectly healthy, except immediately around the seat of the disease.*

Hypertrophy of the coats of the colon is rare, but by no means infrequent in those of the rectum, where it is occasionally conjoined with permanent stricture. The gut, for some distance above the narrowing, is usually considerably dilated, either with or without attenuation of its tunics, or the reverse. The extent to which the hypertrophy occurs, varies from a few inches to several feet ; and, in a few instances, I have seen it involve the whole of the large bowel : the coats which are more particularly affected are, the mucous and cellulo-fibrous, the latter of which, especially, is frequently six or eight times the normal thickness : the muscular fibres are also apt to become very much altered, both as respects their size and color ; but the serous texture rarely participates in the morbid derangement. When the hypertrophy is of long standing, the bowel almost always acquires an extraordinary degree of density, offering as much resistance to the knife as fibro-cartilage, and emitting the same creaking sound.

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* Those who are anxious to obtain further information on this subject, will do well to consult Dr. Copland's Dictionary of Medicine — a work which should be in the library of every intelligent physician — and Dr. John Burne's Memoir on Tuphlo-Enteritis, or Inflammation and Perforative Ulceration of the Cœcum and Appendix Vermiformis, in volume xx. of the London Medico-Chirurgical Transactions.

Tubercular, melanotic, and cancerous affections are rarely found in the large bowel. When carcinoma occurs, it usually has its seat in the ileo-cœcal valve, or in some portion or other of the rectum; and, as it may be said to be almost peculiar to the latter, we shall postpone, for the present, the consideration of it.

Both the colon and the rectum are occasionally the seat of *wart-like excrescences*, similar, in many respects, to those which we so often see on the female organs of generation. Of this lesion I have seen several well-marked examples. In a specimen (Fig. 56) preserved in the museum of morbid anatomy, the mucous membrane of nearly the whole of the large intestine is thickly studded with these vegetations, the smallest of which are scarcely as big as a pin-head, whilst the largest are from three to eight lines in length, by two lines and a half in diameter. The former, which are infinitely the most numerous, are, for the most part, of a spherical shape: the latter, on the contrary, have an elongated, conical appearance, not unlike the nipples of some of the inferior animals. A few of the larger ones are bifid, and several adhere by a narrow peduncle, their free extremity being much broader than the attached. These singular excrescences are most abundant in the rectum and the sigmoïd flexure of the colon, from which they gradually decrease

Fig. 56.
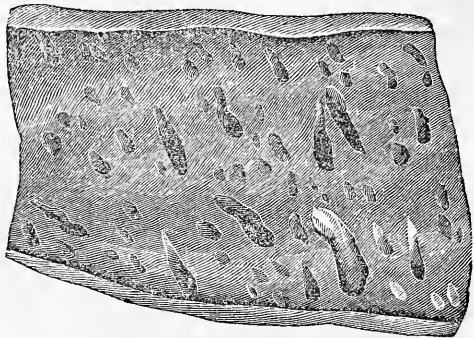
in number, though not in volume, as they approach the cœcum, where they are entirely wanting. Their surface is somewhat rough, as if covered with villi, and in the recent state they were all of a dark mulberry hue. The parietes of the bowel are very much thickened and indurated, especially in the inferior three fourths of its extent; and the caliber of the tube is diminished to less than one half the normal size, and of the rectum to less than one third. The subject of this disease was a man about sixty years of age, during the last

four of which he was constantly harassed with diarrhœa, and intestinal pains, which produced excessive emaciation and gradual exhaustion.

In another specimen of a similar nature, which was kindly presented to me by the late Dr. Herron, of this city — a gentleman who died too soon for the cause of the science to which he was so ardently attached, and of which he bid fair to be one of the brightest ornaments — the walls of the colon are also very much thickened, though not so much as in the preceding case, and the inner surface, besides being cellulated, like a honey-comb, is covered with an immense number of soft, fungoïd excrescences, some of which are nearly half an inch in length. In their shape they exhibit almost every variety, some being conical, some spherical, and some angular. Many of them arise by a common base, and, jutting out like little slender arches, unite at the top, leaving thus a number of intervening spaces which readily admit of the passage of a large-sized probe.

The structure of these vegetations seems to be very analogous to, if not identical with, that of the natural mucous membrane, upon which they grow, and of which they may, therefore, be regarded merely as so many prolongations. That this is the case, is sufficiently obvious when we make a section of them. In both the specimens in my possession, the inner surface of the colon and rectum presents thousands of hypertrophied villi, and similar bodies are plainly visible, even to the unassisted eye, on the warty excrescences. Thus, then, it may be concluded, that these singular growths are neither villosities in a state of preternatural enlargement, nor new formations, but simply, as we have just intimated, so many prolongations of the mucous corion, folded over a small quantity of cellular substance. Their vascularity is sometimes very great, and there is reason to believe that they are susceptible of a sort of erection.

How these vegetations originate is still a mooted question. That chronic irritation has some agency in their production cannot, I think, be denied, as we seldom if ever meet an instance in which the bowels have not been seriously and for a long time deranged ; but what the peculiar modification is, and why these bodies should exist in some cases and not in others, are problems which must, for the present, remain undetermined. In the individual, a young courtesan twenty-three years of age, from whom Dr. Herron obtained the

interesting specimen which he presented to me, there had been well-marked signs of chronic colonitis for several years, with occasional intervals of perfect health. She finally died of gangrenous inflammation of the vulva and vagina, having for the last few months suffered severely from disease of the bowels, the principal symptom of which was torturing pain in the umbilical region, with frequent slimy and bloody evacuations. So also in the other case that we have mentioned, chronic inflammation had invaded nearly the whole of the large bowel, and had existed for nearly four years, having been engrafted upon a severe attack of Asiatic cholera.

The following case, for which I am indebted to Dr. Abercrombie, conveys a very good idea of the symptoms and modifications of disease of the mucous membrane of the large bowel. A lady, thirty-five years of age, was suddenly seized with vomiting and purging, which continued, with occasional intermissions, until the ninth day of the attack, when she expired, in a state of perfect exhaustion. Sometimes there were not more than three or four alvine evacuations in the twenty-four hours; and she occasionally passed a whole night without any disturbance; yet, however this might be, the countenance had always an expression of great anxiety and feverishness. There was but little pain in the bowels, and, after the first three days, scarcely any tenderness on pressure of the abdomen. The evacuations are in general copious, thin, and of a feculent appearance. Towards the last, they became extremely fetid, streaked with blood, dark-colored and puriform.

On examination, the mucous membrane of the cœcum was found to be of a uniform deep red color, and covered by numerous well-defined ulcers, some of them the size of a sixpence. In the ascending colon, there was a more irregular state of disease, consisting of slight wandering erosions, variegated with dark fungoïd elevations. In the arch of the colon, the lesion assumed a still different character. Here the ulcers, scarcely as large as a split pea, were quite distinct from each other, with the intervening structures perfectly sound. In the descending colon, the whole of the mucous membrane exhibited one continued surface of disease. It was of a dark brown color, fungoïd and spongy, without any defined erosion, and, throughout, very much thickened. The other tunics along this portion were also considerably hypertrophied, and in some places almost of cartilaginous hard-

ness. This state of disease extended from near the com-
mencement of the descending colon to within two inches of
the extremity of the rectum, where it abruptly terminated.
The stomach and small intestines were quite healthy, except-
ing the inferior portion of the ileum, which was very vascu-
lar and inflamed. The peritonæal covering of the large bowel,
especially about the sigmoïd flexure and the upper part of
the rectum, was of a dark red color, and dotted with small
specks of lymph.

It deserves to be remarked here, that, about four years
before, this patient had an attack of disease very similar to
that of which she died, and that during the whole of this
interval she occasionally complained of uneasiness in her
bowels. Up to the day of the last attack, however, she was
apparently in perfect health, and able to take a great deal of
exercise, the body being full in flesh. The bowels were
habitually costive, and required the frequent use of gentle
laxatives.

In leaving this subject, there is one point upon which I
deem it necessary to make a few comments. I allude to the
singular contraction of the large bowel which is so frequently
met with in our post mortem examinations. Every physi-
cian who is in the habit of making researches of this kind
must have frequently observed this appearance. During the
early period of my professional life, before I had much ac-
quaintance with morbid structure, I was inclined to look upon
this contraction as the effect of disease ; and as such, there is
reason to believe, it is still regarded by many at the present
moment. That this, however, is not the fact, in the great
majority of instances, my own experience decidedly tells me ;
and, in order to avoid all mistake upon the subject, I would
suggest that, whenever this appearance is witnessed — as it
will, I feel confident, in nine cases out of every ten — the
bowel should be carefully opened with the scissors, and thor-
oughly scrutinized, with a view of ascertaining the color,
consistence, and thickness of its several tunics ; for by such
a procedure alone can the investigator expect to arrive at any
satisfactory conclusion.

The parts of the large bowel most subject to this contrac-
tion are the left half of the arch of the colon, the descend-
ing portion, the sigmoïd flexure, and the upper half of the
rectum, — the frequency of its occurrence being in the order
here enumerated. All these parts are often narrowed at the

same time, and occasionally to such a degree that the caliber of the tube is nearly obliterated. What this condition is owing to it is difficult to conjecture; nor am I able to offer any opinion upon the subject, excepting that these parts of the alimentary tube, being less liable, during the last stages of our existence, to be distended by fecal matter, the muscular fibres are enabled to contract with more energy than in the rest of its extent.

There are some organic lesions which are either peculiar to the rectum and the anus, or which occur so frequently in these situations, as to render it proper that a short account of them should be presented in this place. Of these affections, the most important, from the frequency with which they demand surgical interference, are carcinoma, stricture, ulceration, and vascular excrescences.

Carcinoma is generally seated several inches above the anus, and presents itself in the form of a flattened, oval tumor, from one to three inches in diameter. Its anatomical characters are the same, pretty much, as in the stomach or œsophagus; that is, it is either of a hard, dense, gristly consistence, with a rough, nodulated, and ulcerated surface, or it is of a soft, spongy texture, like the medullary substance of the brain. The mucous and muscular coats of the bowel are usually very much thickened, and the former is often thrown into large, irregular ridges, in the intervals of which, it is not uncommon to find small erosions. When the disease is of long standing, the hemorrhoidal vessels are apt to be enlarged, and the surrounding cellular tissue matted into a condensed mass, destitute, in great measure, of its primitive characters.

No perplexity can prevail in the recognition of cancer of the rectum. The leaden and sallow complexion; the deep-seated, lancinating pains, darting through the hips and pelvis into the groins, and down the thighs; the difficulty of evacuating the bowels; the frequent discharges of bloody, purulent mucus; and the presence of a tumor in some portion or other of the tube; are signs which unerringly stamp the nature of this formidable malady.

There is a singular species of ulceration of the rectum, which has attracted much attention in France, but which, I believe, is extremely rare in the United States, and in many districts of Europe. I refer to the lesion which was first described by the late Professor Boyer, of Paris, under the

name of *fissure* of the anus. The disease, as has been just intimated, consists in an elongated, narrow ulceration, which commonly arises immediately above the internal sphincter, on the posterior surface of the gut, opposite the point of the coccyx, in consequence, frequently, of some mechanical cause. The bottom of the fissure, usually formed by the submucous cellular tissue, has a soft, spongy feel, whereas the edges are indurated and more or less prominent. The peculiar character of this disease is, that it is invariably attended by spasmodic contraction of the sphincter muscles of the anus; owing to which the patient generally experiences the most horrible torture on every attempt at defecation. Occasionally considerable hemorrhage takes place from an ulcer of this kind.

There is a species of *spreading* ulcer of the mucous membrane, which is said to be extremely prevalent amongst the females of Great Britain.* The disease is characterized by the complete removal of a considerable portion of the lining membrane of the rectum, with a dense, indurated, and almost gristly state of the muscular tunic. It usually commences about half an inch within the anus, and terminates above by a rather abrupt but very irregular line of demarcation. The ulceration frequently extends around the whole bowel, and sometimes high up into the sigmoïd flexure of the colon. Unless taken in hand early, it is very apt to prove intractable.

The symptoms of this disease are, pain and soreness in the rectum, difficulty in passing the feces, and a sense of weight in the pelvis, with irritability of the bladder and bearing down of the womb. The pain which is always much aggravated by the action of the diseased bowel, frequently shoots down the thighs, and the patient has no ease except in the recumbent posture.

Organic stricture of the rectum (Fig. 57)† consists in a thickened, indurated condition of the mucous and cellular textures, by which the caliber of the tube is more or less contracted. A smooth gristly ring is thus formed, from a few lines to half an inch in depth, above and below which the bowel commonly retains its natural structure. The thickening does not, however, always embrace the entire circum-

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* Mayo, Outlines of Pathology, p. 348.
† This and several of the succeeding figures are copied from the work of the late distinguished Dr. Bushe, of New York, on the Diseases of the Rectum.

ference of the rectum; not unfrequently, indeed, it forms a mere segment of a circle, and is so arranged as to give the villous tunic in the immediate neighborhood a remarkably puckered and drawn appearance. When the ring is complete, it strongly resembles a scirrhous pylorus. Hypertrophy of the muscular tunic is also occasionally observed, but the peritonæal is seldom implicated.

Fig. 57.

The common seat of organic stricture is about three inches above the anal orifice. Cases, however, are frequently observed, in which it is much lower down or higher up. The disease spares neither age nor sex. Whilst it is not unusual about the meridian of life, it has been repeatedly witnessed in children as early as the eighth year, and in the old as late as the eightieth.

The nature of this lesion can only be satisfactorily determined by an examination with the finger, and by a careful investigation of its history. The same difficulty is experienced here in relieving the bowel as in carcinoma of the rectum, and fissure of the anus; but what perhaps serves, in some degree, to distinguish this affection from any other, is the peculiar shape of the feces, which, instead of being voided in thick masses, come away in short, narrow pieces, often not larger than a full-sized catheter. The bladder is sometimes excessively irritable, from the pressure of the loaded gut; and occasionally one or more fistulæ form in the nates or the perinæum. In the female, a communication frequently takes place between the rectum and the vagina; and in the male a similar passage may be established, though more rarely, between the rectum and the bladder.

Authors have noticed a *spasmodic stricture* of the rectum, caused by an irregular contraction of the muscular fibres. It is supposed to be most common in the upper portion of the tube, and to be dependent upon a vitiated state of the secretions.*

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* Mayo, op. cit, p. 350.

Hemorrhoïds may be distinguished into two varieties, one of them consisting essentially in a varicose enlargement of the vessels, the other in the formation of a small sac filled with blood. In the latter case, the disease appears in the shape of one or more soft, florid, vascular tumors, (Fig. 58,) seated either around the verge of the anus, or just above the internal sphincter muscle. In their size, they vary between a cherry and a walnut, and their color is always more pallid in proportion to their age. When they are old, they often appear like hard, indurated knobs, destitute of that erectility which forms so distinguishing a feature in them, when recent. The hemorrhoidal sac originates, as is supposed by Richter, who has written very learnedly upon the subject, in an extravasation of blood into the cellular tissue, lifting up the mucous membrane, in the case of internal piles, the skin, in the case of external ones. The correctness of this explanation my own dissections have fully verified. The blood being poured out, in the first instance, in the liquid form, afterwards coagulates, and in process of time undergoes pretty much the same changes as in apoplectic and other effusions. Thus a satisfactory reason is afforded for the difference of color and consistence between a recent and an old hemorrhoidal tumor. When these bodies are seated exactly at the margin of the anus, they are sometimes half covered by skin, half by mucous membrane.

Fig. 58.

Piles are largely supplied with blood, and hence they are always more conspicuous during life than after death. As soon, indeed, as the circulation ceases, they become pale and flabby, their surface assuming a shriveled, corrugated aspect, from the retrocession of the blood. These hemorrhoidal tumors I have repeatedly injected ; and in several instances
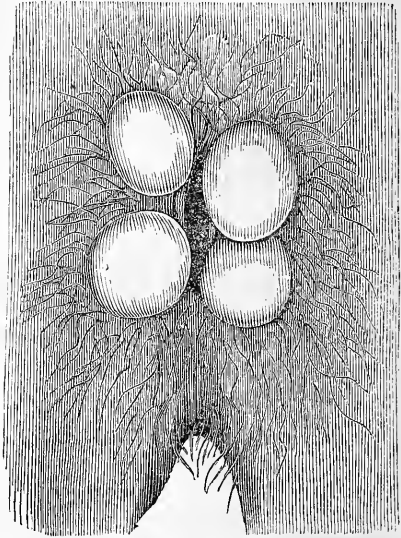
I have found them converted into a semi-cartilaginous mass, of a dirty yellowish color. (Fig. 59.)

Fig. 59.*

Varicose enlargement of the hemorrhoidal vessels, both arterial and venous, is particularly liable to happen in females during utero-gestation, and in males whose occupations oblige them to be constantly in the erect position. The protrusions which are thus formed are soft, spongy, erectile, and remarkably prone to hemorrhage, the blood often spirting from them in a full stream. (Fig. 60.) In their color, they vary from a light red to a deep purple; and they often acquire the magnitude of a common almond. Their most usual situation is just within the verge of the anus. In respect to number, there are seldom more than two or three; but, in a few rare instances, I have noticed as many as five or eight.

Fig. 60.

Polypous growths are sometimes found in the lower part of the rectum; but, as their structure and mode of origin are the same as in the other parts of the body, they need not detain us in this place. The same may be said of the ulcers and warty excrescences which are occasionally seen round the anus, and of the partial protrusion of the mucous membrane, from relaxation of the bowel.

Prolapsion of the anus is another disease which requires brief notice in this place. Of this there are two forms. In the first, (Fig. 61,) which may be termed the partial prolapsion, the mucous membrane of the lower bowel is alone everted, so as to present the appearance of a ring: it is usually observed in the vigor of life, and very frequently de-

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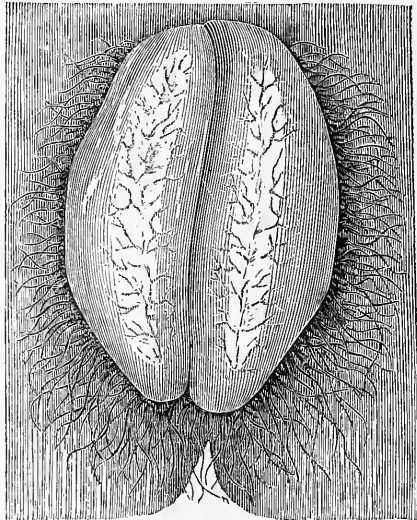
* Section of an old hemorrhoidal tumor, showing its internal structure.

pends upon the presence of hemorrhoids. In the second variety, (Fig. 62,) there is a descent of all the coats, the whole on the greater portion of the rectum falling through the external sphincter muscle. The extent to which the protrusion occurs varies from a few lines to six or ten inches. In cases of the latter kind, it is probable that there is a real invagination of the sigmoïd flexure of the colon ; for it is difficult to conceive, as has been justly remarked by Professor Syme,* of Edinburgh, how the rectum could suffer the requisite displacement, even supposing that it possessed the necessary length. When the prolapsion is complete, as in the form of the lesion we are contemplating, the tumor is commonly of an irregularly, globular figure, and varies from the size of an egg to that of the two fists. the mucous membrane is of a dark livid color, from the constriction of the capillary vessels, and affords a thin, bloody secretion, which has been compared, not un-

Fig. 61.
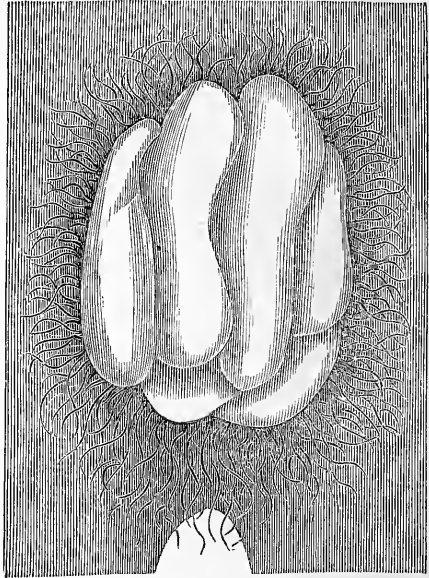
Fig. 62.

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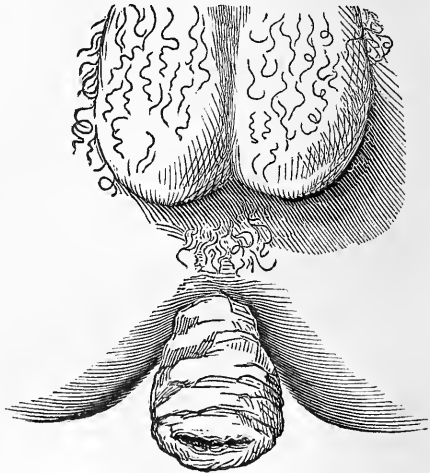
* Principles of Surgery, p. 294. Edinburgh, 1837.

aptly, to red currant jelly.   If the parts be allowed to remain long in this situation, the effect is that they not only become very much thickened, but they gradually assume a fibro-cartilaginous consistence.   Protrusion of all the tunics, it may be stated in conclusion, occurs chiefly in children and aged persons, particularly in females of relaxed frame.

A *fistula* is a small narrow passage, which has one of its openings in the neighborhood of the anus, the other in the rectum : in some instances, the upper extremity of the tube terminates blindly as a cul-de-sac.   Its length varies from a few lines to several inches ; and its diameter generally equals that of a common probe, and occasionally that of a goose-quill.   A channel of this kind may be either straight or crooked ; and when there are several of them at the same time, they not unfrequently communicate with each other.   Internally, it is lined by a layer of adventitious membrane, the surface of which, usually somewhat rugose, is constantly bathed with purulent matter, either alone, or mixed with feces.   A fistula is always preceded by an abscess, and may therefore be considered as a consequence of its imperfect restoration.

Congenital malformations are sometimes witnessed in the anus and lower extremity of the rectum, which are often incompatible with the perpetuation of the life of the individual.   When the anus is absent, the large bowel is either partly or entirely deficient, or else opens in a cul-de-sac, some distance above the usual place.   Occasionally the aperture is closed simply by a thin fold of membrane, not unlike the female hymen, which may be easily divided with the knife, and the infant survive.   Sometimes nearly the whole of the large intestine is wanting, as was the case with a foetus which I dissected a few years ago, in which the ileum terminated in a capacious cul-de-sac, two inches and a half in length, which floated loosely in the pelvic cavity.   At other times, again, the anus and rectum are natural, whilst the colon is either absent or so contracted as to render the continuance of life impossible.   Instances are also upon record, where the rectum opened into the urinary bladder, the urethra, or the vagina ; thus affording an approximation to the cloaca of birds, and of some fishes.

SECTION VIII.

Of Intestinal Worms.

FIVE species of worms inhabit the intestinal tube of the
human subject, the lumbricoïd, vermicular, tricho-
cephaloïd, the long tape, and the broad tape. These
worms are not peculiar to man : they occur frequently
in the inferior animals, and, as might be supposed,
they all have a decided predilection for particular
parts of the alimentary canal, some selecting the
small, others the large bowel. How these parasitic
beings originate is still a mooted point with patholo-
gists : all are agreed, however, in the belief that they
must arise from one of two sources, — either that they
must be introduced into the body from without, or
else be generated within. It does not accord with
the plan of this work to enter into a detail of the
various arguments that have been adduced by the
advocates of these two questions : suffice it to say,
that the great majority of the best writers of the pres-
ent day are decidedly in favor of the doctrine which
ascribes their origin to internal generation. Inde-
pendently of the fact, that many of these animals
have been discovered in a great variety of organs and
tissues, both in man, in quadrupeds, birds, reptiles,
and fishes, the circumstance that they have been re-
peatedly seen in the fœtus, seems to me to be amply
sufficient to settle the question as to their origin
within the body. Kerkringius mentions the case of
an immature fœtus, in whose stomach he found sev-
eral lumbricoïd worms ; and instances of tape-worms
having been discovered under like circumstances are
narrated by Pallas, Heine, and other authors. Rudol-
phi and Bremser, two highly respectable German
writers, refer to numerous examples of worms existing
in the fœtuses of various quadrupeds, and also in those
of birds which had just escaped from the shell.

The *lumbricoïd worm*, (ascaris lumbricoïdes, lum-
bricus teres,) as its name indicates, is of a cylindrical
shape, (Fig. 63,) gradually tapering towards each ex-

Fig. 63.*

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* Ascaris lumbricoïdes : *a*, the anterior extremity ; *b*, the posterior ; *d*, the
vulva ; *e e*, longitudinal lines.

tremity.   It is marked by numerous circular ridges, and by
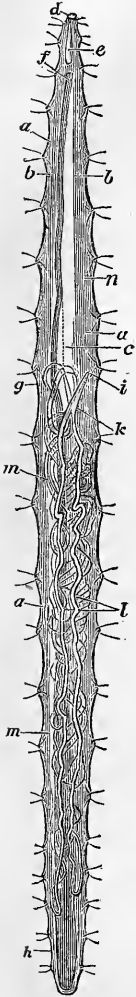
Fig. 64.*   Fig. 65.†   Fig. 66. ‡
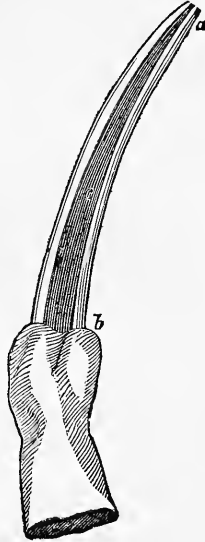
four longitudinal lines,of which the dorsal and ventral are whitish, the two lateral ones dark and opaque. The head is trivalvular, without wings or processes ; and the digestive tube, which runs in a straight course,terminates a short distance from the tail in a transverse fissure. The length of this worm is from three to twelve inches ; its thickness about that of a goose-quill ; and its color of a reddish brown, bordering upon yellow.   The male is much more slender than the female, from which it is readily distinguished by the singular curve of its caudal extremity, and by its forked penis.   This species of worm (Figs. 64, 65, 66, 67) exhibits a high degree of organization, being furnished with integuments, a muscular and digestive apparatus, and well-developed sexual organs, together, as is supposed by

Fig. 67.§
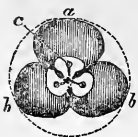
* Organs of the female ascaris: *a*, the external tunic ; *b b*, muscular fibres ; *d*, mouth ; *e*, œsophagus ; *f*, the alimentary tube ; *k l m m*, the generative organs.

† Organs of the male ascaris: *d*, the mouth ; *e*, the œsophagus ; *h h*, generative organs ; *f*, the intestine ; *g*, penis.

‡ Penis of the ascaris lumbricoïdes magnified : *a*, the extremity ; *b*, the base.

§ Head and mouth of the ascaris : *a, b b*, tubercles ; *c*, oval aperture.

Cuvier and Cloquet, with a nervous and circulatory system. Its natural residence is in the small intestines, where it often occurs in considerable numbers.   It has also been found in the large bowel, in the stomach, biliary ducts, œsophagus, fauces, and even in the larynx.   In the latter situation, it has been known as the cause of suffocation.

The *vermicular species* (ascaris vermicularis, oxyurus v., fusaria v.) is extremely small and delicate, (Fig. 68,) the male being not above the sixth of an inch in length, with a very thin, tapering body, of a whitish color.   The mouth is of an orbicular shape, with a bladder-like, transparent membrane on each side : the tail is spiral and obtuse, and the sexual organ is contained in a sheath.   The female is considerably larger, being from four to six lines long, and its tail is as fine as the most delicate needle.   The heads of these worms are in constant motion : from this circumstance they are often called leap-worms : from the uneasy, gnawing sensation which they are supposed sometimes to occasion in the stomach, they have also received the name of maw-worms ; and, from their filliform configuration, they are vulgarly termed thread-worms.   They are found only in the large intestines, especially in the rectum, where they are often collected in vast multitudes, wrapped up in thick, viscid mucus.   In females, these worms sometimes pass into the vagina, and give rise to much uneasiness.

Fig. 68.*

The *trichocephaloïd*, (trichocephalus dispar, trichuris, ascaris trichuria,) *hair-worm*, or *thread-worm*, (Fig. 69,) as it has been variously denominated, is principally found in the cœcum, and is said to be very common in the inhabitants of England and Germany.   It is also frequently met with in the inferior quadrupeds, especially the monkey, dog, and fox. This species is from one and a half to two inches in length, with a white, cylindrical body, which is almost as thin as a horse-hair anteriorly, the remaining third being considerably stouter, and terminating in a rounded extremity.   The mouth is orbicular, the head extremely slender, and the capilliform portion transversely striated : the alimentary tube runs in a

* the head ; *b*, the tail ; *, natural size.

straight course from before backwards, and terminates in the thick bulbous part, where it assumes a flat, spiral form. The male is the smallest, and is distinguishable from the female by the sexual organs, which are enclosed in a sheath, by the greater brevity of the anterior capilliform portion, and by the peculiar circular whirl of the tail.

The *long tape-worm* (Fig. 70) (tænia longa, tænia solium, tænia cucurbitiva) naturally infests the small intestines ; but it has also been observed in the stomach, colon, and rectum. This species is of frequent occurrence in different sections of the United States and Europe ; and, according to Hasselquest, it is also very common in many parts of the East, especially amongst the Jews at Cairo, large numbers of whom are affected with it. The long tape-worm is of a whitish color, from three to six lines in width, and of the average length of sixty feet. Occasionally the length is enormous. Bremser relates a case where it was one hundred and fifty feet, and others are given where it was above three hundred. Towards the anterior part, this worm suddenly tapers off into a very fine thread-like extremity, which is surmounted by a small hemispherical head, provided with four lateral suckers. The body is flat, rough, and composed of numerous joints, on one edge of which there is a slight projection, pierced by a minute aperture. The configuration of the articulations, their relative length and breadth, are much influenced by the movements of the animal, and cannot be specifically defined. The worm is rarely expelled entire : most commonly it is voided in pieces several feet long, and

Fig. 69.*
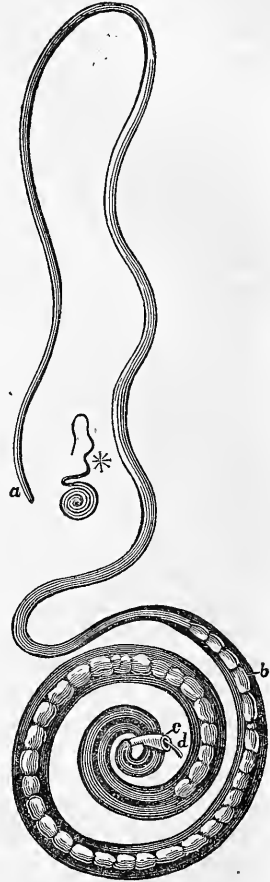
* *a*, the head ; *b*, the intestines ; *c*, sheath ; *d*, penis ; *, natural size.

not unfrequently it comes away in single joints, looking like
so many gourd seeds.
In its organization
it seems to be great-
ly inferior to the
preceding species,
being a homogene-
ous cellulo-gelatin-
ous mass, without
distinction of sexes,
or trace of a ner-
vous system. This
variety of tape-worm
seems to be at once
androgynous and
hermaphrodite, im-
pregnation occur-
ring indifferently by
means of the ap-
proximation of two
individuals, or, as is
probably more com-
monly the case, by
that of two joints of
the same animal.

Fig. 70.*

The *broad tape-
worm* (tænia lata,
bothriocephalus latus, tænia membranacea) seldom exceeds
fifteen feet, though occasionally it attains a much greater
length. It is white, flat, from six to ten lines
in width at the broadest part, which is near the
middle, and consists of a series of concatenated
joints, the intervals between which grow suc-
cessively longer the nearer they approach the
tail. In its general features, it bears a pretty
close resemblance to the long variety ; but the
articulations are comparatively larger and strong-
er ; the flattened surface of each link is perforated
by a small hole, and the head of the animal,
(Fig. 71, *a a,*) when seen by means of a lens, is
found to be of an elongated, elliptical shape,
with a large fissure on each side of it. Both
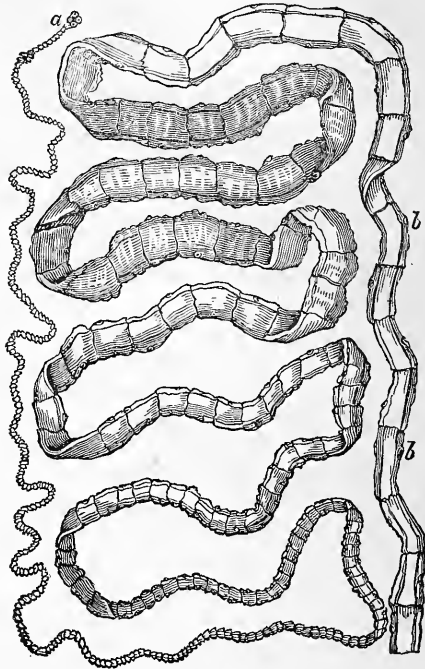
Fig. 71.

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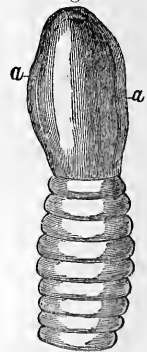
* *a,* the head ; *b b,* the lateral orifices.

extremities are remarkably attenuated, especially the anterior, which is often perfectly thread-like for twelve or fifteen inches. This worm inhabits the upper portion of the small bowel, and is very common in France, Switzerland, Poland, and Russia, — several of them often coexisting in the same individual.

Of the hundred and one *symptoms* which have been enumerated by authors as indicative of the presence of worms in the alimentary tube, there is only a single one that is of any value, and that is the appearance of these bodies in the evacuations. All the other phenomena are of negative importance, as they may result from any irritation of the mucous membrane. The functional symptoms of worms appear to vary according to the particular species. Thus, the vermicular variety induces the most distressing itching and titillation in the lower part of the rectum and anus ; the tænial, twisting and gnawing in the vicinity of the stomach, with enormous appetite, and irregular retraction of the abdomen ; the lumbricoïd, pain and itching about the navel. Worms are supposed by some to be harmless inmates of the intestinal tube, — an opinion the fallacy of which has been abundantly proved by the united experience of the profession. If allowed to remain unmolested, they not only create irritation in the mucous membrane, but cause a variety of sympathetic disorders, which eventuate either in the impairment of the general health, or even in the destruction of life. Of this description are chorea, paralysis, mania, epilepsy, hydrocephalus, with a variety of other affections which it would be needless here to specify.

CHAPTER VIII.

Of the Peritonæum.

Is liable to different forms of Disease. — Acute Inflammation. — Deposition of Lymph. — Effusion of Serum, Pus, and Blood. — Softening of the Subserous Cellular Tissue. — Parts of the Membrane most apt to suffer. — Developement of Vesicles. — Chronic Irritation. — Agglutination of the Bowels and formation of false Passages. — Tubercles. — Ascitic Effusions. — Generation of Gas. — Heterologous Growths.

THE lesions of the peritonæum may be referred to inflammation, tubercles, melanosis, and cancerous growths. A very brief description of these several pathological states is all that will be attempted in this place.

The common characters of *acute inflammation* are increased vascularity, opacity, exudation of lymph, and effusion of serous fluid. The redness is generally of a florid tint, and is either punctiform, arborescent, stellated, or patch-like, being always most intense in those cases where there is least secretion. Under opposite circumstances, indeed, the redness is sometimes scarcely perceptible, and may even be entirely absent; not so much, perhaps, from the reflux of blood from the capillaries during the agonies of death, as from the manner in which they are drained during the violence of the inflammatory excitement. This conclusion, I am aware, is opposed to that of Dr. Scoutetten,* a highly respectable French writer, who asserts that there is always increased redness after death; but that this is not the case must be familiar to every pathologist, however limited his observations.

Occasionally small ecchymoses are observed; and, in almost all cases, the membrane loses a considerable share of its transparency, assuming an opaque, turbid, or milky aspect. Much has been said by writers concerning the thickening of the peritonæum in this disease; but if this condition ever occurs, I have not been so fortunate as to witness it, and am seriously inclined to doubt whether it ever takes place.

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* Archives Générales, t. iii. p. 501.

By the time the redness is fairly established, the affected membrane throws out coagulating lymph and serum. Whether both these substances are separated simultaneously, or one precedes the other, are points which do not seem to be fully settled. The late Dr. Armstrong, of London, well known as one of the ablest physicians of the age, was of opinion that the lymph is deposited first ; whilst others maintain that the priority, if any, is always determined by the intensity of the inflammation. According to this theory, when the disease is very mild, serum seems to be thrown out first ; but, if the excitement is very acute, the earliest product is lymph.* After all, this is a mere hair-splitting affair, in which the wisest plan is to pursue a middle course, as the question cannot be easily decided without numerous experiments upon the inferior animals. To me it appears more than probable that both substances are eliminated at one and the same time, as we have reason to believe they are in the pleura and pericardium.

At first, the lymph has a soft, unctuous feel ; but by degrees it becomes dense, firm, and organized, vessels being either developed in its substance, or else shooting into it from the surrounding parts. The period at which it is vitalized varies in different cases, from thirty hours to several days, weeks, or even months. Of the numerous forms which this matter assumes, the band-like is by far the most common. Not unfrequently, however, we find it deposited in small amorphous masses, filling up the intervals between the convolutions of the intestines, and gluing them more or less closely together. In many instances, from the presence of this substance, all the abdominal viscera present one uniform surface, with extensive adhesions to the surrounding walls.

When partial, these peritonæal adhesions sometimes induce fatal mischief, by strangling the bowel. Of this an interesting case is mentioned by Dr. Abercrombie ; and another was communicated to me, a few years ago, by Dr. Paramore, of Eaton, in the State of Ohio. It occurred in his own child, a boy twenty-one months old, who was treated, at first, for worms, and subsequently for intussusception. The case lasted three days, and was marked chiefly by irritability of the stomach, with obstinate constipation : there was considerable pain in the abdomen, but no tenderness whatever on

* London Cyclopædia of Practical Medicine, art. *Peritonitis*, p. 302.

pressure.   On examination, a band of false membrane, about an inch and a half in width, was found passing over two coils of the ileum, which were thus firmly constricted, and deprived of their vitality.   Both ends of the band were attached to the mesentery, opposite the lumbar vertebræ.

The lymph is sometimes deposited in distinct layers, varying in thickness from the finest silk to the coarsest cassimere. Of a light grayish tint, they are perfectly smooth and transparent, and often contain long, slender vessels, filled with florid blood. Such adventitious membranes, from the manner in which they are attached to and spread over the surface of the bowels, may form small pouches, distended with serous fluid.

The *serum* poured out in this affection varies in quantity from a few ounces to several pounds, being always much less than in chronic peritonitis.   In its color, it differs in different cases.   Sometimes, especially when the inflammation is partial, it is clear and limpid, like water; at others, it is of a pale reddish hue, whitish, or milky, and not unfrequently it is mixed with flakes of lymph, or possesses all the sensible properties of pus.

The effusion of *pus* is a frequent termination in fatal cases, and seems to take place occasionally at a very early period of the disease ; but in general it is not considerable in quantity until the affection has existed for some time.   As there is no breach of continuity in the membrane, the matter is probably thrown out by a sort of exhalation, similar to that which is concerned in the production of the serum and lymph.   The color and consistence of the pus are various, being white, greenish, milky, or reddish, with shreds of membrane, flakes of lymph, or dots of blood.

In very violent grades of this disease, it is not uncommon to find *clots of blood*, sometimes of considerable size, in the serous cavity.   This appearance, which has been repeatedly observed by Broussais and others, has been several times witnessed in my own dissections.   In a middle-aged man, whom I examined a few years ago, along with the late Dr. Herron, of this city, the peritonæum exhibited all the marks of high inflammatory action ; and, although there was no breach of continuity or ruptured vessel, as, indeed, there rarely is in such cases, yet there were nearly two pounds of coagulated blood in the left iliac region.

There is another pathological state which is not unfrequently witnessed in connection with peritonitis, and which

is of too important a character to be passed wholly unnoticed on this occasion. I allude to the softening of the subserous cellular substance. This lesion, although principally observable in the acute form of the disease, is by no means peculiar to it. It is generally associated with sero-purulent effusion, and is particularly conspicuous in the pelvic portion of the peritonæum, in the persons of lying-in females, and in those who fall victims to injuries of the rectum and urinary bladder. The softening, which sometimes involves a large extent of surface, often amounts to such a degree as to permit the serous membrane to be peeled off with the greatest facility from the organs which it serves to envelope. This lesion, which appears to have been known to De Haen, has been particularly pointed out by Dr. Hodgkin, of England; but I had met with it several times before the excellent work of that distinguished anatomist fell into my hands. A similar pathological condition is occasionally seen concurrently with the preceding, in the submucous cellular substance of the stomach and bowels, produced, in all probability, by an extension of the irritation from the serous envelope.

All parts of the peritonæum are not equally liable to inflammation : the portions most commonly affected are the broad ligaments of the uterus, and the covering of the small intestines, especially of the ileum, together with the tunic of the spleen and liver. Rarely is the parietal part of the membrane implicated ; and the same remark is applicable, in a still higher degree, to the serous envelope of the stomach. Indeed, serous gastritis must be regarded as an extremely infrequent disease, infinitely more so than is generally imagined by the profession. In all my dissections, I cannot recall a single instance in which this portion of the peritonæum betrayed the least sign of acute inflammation. True it is, the organ is occasionally found glued to the neighboring structures, as the spleen, diaphragm, or arch of the colon ; but even this circumstance is far from affording conclusive evidence that it was the seat of the effusion which led to this pathological condition.

Nor does the disease always remain confined to the original seat of the attack. Thus it often happens that the external coat of the bowel is inflamed in the first instance, and that the irritation is afterwards propagated, either rapidly, or step by step, as it were, to the other layers, or even to the wall of the abdomen.

On some occasions, the peritonæum is elevated into little *vesicles*, produced by an evolution of air in the subjacent cellular tissue. Dr. Gendrin tells us that he has several times noticed this phenomenon in his experiments on inferior animals ; and, he moreover adds, it is very often met with in the violent inflammations which supervene upon intestinal effusions. Another phenomenon, which is sometimes noticed, is the developement of gas, either in the peritonæal sac, or in the digestive canal, or in both these cavities simultaneously.* How this fluid originates, it is not very easy to determine ; perhaps, however, it would not be going too far to suppose that, in some instances, it is the result of a true secretion, whilst, in others, it is separated from the effused liquids and alimentary substances.

Bold and well-marked *symptoms* often usher in this disease ; nevertheless, its progress is frequently insidious, and the phenomena, both local and general, such as not to afford any satisfactory indications of the mischief that is going on in this important membrane. Thus, there may be little or no gastric irritability, little or no pain, little or no derangement of the bowels. Towards the close of the disease, however, there is usually vomiting, a tense and tympanitic condition of the abdomen, an anxious and contracted state of the features, great prostration of strength, and pain, on pressure, over the region of the belly, with diarrhœa or constipation. Often, the least pressure is insupportable, and even the weight of the bed-clothes is distressing. The pain, though occasionally wandering, is generally fixed, acute, and constant ; and the patient rarely lies in any other position than on the back. The formation of matter is indicated by irregular chills, diminution of the abdominal pain, with a sense of weight and oppression, pallor of the countenance, and coldness of the extremities.

The presence of plastic lymph, with partial adhesions, is indicated, at an early stage, by a remarkable symptom, which was discovered, a few years ago, by that eminent pathologist, Dr. Bright, of London. It consists in a peculiar crepitating sensation, not unlike what is produced by bending a sheet of new leather, which is recognized by the hand when applied to the abdomen in a mode calculated to facilitate motion. It has also been likened to the obscure creaking of pulmonary

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* Gendrin, Histoire Anatomique des Infl. t. i. p. 138.

emphysema, and to the sensation caused by passing a wetted finger over a pane of glass. It is felt both during the ascent and descent of the diaphragm, but more distinctly during the latter, and appears to result from the friction of the roughened surfaces of the peritonæum. This symptom, it should be added, is to be perceived only when the lymph, upon the presence of which it depends, is of a plastic, organizable character, competent to form adhesions, and never lasts beyond a few days.

The bowels, in this disease, as we have already seen, are sometimes firmly agglutinated to each other, and to the parietes of the abdomen. When this happens, the diagnosis, as might be expected, must be extremely obscure and difficult. Indeed, there is no symptom or group of phenomena, upon which we can place any special reliance. Dr. Armstrong says that such adhesions may generally be suspected by an irregularly lobulated state of the bowels, perceptible on passing the hand over the abdomen ; but this sign is by no means constant, even in recent cases, whilst, in those of long standing, or in which the adventitious substance is in great measure absorbed, or transformed into the cellular and serous tissues, it is generally entirely wanting. Occasionally, though rarely, the patient experiences a sensation, as if a ball were rolling about the abdomen. The caliber of the bowels is often very much diminished ; and these organs are either habitually torpid, or very much relaxed.

Acute peritonitis generally ends favorably or fatally in from five to ten days from its invasion. Occasionally it is disposed to run into *gangrene*. This termination, which is more liable to occur here than in any other serous texture, is anatomically characterized by the black, grayish color of the affected part, by its soft, pulpy consistence, by its disagreeable, fetid odor, and by the facility with which it can be scraped off from the subjacent structures. If there be any adventitious membrane, it usually participates in the disorganizing process, assuming the same appearances as the natural texture.

In *chronic* peritonitis, the affected part is of a darker color, the vessels are more dilated, and the subjacent cellular tissue is more dense and thick. The serous texture itself is sometimes hypertrophied, not uniformly, but in patches ; but this effect is by no means so well marked as is asserted by pathologists, and, in fact, is often entirely absent. Brownish, grayish, bluish, or dark slate-colored spots, are frequently observable in this affection, and might be mistaken by the young anatomist

for gangrenous eschars ; from which, however, they can be easily distinguished by their firmness, want of odor, and great extent, — the whole peritonæum being occasionally marked with them. But we must not always expect to find this membrane discolored ; for, in protracted cases, it is more common to witness the opposite state, the affected parts being unusually white and milky.

The false membranes are often very thick, forming large masses of fibro-cellular substance, by which the abdominal viscera are agglutinated into one general mass. When these structures ulcerate, their ordinary color is a dirty green ; but they may also present various shades of yellow, gray, and brown, especially when, as sometimes happens, they are much impregnated with blood. Occasionally these membranes do not become organized, but have a friable, rotten aspect. Masses of this description have been found from two to three inches thick, overspreading the whole peritonæum like a poultice of mashed carrots.*

The plastic lymph which is thus poured out not only serves to agglutinate the abdominal viscera more or less firmly to each other and to the enclosing parietes, but it occasionally becomes the seat of fistulous tracks, having either the arrangement of a blind sac, or communicating at each extremity with the intestinal tube. In the only instance in which I have observed this condition, and the only one, indeed, of which I have any knowledge, the canals were of an irregularly cylindrical shape, from two to four lines in diameter, and from two to nine inches in length. The course of all, five in number, was remarkably tortuous. The principal one extended in an oblique direction over the anterior surface of the small bowel, from the sigmoïd flexure of the colon, towards the right side of the abdomen ; where, after a distance of six inches, it terminated in two branches, each three inches in length ; one of which opened into the upper part of the jejunum, the other into the upper part of the duodenum. The internal surface of these channels was somewhat rough and fleecy, as if lined by a mucous membrane : their parietes were of a fibro-cartilaginous consistence, and insensibly blended with the surrounding adventitious textures. At the time of making the examination, they all contained a small quantity of fecal matter, of the same nature as was found in the small and large intestines.

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* Hope, Principles of Morbid Anatomy, p. 224.

The manner in which these new channels are found may be explained in one of two ways. In the first place, we may suppose that they are generated under the immediate influence of ulceration and perforation of the bowel. Under ordinary circumstances, the consequence of such an event would be an extravasation of fecal matter into the peritonæal sac, rapidly followed by fatal inflammation. But, in a case like that before us, no such occurrence, it is obvious, could possibly take place, owing to the manner in which the intestinal coils are tied together. Hence, when the bowel becomes perforated, its contents, instead of escaping into the abdominal cavity, find their way into the connecting adventitious substance, where they excite ulcerative absorption, and thus gradually generate passages of communication between different parts of the alimentary tube. What countenances this view is the fact that, in the interesting case which fell under my observation, there were numerous ulcers both in the small and large bowel, and that the new channels all opened into these reservoirs. The individual, a patient of Professor Drake, was about twenty-eight years of age, during the four last of which he had been harassed almost incessantly with a griping diarrhœa, the relic apparently of a severe attack of Asiatic cholera, complicated with acute peritonitis. Latterly, whenever he took food, it would generally in a few minutes pass by the bowels, in the state in which it was swallowed. All the abdominal viscera were firmly and inseparably melted together; and the caliber of the whole intestinal tube was contracted to nearly one half the original volume. In different parts of its extent the new substance was studded with hard, grayish, miliary tubercles, distinctly encysted, and many of them as large as a common pea.

We may suppose, secondly, that these fistulous tracks are formed under the influence of purulent matter, poured out either simultaneously with the plastic lymph in which they are situated, or subsequently to the establishment of adhesions. The fluid which is thus accumulated, instead of being absorbed, or extravasated into the peritonæal sac, works its way into the neighboring intestinal coils, through which it finds a ready outlet. In proportion as the contents of the abscess are evacuated, fecal matter passes in and supplies their place; for the opening in the bowel, being prevented from closing up, remains permanently patulous. According to this theory, the ulceration of the intestinal tunic, it will

be observed, is supposed to be consecutive to the formation of the fistulous tracks.

Cases are occasionally observed in which these membranes, both natural and adventitious, are of a fibro-cartilaginous consistence ; and a very common occurrence is the developement of *tubercles*, either upon their surface, or in their substance. In their size these bodies vary between a mustard-seed and a common pea ; and in several instances I have found them so numerous as to cover nearly the whole peritonæum, thousands of them being visible in every direction, both on the visceral and on parietal portions of the membrane. In a case which I recently examined, the tubercles were seen in every stage of developement, from the consistence of recent lymph to that of fibro-cartilage. Many of them were confluent, like the pustules of small-pox, and not a few appeared to have vessels shooting into them from the surrounding parts, which were highly vascular, as well as considerably thickened.

Although there is no part of the peritonæum which is entirely exempt from these heterologous bodies, yet they appear to be much more liable to occur in some situations than in others. In my own dissections, I have constantly found them more abundant, larger, and more distinctly developed, in the iliac and pelvic portions of the membrane than at any other points. They are also frequently seen on the mesentery, the omentum, and the serous coat of the spleen. In the early stage of their formation, they are so soft as to be easily wiped away ; but they gradually increase in density, and finally assume, as was previously stated, a fibro-cartilaginous, cartilaginous, or even bony hardness. In some instances they have the consistence of putty, dry curds, or of semi-concrete mortar. The older ones are generally distinctly encysted, the enveloping membrane, which is very thin and delicate, being evidently of new formation ; those, on the contrary, which are more recent, are unprovided with such a covering, and appear to consist merely of little masses of plastic lymph in a state of incipient organization. No particular symptoms are occasioned by the presence of these bodies ; and, in the generality of cases, they occur in scrofulous subjects, in connection with tubercles of the lungs, spleen, liver, or other organs.

The effusion in chronic peritonitis is sometimes perfectly clear and limpid ; but more commonly it is of a greenish tint, white or milky, and blended with purulent matter, and

flakes of lymph. Occasionally we find it reddish, from the exhalation of blood. The accumulation of watery fluid is sometimes immense. Dr. Cordes, of Hirschberg, in Germany, mentions a case, in which the patient, a female, forty years old, was tapped in the short space of eighteen months, fifty-nine times, and five hundred and sixty-nine quarts of water drawn off.* A still more remarkable instance has been recently detailed by Dr. Beall, of the State of Missouri. The patient, a gentleman, whose age is not stated, was tapped ninety-six times within a few years, and the whole amount of fluid evacuated was two hundred and seventy-five gallons and a half, the first fifteen operations yielding an average quantity of twenty quarts ! †

The diagnosis of ascitic effusion is usually unattended with much difficulty. The only state, indeed, with which it is liable to be confounded is pregnancy. From this, however, it may in general be easily distinguished, first, by the history of the case ; secondly, by the fluctuating nature of the tumor ; thirdly, by the subsidence of the fluid to the more dependent parts on varying the posture of the patient ; fourthly, by the effects of hydrogogue medicines ; and, lastly, by the absence of the ordinary symptoms of gestation. In a few instances, I have been able, by applying the ear to one side of the abdomen, and striking the other with the fore and middle fingers, to recognize a peculiar plashing noise, similar to what results from the agitation of a half empty cask of water. Percussion produces a dull, flat sound, which is always most distinctly marked in the hypogastric region, as it is here that we usually find the greatest degree of accumulation. Higher up, the sound is commonly somewhat sonorous or *humoric*, as it has been styled by M. Piorry, from the presence of the intestines, which, on account of the gaseous nature of their contents, generally follow the upper level of the effused liquid.

There is a singular circumstance connected with the present topic deserving of brief notice in this place. I allude to the fact that the water in ascites occasionally exerts such a degree of pressure upon the recto-vaginal portion of the peritonæal sac as to make the perinæum bulge out in the form of a tumor. This singular lesion was first accurately described, I believe, by the late Dr. Denman, of London, in

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* Walther's and Græffe's Journal der Chirurgie, &c. 11 ter. B.
† Western Journal of the Medical and Physical Sciences, vol. x. p. 343.

his excellent work on midwifery, though it had been incidentally noticed by other writers. The swelling varies in size between an orange and a fœtal head, and is generally of an irregularly oval figure, like the urinary bladder : it distinctly fluctuates under the finger, and disappears temporarily on pressure. When large it is usually more or less translucent, and projects forward so as perfectly to occlude the mouth of the vagina. The internal coat of the tumor is formed by the peritonæum, the external by the perinæum, which is sometimes inverted.

Gas is also occasionally generated in this disease, and in some instances it has been known to possess the odor of sulphureted hydrogen. It generally occurs in connection with sero-purulent effusions, and is most common in that variety of peritonitis which is primitively chronic. Broussais and Scoutetten also inform us that they have sometimes seen minute, yellowish vesicles, filled with limpid serum, and bearing a considerable resemblance to hydatids. None of these appearances have ever been witnessed in my own dissections, and I presume that they are very rare. The same may be said of ulceration of this membrane, a lesion which has been observed several times by Portal, Bonet, and Scoutetten.

In chronic peritonitis, when matter is formed in the abdominal cavity, it sometimes works its way along the spermatic cord, and points externally. Dr. Gordon, of Edinburgh, relates several cases in which it escaped at the umbilicus, and another in which it found an outlet through the urethra. A person thus circumstanced may live a considerable period, with a fistulous opening, or fatal inflammation may arise from the ingress of air.

This disease occasionally exists as an intra-uterine disorder. Of this several interesting examples are detailed by Morgagni and Billard. The children were pale and much emaciated, and thick, old membranes were found in the abdomen, agglutinating the viscera so firmly together that it was difficult to separate them. Even tubercles, such as we have briefly described them, have been detected in several instances in children that have died within a few hours after birth.

Chronic peritonitis often lasts for a considerable length of time, and is occasionally extremely obscure and insidious in its nature. These characters are well shown in a case mentioned by Dr. Abercrombie. A young lady, aged sixteen, had been observed for several weeks to lose flesh and strength, with listlessness and impaired appetite. She be-

came easily fatigued by exercise, had a hectic look, a foul tongue, and a pulse of one hundred and twenty in a minute : the abdomen was tumid and somewhat tender on pressure, but otherwise she did not seem to suffer any inconvenience.

These symptoms continued from the fifth until about the fifteenth of April, when she seemed to improve somewhat in spirits, strength, and appetite; but the pulse remained frequent, being generally from one hundred to one hundred and twenty, and the abdomen retained a considerable degree of tympanitic fulness. The bowels were regular in their action, and, excepting some griping pain, there was no particular uneasiness. In May she became worse, the emaciation and debility gradually augmenting, but still there was no local pain. At the end of the month she had some vomiting and occasional diarrhœa, the former of which became more and more frequent, until at length she was unable to retain any thing on the stomach. She expired early in June, having been confined to bed only a few days.

On inspection, the contents of the abdomen presented one solid mass of adhesion, in which it was impossible to distinguish one intestine from another. The mass likewise adhered extensively to the walls of the abdomen ; and in various parts of it were small cavities, containing purulent matter, and exhibiting on their surface unhealthy scrofulous ulcerations. The liver was considerably enlarged, as were also the mesenteric glands, and much pus was found in the pelvis.

Melanosis is sometimes found after chronic peritonitis, the form in which it is poured out being liable to considerable variety. Occasionally it occurs as an infiltration in the connecting cellular tissue ; but more commonly it is deposited upon the free surface of the serous membrane, and observes a punctiform, stratiform, or nodulated arrangement. The parts of the peritonæum most prone to this lesion are, the great omentum and the epiploïc appendages of the colon, from the predilection, probably, which this substance has for the adipous tissue. In the nodulated variety, the tumors, whether isolated or agglomerated, generally adhere by small footstalks, and are enveloped by cysts of fine cellular tissue, often furnished with delicate vessels. When in layers, this substance is covered over by a thin film of membrane, and is apt to be confounded with common hemorrhagic effusions, altered in their color by the chemical action of certain acids and gases, developed either in the intestinal tube, or in the peritonæal cavity.

Scirrhous, steatomatous, and *encephaloïd tumors* sometimes grow from the peritonæum, so large as to encroach very materially upon the abdominal viscera. Of the two first varieties of disease I have never seen an example; but, of the latter, an interesting specimen was transmitted to me, about eighteen months ago, by Dr. George E. Conant, of Huntington, in the State of Ohio. It was taken from the body of a little girl, five years of age, and weighed eleven pounds nine ounces. It occupied the whole abdominal cavity, extending from the ensiform cartilage low down into the pelvis, concealing the small bowels, and adhering to the great omentum — from which it seemed to originate — the uterus, the urinary bladder, and the parietal portion of the peritonæum. The tumor is of a whitish yellow color, lobulated, soft and doughy, with numerous vessels, of a large caliber, ramifying over its outer surface. Internally, it has a distinctly fibrous arrangement, and contains numerous little cells, some of which are filled with pus, some with a thin, turbid sanies, some with blood. This immense encephaloïd mass could be easily felt through the abdomen during the life-time of the little patient; and its presence occasioned, especially towards the last, the most frightful dyspnœa, together with great emaciation, and gradual exhaustion of the powers of the system.

The most ordinary form in which the encephaloïd matter occurs is that of small tumors, from the size of a bean to that of an egg. Their shape is either spherical or pear-like, and their number is often quite great, from twenty to a hundred being found in the same individual. They are generally of a dull white color, mottled with dark modena spots, are surrounded by a very delicate yet distinct membrane, and are penetrated at different parts of their circumference by minute florid vessels, which thus supply them with blood. The contents of these tumors are subject to considerable variety; for, whilst some are composed almost wholly of cerebriform matter, others are made up of a soft grumous substance, or of a fluid closely resembling thin jelly or half-boiled arrow-root. On some occasions they are exceedingly vascular, and present an appearance very much like that of the spleen. These heterologous growths are frequently observed on the visceral portion of the peritonæum, and they generally coexist with similar formations in other parts of the body.

CHAPTER IX.

Of the Biliary Apparatus.

SECTION I.

Of the Liver.

THE liver, situated, as every body knows, in the right hypochondriac region, also in part in the epigastric and left hypochondriac, is a large glandular organ, from ten to twelve inches in breadth, from six to seven in length, and from two and three quarters to three and a half in thickness. In *weight*, it varies from two pounds and three quarters to three pounds and a half; consequently, it may be said to constitute about the thirty-fifth part of the entire weight of the human frame. Its volume, however, it should be observed, is much influenced by the state of its own circulation, — a circumstance which might be anticipated from the immense quantity of blood which is continually poured into it by the hepatic artery and portal vein. Of the extent of this influence, a good idea may be formed by removing the liver from the abdomen and washing out its fluids, when its bulk will be found to be considerably diminished, as is shown by its collapsed and wrinkled aspect. Nor is this all. Whatever has a tendency to retard, interrupt, or prevent the return of the blood from the hepatic veins to the right side of the heart, must induce congestion, with all its necessary evils, in the organ under consideration. Hence it is found that disease of

the liver is often directly dependent upon lesion of the heart or large veins.

That the *color* of the liver, the next subject to be noticed, should be modified, and, if I may so express myself, controlled by the amount of blood which it receives, no one can for a moment doubt. Accordingly, we find, that, in the foetus, in which the liver is always remarkably vascular, the color is much more florid than some time after birth, or in the subsequent periods of life. In the adult, it is generally of a reddish-brown, with spots of blue, particularly along the anterior margin and under surface. In persons who are hung, the liver is usually of a deep pink color, — sometimes quite purple. Such, in a few words, is the healthy complexion of this important organ. How it is altered by disease will appear in the sequel.

In simple *congestion*, the hepatic tissue is generally of a florid red ; the arteries and veins are preternaturally distended, and blood flows freely on making sections of it. By a careless observer, this condition of the liver might be confounded with inflammation, but may be readily distinguished from it, by the greater uniformity of its color, by its pervading the entire organ, and by the facility with which the blood may be squeezed from its vessels. Dr. Kiernan, of London, has recently shown, that, when the congestion results from the portal veins, the granules are the parts which are most vascular ; whilst, when it is caused by the hepatic veins, it is most distinct in the intervening cellular tissue. When both systems are filled with blood, the redness will be equally conspicuous in both textures. This is an important circumstance, and should not be lost sight of in our investigations.

The *parenchymatous structure* of the liver is very fragile and lacerable, yet so compact that it cannot be much compressed. When torn, it assumes the appearance of small polyhedral granules, each of which may be considered as a perfect gland, as it is furnished with an appropriate excretory duct, together with nerves, blood-vessels, and absorbents. Their size equals that of a millet-seed, and their number is incalculably great. Lodged each in a distinct capsule of cellulo-fibrous substance, they are of a lighter color usually than the surface of the liver ; and, when a section is made of them, they appear to be porous, — though whether this be really the case or not is a point upon which anatomists are still unde-

cided. Around them may be observed, in a collapsed state, the branches of the portal vein, accompanied by those of the hepatic artery, and those of the hepatic duct, the latter being frequently distinguishable by the exuding bile.

An important question here arises, not only in a physiological but also in a pathological point of view, namely, — are there two distinct sets of granules in the liver ? Ferrein, Meckel, Andral, Hope, and other highly respectable anatomists, think that there are, and, in support of their opinion, allege that, in certain diseases of the organ, they are distinctly perceptible, one being yellow, the other red. Without entering into an elaborate discussion of the subject, which the limits of this paper would render improper, I shall content myself by observing, that, so far as my own researches go, I see no reason for adopting the sentiments of these eminent authorities. Nor am I singular in my want of orthodoxy upon this point. Professor Cruveilhier, of Paris, who may be considered as decidedly the best anatomist, both descriptive and morbid, of the present day, positively asserts, upon the evidence of a series of the most carefully conducted observations, that there is only one order of hepatic granules, lying in juxtaposition, and having each a cellulo-fibrous envelope.* The same sort of testimony is borne by Dr. Kiernan, in his admirable monograph on the structure and functions of this organ, published in 1833. He states that he has satisfied himself by repeated injections, by examinations with the microscope, and by experiments on living animals, that the two species of granulations described by Andral and others are perfectly identical, both in their texture and office ; and he attempts to account for the error into which they have fallen, by referring the difference of appearance to a difference of congestion, the color of these bodies being red when the portal capillaries are engorged, but light yellow when there is distention of the minute branches of the hepatic veins.

In the liver of the hog, in which these granules are unusually distinct, and of a polyhedral form, I have repeatedly looked for these two orders of acini, but never, in a single specimen, have I been able to make them out. For this reason, therefore, as well as from the testimony of the French and English anatomists whose names have been quoted, I am warranted in the conclusion that they do not exist.

Anatomie Descriptive, t. ii. p. 567

In the infant, the acini are much less distinct than in the adult. When a section is made, the parenchymatous substance seems to be much more homogeneous; and, if torn, it does not exhibit such a well-marked granular aspect. Its consistence, also, is more tenacious, and the organ is much less liable to rupture from accident.

The liver is enveloped by two *tunics*, which, although they are intimately connected, differ from each other widely in their structure, and in the purposes which they are destined to fulfil in the animal economy. Of these, the external, after covering the greater part of the surface of the organ, forms a number of folds, improperly called ligaments, which unite it to the diaphragm and wall of the abdomen. Derived from the peritonæum, it is perfectly transparent, smooth, and lubricated, for allowing the liver to move, without detriment, upon the surrounding parts. No vessels can be discerned in it in the healthy state; and, when diseased, it often adheres to the neighboring structures by bands of adventitious cellular tissue.

The other membrane, usually named the *proper coat*, is much the more important of the two, inasmuch as it may be considered as constituting the frame-work of the entire organ. Not only does it enclose and sustain the liver, but sends thousands of processes into its interior, which, intersecting each other in every conceivable direction, form so many minute capsules for the hepatic granules. Thus, each of these little bodies may be viewed in the light of a representative of the entire gland, as it is not only furnished, as already stated, with appropriate vessels and nerves, but likewise with its own proper covering.

In structure, this tunic assimilates itself to the fibrous membranes. It is by no means so close and thick as the pericardium, with which, however, it has many important characters in common. Thus, for example, it is composed of fibres which interlace in different directions, and is in contact on one side with a serous membrane, which, in both cases, answers a similar purpose, — that, namely, of facilitating the movements of the respective organs. Nor does the analogy cease here. In inflammation of the fibrous coat of the liver, the disease is generally propagated to the parenchymatous structure, in virtue of the processes which the membrane sends into the interior of the organ, and also of its close connection with its outer surface, in the same manner as an inflamma-

tion of the pericardium may be propagated to the muscular substance of the heart along its serous investment.

Much difficulty is experienced, and much dexterity required, in dissecting this membrane from the part with which it lies in contact. On the concave surface of the liver, it is almost impossible to display it ; but, anteriorly, and especially towards the upper margin, it is very easy to raise it in the form of a strong, thick, dense, and consistent coat, inelastic, and of a light grayish color. In a preparation in the museum of the Cincinnati College, the membrane in question is nearly the twelfth of an inch in thickness. Superiorly it runs into the cellular tissue which is so abundantly found at the upper border of the liver, and which serves the important purpose of connecting the organ with the diaphragm. The mode of this connection should never be lost sight of in our pathological investigations. By bearing it in mind, we shall be enabled to account for the manner in which disease may be propagated from one of these structures to the other, and how the matter of an abscess, that is originally formed in the liver, may find its way into the lungs, and be finally expelled by coughing.

The discovery of this important tunic has been claimed by some of the German anatomists for Professor Sœmmering ; by the French, for the celebrated Laennec ; but the truth is, it was described more than a hundred years ago by Dr. Grieve, an English physician.*

Nor can all the good be done by paying attention simply to the healthy and morbid appearances of the liver. To the practising physician, with a view of determining the diagnosis of some of the structural lesions of the organ, a knowledge of its *situation*, in respect to the neighboring parts, is of tantamount importance. Such information will be in the highest degree useful, also, as enabling him to comprehend how an enlarged liver may compress the stomach and interrupt its functions ; how it may produce jaundice, by impeding the flow of bile ; dropsy of the abdomen, by obstructing the return of the blood to the heart ; how abscesses, originally formed in the hepatic tissue, may burst into the surrounding organs.

The position of the liver is sometimes singularly altered, even although it may not have undergone any change in bulk. Thus, in hydro-thorax, it may be prominently felt, not only

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* De Secretione Bilis, Edinburgh, 1731.

in the epigastric, where a part of it is naturally situated, but also in the umbilical, and left hypochondriac regions. On the other hand, in copious ascitic effusions it may be forced so high up into the chest as to encroach seriously upon the right lung, producing atrophy in that viscus, and terrible dyspnœa. Sometimes, again, the liver is pushed over into the left hypochondriac region, by an encysted tumor, or by enlargement of the right kidney. Now all these facts should be borne in mind by the physician, as they have an important relation to the diagnosis of abdominal diseases.

The *lesions*, which will be treated of in the present chapter, are, inflammation, suppuration, gangrene, softening, induration, hypertrophy and atrophy, tubercles, cancer, melanosis, hydatids, adipous degeneration, worms, cartilaginous and osseous concretions, apoplexy, and laceration.

Inflammation of the liver may involve either its proper substance or its investing membranes, and, like the same disease in other organs of the body, it may be either acute or chronic. The acute form of the complaint is of rare occurrence in this country, but is sufficiently common in hot climates. In warm latitudes, there is always, as is well known, a high degree of nervous excitability of the chylopoietic viscera, and hence nothing is more usual than to see a large proportion of the maladies of those regions characterized by a predominance of inflammation of the stomach, liver, bowels, or spleen. In our Southern States, almost all diseases assume a bilious type ; but whether the liver labors under much inflammatory irritation, or is merely sympathetically affected, are points which still remain undetermined. The term *congestive*, which is so much in vogue with the physicians of those regions, seems to me to be often used unmeaningly, certainly without a proper regard to the fundamental principles of pathology. It is with them a sort of talisman, — a mantle which covers a multitude of sins in the way of unsuccessful practice. That the internal organs, and especially the liver and spleen, are often inundated with blood in the intermittent and bilious fevers of those districts, may be readily supposed ; but that this condition can last long without inflammation, is what very few will be willing to concede.

Inflammation of the liver appears occasionally to assume an epidemic type, affecting a considerable number of persons at the same time. An instance of this tendency occurred in

1828, in the city of Dublin, where, as we are informed by Professor Stokes, prior to this period, acute hepatitis was looked upon as a very rare disease, — a case being seldom met with more than once in a year or two, in their largest hospitals. At the date here specified, however, every institution of the kind in the Irish metropolis had a considerable number of individuals afflicted with it, and of these not a few died.

The anatomical characters of *acute hepatitis* vary, as might be expected, according to the intensity of the irritative action, and the length of time it has been in operation. In general, the first perceptible effect is an increase of the vascularity of the parenchymatous structure, which becomes engorged in circumscribed spots, of a light red color. The part affected is somewhat tumid, abnormally dense, and bleeds freely on being incised : the hepatic canals are distended with a viscid, yellow, brownish fluid ; and the acini are increased in size, and of a florid tint, though sometimes the reverse is the case, these bodies being much less distinct than natural.

In a more advanced stage, in addition to the vascularity, the hepatic structure becomes singularly softened, so that it may be reduced, by the slightest pressure of the finger, to a mere pultaceous mass. This state is analogous to the second stage of acute pneumonitis, and, like it, may be accompanied by the formation of pus, or a deposition of lymph upon the serous surface. In this respect, however, there is a wide difference between the liver and the lung, as we seldom meet with inflammation of the substance of the latter without pleuritis, while the reverse often obtains in acute hepatitis.

In its transition from the first to the second stage, the inflammation gives rise often to various shades of color. Thus, the parenchyma may be of a deep red, disposed in arborescent lines ; or the vessels may encircle the acini in the form of wreaths, which freely anastomose with each other. When the disease is very intense, it is not unusual to see a number of small ecchymoses, produced by a rupture of some of the capillary arteries or veins ; and instances frequently occur in which the affected part assumes a deep brownish, violet, or mottled aspect, the latter appearance being particularly liable to happen when the inflammation occurs in circumscribed spots. In such cases, the whole portal circle is gorged with black blood, the biliary ducts are deeply injected, and their contents, being of a sero-sanguinolent nature, have no longer

that bitter taste and ropy feel which characterize healthy
bile. The mucous coat of the duodenum, also, is more or less
phlogosed, and the minute branches of the hepatic artery and
portal vein no longer admit injecting matter.

It is not often that the whole of the liver is involved in
acute inflammation : most commonly it is limited to its sur-
faces, to its borders, or some of its deep-seated parts. In the
latter case, the disease sometimes escapes the attention of
the examiner, owing to the normal aspect of the exterior of
the organ. Hence the necessity, in all our investigations,
after having tied the large vessels, of removing the liver from
the abdomen, and cutting it into thin slices. In some cases,
especially such as follow surgical operations, the hepatic and
portal veins are inflamed ; and cases occasionally occur in
which these tubes are filled with purulent matter.

When the inflammation is seated in the investing mem-
branes, they exhibit the same appearances pretty much as the
fibro-serous textures generally. Numerous vessels pervade
them, passing up from the parenchymatous texture, and they
are thicker and more opaque than in the healthy state. Lymph
is also commonly deposited upon their outer surface, either in
narrow bands, in small patches, or in considerable masses.
The organ being thus glued to the neighboring parts, is often
compressed, and much restrained in its movements. In some
instances it is literally buried in lymph, and so strong are its
adhesions, that much dissection is required before it can be
removed from its situation. The disease, however, is seldom
thus extensive : in the generality of cases, it is limited ; and,
if I may judge from my own observations, it has a peculiar
predilection for the anterior segment of the membranes.

Does disease of the substance of the liver ever exist with-
out involving its coverings, and, conversely, of its coverings
without involving its substance ? Upon this point, different
opinions have been expressed by different writers ; some
answering affirmatively, others negatively. M. Bonnet, a recent
French writer, evidently a disciple of the Broussais school,
maintains that inflammation of the hepatic parenchyma is
almost always accompanied with inflammation of its perito-
næal investment. The arguments, however, upon which he
endeavors to sustain his proposition have but a very slender
foundation ; and, as they are directly at variance with the
testimony of some of the best authorities of the present day,
no further notice need be taken of them here. The dissec-

tions of Annesley, of Andral, and of Louis, are sufficient to negative a thousand speculative notions; and, if any reliance is to be placed upon them, it must be clear enough to every candid mind, that the very reverse of the position assumed by M. Bonnet is the true one. Not only do these pathologists assert that hepatic peritonitis is of extreme rarity, but they declare, upon the evidence of repeated personal observations, that the substance of the organ may be greatly altered, nay, even seriously disorganized, and yet its tunics be perfectly sound. "Even abscesses of the liver," says Mr. Annesley, "may proceed to the utmost extent, and ultimately break into the abdominal cavity, without having induced inflammation of the serous surface, where they point, and consequently without forming adhesions to the parts with which they are in immediate and close contact."

Not much need be said here of the *symptoms* of acute hepatitis, as all the information that the student may desire upon this point can be obtained in the common treatises on the practice of medicine. The local phenomena, to which my remarks will be limited, may be referred principally to the pain, tenderness, and swelling in the region of the affected organ. When the disease is seated in the parenchymatous structure, the pain is of a dull, heavy, aching character; if in the investing membranes, it is sharp, lancinating, and often extremely severe. In either case, but especially in the latter, it is *constantly* increased by pressure, by inspiration, and by coughing. In some instances, the pain is felt in the right shoulder, along the spinal column, under the short ribs, in the loins, or in the epigastric region; but, as these symptoms may arise from other affections, as, for example, inflammation of the top of the right lung, incipient phthisis, pleuritis, aneurism of the right subclavian, gastritis, colonitis, or disorder of the kidney, they are perfectly worthless as diagnostics. The patient lies commonly on the affected side, seldom on the back or on the left side; in which respect, there is a striking difference between this disease and acute pleuritis, in which the person always lies on the sound side.

The tumefaction of the liver, which, next to the pain and tenderness, may be regarded as the most important symptom, is seldom considerable. When it is, the right hypochondriac region appears unnaturally full, and the margin of the organ can be felt beneath the edges of the false ribs. In some instances, the costal cartilages seem to be tilted out; but, in

such cases, the intercostal spaces retain, almost invariably, their depressed appearance,— affording thus a striking contrast between hepatic and pulmonic disease, in the latter of which, when the cavity is distended, the intercostal spaces are either flat, or pushed beyond the level of the ribs.

Such, then, are the three signs upon which our principal reliance is to be placed, when endeavoring to make up our diagnosis of acute hepatitis, *pain, tenderness on pressure, and swelling*. Add to these, the position which the patient assumes in bed, the derangement of the digestive organs, and the inflammatory state of the system, and little or no difficulty can occur in coming to a correct decision.

Acute inflammation sometimes terminates by resolution, but much oftener by the formation of matter, gangrene, or softening of the hepatic texture. Not unfrequently it passes into the chronic form, when it is liable to give rise to induration and other structural lesions. There is reason to believe that chronic hepatitis sometimes exists as a primitive affection, its invasion being very gradual, and unaccompanied by any severe symptoms. It is a much more frequent complaint, in this country, than the acute form ; yet it is not quite so common, perhaps, as the term "liver disease," so generally used by the profession, would lead us to suppose. The anatomical characters of the disease, together with its diagnostic symptoms, so far as they are understood, may be collected from what we shall say concerning induration, hypertrophy, atrophy, and fatty degeneration of this organ.

Although *suppuration* of the liver occasionally follows chronic inflammation, yet this effect is much more frequently witnessed as the result of the acute variety of the disease. The pus may be diffused, occur in small points, or be collected into one or more abscesses. The number of these purulent deposits is often quite great, the liver being literally burrowed by them ; sometimes they communicate together by narrow fistulous passages, but in most cases they are separated by considerable intervals, or by thin partitions of hepatic substance. Occasionally the abscess is of extraordinary size, occupying nearly the whole of one lobe, or the greater part of the organ. In this way quarts of matter are sometimes accumulated, and the hepatic textures almost entirely wasted. When the quantity of fluid is great, or if it be long detained, even when small, it is apt to become encysted, the membrane by which it is enclosed, and which is susceptible of organi-

zation, varying in thickness from the fourth of a line to half
an inch, and in consistence from the softness of lymph to the
firmness of fibro-cartilage. In other cases, especially in such
as run a very rapid course, the matter lies in immediate con-
tact with the hepatic tissue, which is itself usually in a state
of purulent infiltration, or very much softened and altered in
color.

The matter of a hepatic abscess usually partakes a good
deal of the nature of true pus, being of a thick, white, cream-
like appearance. Sometimes it is thin and sanious, some-
times thick and curdy, sometimes thin and brownish, like
chocolate, and sometimes of the color and consistence of a
decoction of unburnt coffee. In the generality of cases, it is
destitute of smell ; but occasionally it is highly offensive and
irritating. Now and then the fluid contains flakes of blood
of a dark gray color ; and instances occur in which it looks
like the washings of flesh.

Suppuration of the liver does not always prove fatal. In
many instances the matter has a tendency to discharge exter-
nally, or to force its way into some one of the adjacent organs.
The principal circumstances which appear to influence the
point of communication are the seat of the abscess and the
general volume of the hepatic tumor. In the abdomen, the
opening usually takes place in the peritonæal sac, the colon,
duodenum, the stomach or gall-bladder : when the abscess
points externally, the matter may find its way out at the
epigastric region, the right loin, or between the false ribs ;
and in either case it generally pursues a narrow, fistulous
route. It is not improbable that the pus, formed in the sub-
stance of the liver, may sometimes pass into the bowels
through the biliary ducts ; and authors mention instances in
which it found an outlet through the right kidney. When
the abscess is seated at the upper border or on the convex
surface of the liver, it not unfrequently breaks into the right
side of the chest, where it either excites fatal inflammation,
or erodes the pulmonary tissue, and is finally discharged
through the bronchial tubes between the ribs, or even through
the axilla. But the most extraordinary circumstance con-
nected with this subject is, that the fluid sometimes works its
way into the pericardium. Of this an interesting case has
been reported by Dr. Smith. The liver adhered closely to
the upper part of the diaphragm, and was occupied by an
enormous quantity of pus, about a quart of which had escaped

into the pericardium. When the matter is discharged, the abscess sometimes heals, the process being analogous to that which is observed under like circumstances in the lungs and other organs.

Hepatic abscesses, on the whole, I have reason to believe, are very rare in this country, having never, in all my dissections, seen more than two cases. In Europe, they are also extremely infrequent;* but they are sufficiently common in hot climates, and nowhere, perhaps, more so than in the East Indies.

In acute hepatitis, pus usually begins to be deposited in the course of six or eight days from the commencement of the attack; whereas, in chronic cases, months often elapse before the occurrence of this event. When suppuration is about to take place, there is a sudden aggravation of all the symptoms; the patient experiences frequent rigors, followed by profuse sweats; the pain in the side is of a throbbing, lancinating nature; and there is a peculiar sense of sinking, with anxiety and precordial oppression; the organ is commonly somewhat enlarged; and although there is no distinct fluctuation, especially if the matter be deep-seated, there is almost always a boggy, yielding sensation imparted to the finger when passed over the region of the tumor. This sensation, as might be anticipated, will be more distinct in proportion as the purulent fluid approaches the surface; and in this case, too, the diagnosis will be much aided by percussion. In the natural state, the hepatic tissue is so dense as to afford a very dull sound when we strike the hypochondriac region; but in superficial abscesses, especially in such as do not contain too thick and consistent a pus, there is usually a considerable degree of resonance, which serves to define the limits between the healthy and diseased parts. After all, however, the nature of the lesion is often extremely obscure, and it may be truly said that there are few occasions for finer diagnosis than in the affection in question.

Abscesses of the liver are liable to be produced by irritation of the lungs; and in many instances they supervene upon injuries of the head, large wounds, and surgical operations. The matter in these cases is supposed by some to be transmitted with the blood through the veins, from remote and diseased parts; but the more philosophical opinion, and that

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* Andral's Pathological Anatomy, vol. ii. p. 373.

which meets my own decided approbation, ascribes its origin to inflammatory irritation of the substance of the liver, brought on by some inscrutable sympathetic action. That matter may be thus conveyed, no one will deny; but that it should create irritation in one organ in preference to another, is a point in pathology which cannot be very easily comprehended. If it has any truth at all, it forms merely an exception to the general rule. To admit that abscesses may be thus produced in any organ, is to admit that such an organ has an elective attraction for the purulent fluid that shall be flowing in the circulating mass; or, on the other hand, that its tissues are so close and peculiar, its capillaries so exceedingly fine, as to entangle the matter, and retain it, *vi et armis*, as it were, in its interior. To me the hypothesis appears not only objectionable, but too absurd almost for serious consideration.

The termination of acute hepatitis by *gangrene* is so rare, that many writers have denied the possibility of its occurrence. Baillie never witnessed an instance of it,[*] and Annesley, although for many years an inter-tropical practitioner, and constantly in the habit of making examinations, declares that he has not been more successful.[†] In several thousand dissections made by Andral,[‡] this lesion occurred only in a single case. From all these facts, then, it may be justly concluded that gangrene of the liver is of great rarity. Portal describes the mortified part as being extremely offensive, of a dark color, pervaded with sanious fluid, very soft and lacerable. In a case recently detailed by Dr. Stokes, of Dublin, the organ bore numerous marks of chronic disease, and in the left lobe was a cavity which was distinctly gangrenous, having in its centre a large mass of slough. The patient, an old drunkard, complained, during the last few days of his life, of great pain and tenderness of the abdomen; and, a short time before he expired, he was seized with vomiting, and threw up a large quantity of fetid matter.

Softening of the liver is said to be a very common and destructive affection in warm latitudes; but it is very rare, I presume, in the more temperate regions of America and Europe. That this is the case I am disposed to believe from my own experience, and from the few cases that are reported

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[*] Morbid Anatomy, p. 136.
[†] Diseases of India, vol. i. p. 435.
[‡] Pathological Anatomy, vol. ii.

of this disease in our periodicals. Softening of the liver presents itself under two distinct forms, differing from each other both in their color and consistence, but resulting probably from the same cause, namely, inflammatory irritation. In the more common variety, which I shall denominate *brownish softening*, the substance of the organ usually retains its normal color, but is broken down and friable, or has so far lost its cohesive properties that it readily yields to the force of the finger. In some instances, the affected part is infiltrated with thin, bloody, sanious, or puriform matter, and is converted into a soft, brittle mass, not unlike a rotten pear. When put in water, an immense number of small granules appear, resembling the seeds of a bunch of dried grapes : they are of a yellowish, brownish, or cinnamon color, and are attached to the large vessels by delicate vascular pedicles. In other cases, maceration produces an appearance like the washings of half-putrid flesh, the water becoming discolored, and the part exhibiting multitudes of shreds, the remains, probably, of vessels and fibrous filaments. This variety of mollescence is generally most remarkable on the convex surface of the liver, and occurs almost always in combination with diseases of the other viscera, especially of the stomach, spleen, and lungs. According to Mr. Annesley, it is frequently met with in India, in persons who are rapidly carried off by cholera, dysentery, and malignant fevers.

The *second species* of softening has received the name of *black*, and, from its close resemblance to gangrene, is probably the result of a higher grade of inflammatory action, disorganizing the parenchymatous texture of the liver. It commonly invades a large extent of surface, sometimes, indeed, almost the whole organ, which it reduces to a dark pultaceous mass, having the consistence and aspect of grumous blood, or of a black, softened spleen. In some instances, the affected part emits a remarkably fetid odor, — a circumstance which, together with its color, has given rise to the belief that the disease is analogous to if not identical with gangrene. The size of the liver is commonly altered : in most of the cases of which we have any account, it was reduced to one half or less of its normal volume : it is occasionally, I presume, enlarged ; but this does not occur often.

Very often there are no symptoms which denote the existence of this fatal lesion during life. In a case recently communicated by Dr. C. A. Lee, of New York, in which the

liver was completely disorganized, and converted into a black mass, like grumous blood, the patient, a colored man, of intemperate habits, forty years old, suffered no other inconvenience than diarrhœa and slight debility : he was not confined to his house, and suddenly expired while walking the street.* In another case, mentioned by Dr. Abercrombie,† the symptoms were jaundice, want of appetite, and nausea, followed, towards the last, by vomiting of black matter : there was no pain, no tenderness, no fulness in the region of the liver. From these and various other facts of a like character, it may be inferred that the disease, commencing in the parenchymatous structure of the organ, progresses in a stealthy and insidious manner in its work of disorganization, without always particularly impairing the general health.

Neither Morgagni, nor Haller, nor Baillie seem to have ever met with this disease ; and, although numerous examples have been narrated by more recent writers, a good description of its anatomical characters is still a desideratum. The causes of this singular lesion are not well understood ; but that it depends upon inflammation, either acute or chronic, is an opinion which seems to be borne out by an attentive examination of the various cases of it which are to be found upon record.

There is a state of the liver, not at all unusual, the very reverse of that which has been now described. I need scarcely say that I refer to *induration.* In this disease, the substance of the organ is unnaturally hard, firm, and dense, exhibiting, when torn, a singularly granulated surface. The volume of the gland is sometimes unaltered, but in most cases it is much reduced, occasionally nearly one half. The color varies in different instances, being either a pale red, purple, nutmeg, brown, or lilac. Cruveilhier informs us that he has often seen induration of the liver accompanied with a green olive hue ; but of this I have never witnessed an instance, nor am I aware that the same observation has been made by other pathologists. This change, which I am inclined to believe commonly results from chronic inflammation, is often characterized by great thickening of the fibrous structure, and by a remarkable atrophy of the hepatic granules. In some cases, indeed, the granules seem to be entirely

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* American Journal of the Medical Sciences, vol. xvii. p. 60.
† Pathological and Practical Researches, p. 357.

removed, their place being occupied by a cellular tissue, very
hard, and of a dull grayish color. The tunics of the liver
usually participate in the condensation ; the cellular substance
accompanying the ramifications of the hepatic artery and
portal vein is frequently indurated ; and many of the excre-
tory ducts are permanently obliterated, whilst others are
thickened, and of almost gristly consistence.

The induration is not always partial : I have frequently
seen it pervade the entire organ, though in the majority of
cases it occurs in patches, or is limited to particular parts.
The right lobe and lobule of Spigelius are perhaps more
generally implicated than any other portions. The disease
is often attended with pain in the hypochondriac region ; the
countenance is wan and sallow ; the conjunctiva is more or
less yellow ; and the patient is liable to be affected with
ascites. The secretion of bile is frequently very sparingly
performed, and the properties of this fluid are singularly
altered. These symptoms, however, are far from being con-
stant ; nor can they be considered, when present, as diagnos-
tic of hepatic induration.

Hypertrophy of the liver is a frequent affection. This
state is said occasionally to exist simply, but the assertion, I
think, may well be doubted. In by far the greater number
of cases, if indeed not always, it is combined with one or
other of the states which we have just described, — induration
and softening. The color, size, and form of the liver in this
affection vary infinitely, according to the period of its exist-
ence and the nature of the primary lesion. The most com-
mon tints are pale red, gray, brownish, dark green, mahoga- ˎ
ny, and nutmeg. Frequently these colors are more or less
blended, so as to impart a variegated appearance to the paren-
chymatous structure.

The bulk of the organ is sometimes enormous. Cases
have been recorded in which the human liver weighed from
twenty to thirty pounds ; and in animals, as the horse and
ox, the weight not unfrequently exceeds one hundred pounds.
In a case mentioned by Dr. Ruyer, in the Encyclographie
des Sciences Medicales for 1835, the organ weighed twenty-
four pounds.* It was taken from a woman thirty-three years

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* " Mr. Gooch gives a case in which, during dropsy, the liver acquired the
monstrous weight of twenty-eight pounds. Baldinger reports another instance,
in which it reached twenty pounds ; and Bonetus a third, in which it weighed
only two pounds less."

of age, was of a brownish slate color, soft and friable, and filled the whole abdominal cavity, forcing the diaphragm high up into the thorax, and pressing the bowels and other viscera firmly against the spinal column. In its substance were contained numerous whitish tumors, varying in size from that of a mustard-seed to that of a hen's egg, some of which were occupied by purulent fluid.

The hypertrophy may be limited to a single lobe, or it may occur in all of them at the same time; most commonly, however, it attacks the right side. The shape of the liver, as has been already hinted, may be variously affected; and the surface of the organ is remarkably rough, granulated, furrowed, notched, or mammillated.

Hypertrophy is most common in young strumous subjects, or in such whose constitution has been tainted by syphilis, and is usually connected with a low and protracted inflammatory state of the parenchymatous structure. The affection is rarely attended with much inconvenience, save what arises from the increased bulk of the organ. In the generality of instances, there are jaundice, dropsy of the abdomen, irritable stomach, and constipation of the bowels, with enlargement of the spleen, and a sense of weight in the right hypochondriac region.

Atrophy of the liver is much less frequent than hypertrophy, and, like it, usually occurs in combination with induration or mollescence. I have seen it repeatedly affect the whole organ; but it is much more common to find it limited to one of its lobes; and, what is rather paradoxical, the liver may not only be of its natural dimensions, but even enlarged. In speaking of induration, mention was made of the fact that the granular structure is sometimes entirely absorbed, and replaced by dense cellular substance. In this case, although there may be no diminution of bulk, there is yet an actual wasting of the hepatic tissue, the part affected being reduced, as it were, to its primordial frame-work. The color of an atrophied liver presents every variety of shade, from grayish white to almost entire black.

This state of the liver is often observed in persons who are in the constant habit of using ardent spirits. It is rarely seen before the middle term of life, and is most common in old age. The hepatic vessels are always much diminished in size, and the functions of the organ more or less impaired. Its cause is manifestly chronic inflammation, producing an ef-

fusion of lymph and a partial absorption of the granular tissue.
This atrophy of the liver is frequently connected with ascites,
either as cause or effect, as was pointed out several years
ago by Dr. Andral, and more recently by Dr. Seymour, in
his valuable work on the nature and treatment of dropsy.

As intimately connected with the two changes last de-
scribed, it will be proper here to notice that peculiar state of
the liver to which some of the French and British pathologists
have applied the epithets *granulated*, *mammillated*, and *tuber-
culated*.   The affection seems to have first attracted the at-
tention of Laennec, who has described it under the name of
cirrhosis, in reference to the tawny yellow color which it
occasionally presents. (Fig. 72.)   It was soon after noticed
by Dr. Baillie, of London ;
and, since his time, it has
been particularly investi-
gated by Andral, Bouil-
laud, Cruveilhier, Hope,
Carswell, and other anat-
omists.   The lesion seems
to consist essentially in a
hypertrophy of the hepat-
ic granules, brought about
by chronic irritation, act-
ing in a slow and insidi-
ous manner.   Their tex-
ture is dense and compact,
and exhibits a great varie-
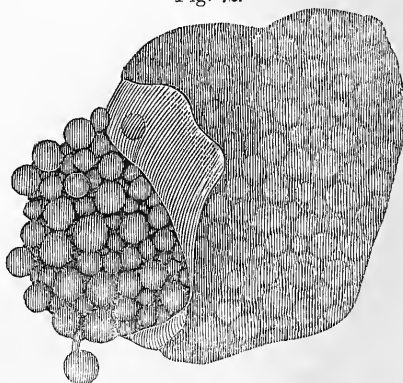
Fig. 72.

ty of tints, being sometimes of a deep brownish red, some-
times of a tawny yellow, like bees-wax, and not unfrequent-
ly of a pale cinnamon, pink, or lilac hue.   When cut, they
present a perfectly flat surface ; and, if further examined, are
found to be invested by a dense cellulo-fibrous capsule, of a
light grayish color, from which they can be easily removed
by dissection, their principal bond of connection being a small
peduncle, through which they receive their supply of blood-
vessels, nerves, and absorbents.   The size and shape of the
granulations are variable.   I have seen them of the magni-
tude of a common cherry ; but usually they do not exceed a
garden pea, and often they are not larger than a mustard-
seed or a currant.   Although mostly spherical, they are some-
times irregularly round, and even angular.

When these granules are very numerous, large, and of a

variegated brownish color, they give the liver a peculiar *nut-meg-like* appearance. (Fig. 73.) This state of the organ is said by Dr. Hope to be most prevalent in old dram-drinkers ; but it may also result from re-peated attacks of chronic irrita-tion, or from long-continued congestion.* Hence obstruction of the vena cava or hepatic veins seldom exists long without pro-ducing enlargement of this kind.

Fig. 73.
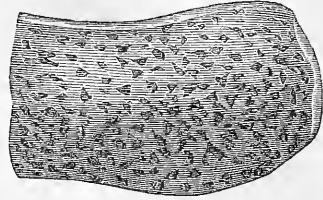
In whatever form this species of hypertrophy occurs, the surface of the liver generally presents a singular mammillated aspect, as if it were raised into a multitude of spherical emi-nences ; the peritonæal coat is thickened, opaque, and wrin-kled ; and the volume of the organ is either diminished or aug-mented, seldom natural. In the former case, the hepatic texture is generally very dense, and almost destitute of moist-ure ; in the latter, it is usually somewhat soft, more or less vascular, and impregnated with thin, bloody matter, which can be easily squeezed out with the fingers. In both varie-ties, but more especially in the first, the hepatic tissue is often of a yellow tinge ; and the bile being retained in the rootlets of the hepatic duct, exudes pretty freely on making sections of it. If, in this state, a portion of liver be macerated for ten or twelve days in water, the little granules will assume the appearance of adipocire, and may be easily washed out of their cellulo-fibrous capsules, leaving them in a soft, flocculent condition.

Tubercles are of very common occurrence in the liver, be-ing either seated in its substance, or scattered over its surface, giving it, in the latter case, a very rough appearance. Lying in close contact with each other, or separated, as the case may be, by large intervals, these bodies are generally of a rounded shape, and consist of an opaque yellowish substance, in vari-ous degrees of maturation. Their size, although sometimes not exceeding that of a mustard-seed, is usually considerable, many of them being as big as a cherry or even a hazelnut. When the liver is thus tuberculated, it feels much harder than natural, and its vessels are compressed and sometimes greatly reduced in volume, though the organ itself rarely de-

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* Principles of Morbid Anatomy, p. 103.

viates much from the ordinary standard. In some cases, the tubercles bear a strong resemblance to those of the lungs: they have the same size, the same form, the same consistence, and, in all probability, the same origin, but are a little browner in their color. They are obviously connected, in most instances, with a scrofulous diathesis of the system, as is manifested by their frequent coexistence with pulmonary phthisis, and by their contents being usually of a curdy nature.

Besides this variety of tubercles, Baillie has described another, which he has designated by the phrase, large white tubercles of the liver. His division, however, has not been generally adopted by succeeding writers, and may justly be rejected on pathological grounds, it being now pretty well ascertained that the bodies in question are merely a species of carcinoma, presently to be described.

Tubercles of the liver produce marked symptoms only when they are numerous, or when they are associated with hypertrophy or structural lesion. Under opposite circumstances they seldom cause much local inconvenience, or impairment of the general health. They are seen occasionally in old subjects, but are most frequent by far in children. Cruveilhier asserts that he has never met with them in adults who died of pulmonary phthisis, although he has made numerous examinations.* Louis, however, has been more successful; for, in one hundred and twenty-three cases of consumption, he met with these tubercles twice in the liver.†

I have also, in a few cases, found them in association with tubercular phthisis, though more commonly without it. On the whole, I am induced to believe that this lesion of the liver is of rare occurrence in this country. In some of the inferior animals they are sufficiently common, and in none more so than in the sheep, in which they are observable at a very early age.

The liver is extremely liable to be affected with *cancer;* more so, according to some writers, than any other organ in the whole body. That this may be the case in some countries is probable, but that it is not in the United States I am convinced, both from my own observations, and from those of the profession at large. Be this as it may, cancer is always

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* Dict. de Medicine et de Chirurg. t. viii. p. 329.
† Pathological Researches on Phthisis.

a most formidable disease, perfectly uncontrollable by medi-
cine, and consequently invariably fatal. Two varieties of
cancer are usually recognized by authors, namely, the scir-
rhous, and the encephaloid.

Scirrhus always occurs in distinct masses, the size, form,
and consistence of which exhibit numerous diversities. The
smallest are frequently not larger than a mustard-seed, but in
most cases their volume equals that of a chestnut, a walnut,
or an orange. In a specimen in the museum of the Cincin-
nati College, the tumors, two in number, are about the size
of a common apple : they are of a spherical form, hard, dense,
and gristly, and situated in the very centre of the organ.
The masses sometimes lie close together, and, by their agglom-
eration, form a tumor equal in size to a fœtal head ; but
such cases are rare, and I have never met with them. These
heterologous structures seldom occur singly. In the majority
of cases, there are not less than six or eight ; and instances
have been known where there were as many as two or three
hundred at the same time.

In their form, these tumors are generally spherical ; and
those which project beyond the surface of the liver, for which
they have a great predilection, have often a white grayish
dimple in their centre, produced, it is supposed, by a conden-
sation of the subserous cellular substance. The smallest, and
those that are of recent formation, are of an opaque white ap-
pearance, and intimately connected with the surrounding
tissues ; whilst such as are old, and of great magnitude, are
often of a brownish color, with various shades of gray and
black, and can be easily lifted from their situation. Vessels
frequently shoot into them, sometimes so large that they can
be filled with injecting matter : nerves and absorbents they
also no doubt receive, but their existence has not yet been
demonstrated by actual observation. To the touch they are
hard and firm ; and to the scalpel they offer the resistance of
fibro-cartilage, the largest and densest yielding a slight creak-
ing sound. The section generally displays a fibrous struc-
ture, the fibres radiating irregularly from the centre towards
the circumference, like those of a tulip. In other cases, the
tumor is lobulated and internally areolar, filaments of a gray-
ish, brownish, or yellowish hue intersecting it in every pos-
sible direction. A juice may be obtained from them by
pressure, and, in the cellular variety, a substance of the con-
sistence and color of thin putty, paste, or concrete lard. Small

masses of blood are sometimes diffused through them; but this occurrence is seldom witnessed, except in such as are old, or in a declining state.

The hepatic substance in the immediate neighborhood of these bodies is in most cases perfectly sound. In others it is indurated, softened, infiltrated with different kinds of matter, or partially absorbed. Hypertrophy of the liver is sometimes observed; but a much more common occurrence is an extreme reduction of its weight and bulk. When the tumors are numerous, the larger vessels are apt to be compressed; and, as a consequence, the organ is often exsanguine. From the same cause may result obstructions in the hepatic duct, with retention of the bile, and yellowish discoloration of the parenchymatous texture.

Encephaloïd disease of the liver is occasionally observed, though not so often as carcinoma, with which it probably has a similar origin. Like the preceding variety, this species of cancer occurs in various sized masses, of a grayish white color, soft, compressible, and elastic, with trifling vascularity. They offer very little resistance to the knife, and are composed of an areolar mesh-work, occupied by a soft, pulpy, brain-like substance, intermixed with fibrinous concretions, and dark-colored clots. The intersections are commonly of a lighter tissue, and, instead of being dense and thick, are eminently lax and delicate. Occasionally, though very rarely, the contents of these tumors are of the nature of hard jelly, constituting the *gelatiniform sarcoma* of Portal, Cruveilhier, and other pathological anatomists. The liver is sometimes much enlarged, and presents a mixed mass of disease, carcinomatous, encephaloïd, melanotic, and tubercular, in various stages of maturation. The encephaloïd matter is sometimes deposited in the portal and hepatic veins, as has been so ably represented by Carswell, in his Illustrations of Morbid Anatomy.

The symptoms of cancer of the liver are often exceedingly obscure, and frequently a long time elapses before the patient experiences much constitutional disturbance or local suffering. The disease in some instances appears to be latent, or manifests itself only a short time before death. The appetite is generally more or less impaired, the skin is sallow, the strength gradually declines, the body becomes emaciated, and there are frequent attacks of pain in the right hypochondriac region, with occasional nausea and vomiting. When the

liver is much enlarged, and the cancerous tumors have attained considerable magnitude, the surface of the organ may impart a hard, nodulated, or lumpy feel to the hand applied over the abdomen, and this constitutes the only pathognomonic sign of which we have at present any knowledge.

It is seldom that the liver is affected with *melanosis*. When it occurs here, it exhibits the same characters as in the other organs, and need not therefore be particularly described. I have never seen this disease in the human liver, but several times in that of the ox, in which it is by no means uncommon, especially in such as are raised in Ohio. In one specimen, the organ contained a great number of melanotic masses, arranged in the form of encysted tumors, varying in size from a small pea to a walnut. In man, the matter either assumes the tuberiform arrangement, or is diffused throughout the parenchymatous structure as an infiltration.

Hydatids are of frequent occurrence in the liver, either occupying its substance, or studding its surfaces. Like tubercles, they may occur at any period of life, although they are witnessed most usually in adults, and persons who have been addicted to intemperance in eating and drinking. Commonly of a globular shape, they are often closely clustered together, and are almost always contained in a cyst, formed of a dense, fibrous texture, of a white, opaque appearance. In an examination which I made about eighteen months ago, the hydatids looked like spherical bags, the largest of which was about the size of an onion, whilst the smallest was scarcely as large as a rifle-ball : their external tunic was dense, opaque, marked with numerous yellowish dots, and liberally supplied with vessels : their number did not exceed fifteen. The liver was much reduced in size, pale in its color, and its texture in many places so soft as to be unable to withstand the slightest pressure of the finger.

These parasitic beings are not peculiar to the human liver : they occur also·in that of animals, especially in oxen, hogs, and sheep. In these quadrupeds, the organ is sometimes completely crowded with them, immense numbers being every where scattered through its substance. In the liver of a cow, Mr. Youatt found nearly three hundred of these singular animals, varying from the size of a sparrow's egg to that of a swan. Some of the cysts were filled with blood, some with lymph, and many of them were intersected by fibrous bands. The liver in which they occurred weighed

one hundred and thirty-seven pounds, and measured, from one
lobe to the other, more than a yard and a quarter : its centre
was perfectly fibro-cartilaginous, without any trace of its
original structure.*   This case is an exceedingly interesting
one, and I mention it here not only with a view of showing
the great number of hydatids that are sometimes congregated
together, but also for the purpose of pointing out the fact,
that the liver may be sometimes almost totally disorganized,
and still the animal not evince any serious indisposition.
The disease in this instance had no doubt existed for a long
period, yet the cow's health was but little impaired, — enlarge-
ment of the belly, yellowness of the skin, and slight emacia-
tion, being the only symptoms which she exhibited previously
to being killed by the butchers. In the human subject, there
are no manifestations which mark the presence of these
bodies, distinct from those of chronic hepatitis.   The disease
may simulate ascites ; and not a few cases are recorded in
which the patient was actually tapped for this complaint.†

Less distinctly organized are those *serous cysts* which are
sometimes observed on the surface of the liver, constituting
the disease which some writers have described under the
name of encysted dropsy.   The walls of these vesicles are
generally transparent, smooth and polished, and supplied
with numerous vessels, of the finest texture and most beauti-
ful arrangement.   Their contents, which are thin and limpid,
like the water of ascites, are coagulable by heat, alcohol and
acids.   In the only case in which I have observed these
tumors, they hung pendulous from the convex surface of the
liver, were somewhat globular in their shape, and about the
size of a walnut. Their most common size is that of a grape ;
but they may increase to a magnitude capable of holding
many pints.   Thus, in a man aged thirty-two, Dr. Aber-
crombie found a cyst which contained eighteen pounds of
fluid, and the walls of which were firm and dense, like
thickened peritonæum.   At the bottom of the sac were two
coiled up cylindrical bodies, of a soft gelatinous consistence,
which, when unrolled, had the appearance of false mem-
branes, being about ten inches in diameter, and the eighth of
an inch in thickness.   The liver was not altered in struc-
ture, and all the other abdominal viscera were in a normal

* The Management and Diseases of British Cattle, p. 460. Phila. 1836.
† See Medico-Chirurgical Review for March, 1824, p. 930.

state. The patient had experienced much suffering, caused
mainly, perhaps, by the encroachment of the immense tumor
upon the diaphragm and surrounding organs.

The liver has occasionally a peculiar *adipous* appearance,
the fatty matter being either diffused through its parenchy-
matous structure, or confined to particular spots. The affected
part is of a pale yellowish color, not unlike that of a pale
autumnal leaf ; its consistence is more or less diminished ; it
perceptibly greases the scalpel, is unctuous to the touch, and
yields an oily principle by boiling. This, according to the
recent experiments of Mr. Bird, of London, is a soft, brownish
substance, very fusible, and possessing a peculiar and un-
pleasant odor. The quantity yielded by a pound of hepatic
tissue is about five drachms and a half.

Frequently the surface of the organ presents small brown-
ish spots, which, from the manner in which they are ar-
ranged, give it a very singularly mottled appearance, resem-
bling very much the liver of the shark, cod, and other oily
fishes. When a section is made, the interior is found to be
of a much more uniform color, being of a pale yellow, deep
orange, or light ochre. The hepatic tissue is generally di-
minished in specific gravity, though this occurrence is by no
means constant. In two specimens examined by Mr. Bird,
the weight was only 1,027, whereas in the same amount of
healthy liver it was 1,062.

This fatty degeneration occurs almost exclusively in phthis-
ical subjects. Louis found it in forty-four persons out of
the one hundred and twenty-three who died of this disease
under his care, in the Charity Hospital at Paris. This writer
even goes so far as to contend that this state of the liver is
never seen, except in connection with tubercles of the lungs,
or of some other organs. That this, however, is not neces-
sarily, although it may be generally, the case, is abundantly
disproved by the observations of other pathologists.

Various hypotheses have been offered with a view of ac-
counting for this curious state of the liver ; but the only ex-
planation which seems to me to be at all tenable, is that
which ascribes it to chronic inflammation, with venous en-
gorgement, giving rise to an augmentation of the secretion of
fatty matter, which, according to the well-known experiments
of Braconnet and Vauquelin, is naturally contained in the
organ. This opinion derives support and illustration from
what is observed in the inferior animals. In the goose and

duck, an almost complete adipous transformation of the liver may be induced in the course of a few weeks, by subjecting them to inactivity, withholding the light, and cramming their stomachs with a paste made of barley-meal, mutton-suet, and coarse sugar, mixed with milk. This mode of fattening fowls has been pursued for many years in the neighborhood of London, and it has been found that if the repletion be kept up longer than a fortnight, so much structural lesion will be induced as to kill them, or render the meat unfit for the table, the liver being converted into a soft, red, oily mass. In the human subject, this change seems to take place very rapidly in some instances, as in the course of five or six weeks; and the organ is not unfrequently double the usual weight and bulk. Louis has ascertained that it is more common in young than in old persons, and in females than in men, in the ratio nearly of four to one.

The bile seems to be considerably altered in this affection, both in its chemical and physical properties. Dr. Addison, of London, who has published an able essay upon the subject in a late number of Guy's Hospital Reports, states that this fluid is frequently of a dirty-brown color, and contains an infinite number of carbonaceous granules. After the addition of almost any of the acids, a most intolerable odor is evolved. The urine, too, is usually a good deal altered, being of very low specific gravity, quite neutral, and holding in suspension numerous flakes of mucus.

There are no signs, either general or local, which characterize this singular state of the liver. How far the symptom, recently pointed out by Dr. Addison, forms an exception to this remark, is a question, which, for the present, must remain undecided. The symptom to which I allude consists in a peculiar alteration of the color and texture of the integuments, most conspicuous on the face and back of the hands. These parts exhibit a singularly bloodless, almost semi-transparent, and waxy appearance, which by degrees becomes observable over the whole body. Sometimes the skin has a fine, polished, ivory look. To the touch, it is remarkably smooth, loose, flabby, and almost as soft as satin, apparently from the natural asperities being obliterated. In several instances, in which this peculiar condition of the integuments was present, has Dr. Addison confidently and correctly predicted the existence of the fatty degeneration of the liver. The subject is certainly of great interest, and will no doubt receive the serious attention of the profession.

The *liver-fluke*, the *distoma hepaticum*, (Fig. 74,) of hel-
minthologists, although said to have been several
times found in the human subject, is much more
common in the inferior animals, as the sheep,
horse, stag, and ox.   It is also found in the gall-
bladder ; and Pallas mentions that he once de-
tected it in the hepatic duct of a young female.
Somewhat lanceolated in shape, it is of a yellow-
ish color, obtuse at either extremity, and scarcely
a fourth of an inch long, by one line in breadth.
It has two openings, one in front, which is
directed obliquely inwards, and another behind
and inferiorly, which is slightly prominent, and
answers to the anus ; the neck is rounded, and
of a light brownish hue ; and the belly is marked
by spots of an opaque dingy white.   The insect
is thought to have a distinct genital apparatus,
with a vascular, and probably also a nervous system.   In
animals, it is often an inch long, by nearly half an inch broad.

Fig. 74.*

Worms sometimes crawl from the duodenum into the liver,
where they have been known to create profuse suppuration,
followed by fatal irritation.   Of this I have never seen an
example in the human subject, but several highly interesting
cases of it are recorded by writers.   The late Dr. Thomas
Bond, of Philadelphia, has detailed the particulars of an ex-
traordinary instance of hepatic disease occasioned by a worm
nearly two feet long by one inch in diameter.   On dissection,
a large abscess was discovered in the substance of the liver,
containing nearly two quarts of bloody matter.†   Many other
cases of a similar kind are related by authors ; and it is
worthy of remark that in nearly all of which I have read an
account, the parasites belonged to the lumbricoïd species.   In
the liver of the hog I have frequently seen the vessels and
excretory ducts of the liver filled with small worms of this
kind.   In this animal they generally coexist with hydatids.

In examining, not long ago, the liver of a rat, I discovered
a serous cyst, about the size of a marble, on the under sur-
face of the organ, which contained a tœnia one foot in
length by two lines in breadth.   The parasite was completely
coiled up, and lived for upwards of an hour after its removal.

* *a*, the mouth; *b*, suctorious disc ; *c*, generative orifice.
† London Medical Observations and Inquiries, vol. i. p. 68.

The liver itself was perfectly sound. The specimen is preserved in my museum of pathological anatomy.

Cartilaginous depositions are sufficiently rare in this organ; most frequently they are confined to the investing membranes, occurring in small patches, of a soft texture and grayish color. Dr. Roberts, of Paris, relates a case in which the whole of both tunics was converted into one mass of cartilage, in some places half an inch thick. In the midst of this substance were several scales of bone, one of them of the size of a half-crown piece.

The depositions are sometimes entirely *osseous*. Dr. Venables met with a case in which the concretion, consisting almost entirely of phosphoric acid and lime, was about the size of the patella, with very much the same shape. It was embedded in the parenchymatous structure, and resembled common bone.* In other cases the earthy matter is soft, gristly, of a brownish white color, and enclosed in a dense, firm, fibro-cartilaginous cyst.

Very recently I have met with very small osseous concretions in several livers which were otherwise perfectly healthy. In one of the cases there were altogether about fifteen, varying in volume from a mustard seed to a currant. They were hard, somewhat gritty, of a yellowish hue, and most of them distinctly encysted, the capsule, which was of a grayish color, and fibro-cartilaginous firmness, being from the sixth to the fourth of a line in thickness, and closely adherent to the surrounding tissues. In another case, the concretions were only five or six in number, the largest of which was about the magnitude of a common pea. They were also encysted, but of a light brownish color, and of great hardness. How these little bodies originate, cannot be very easily determined. In one of the cases now referred to, it seemed to me that they were nothing but tubercles in a state of osseous degeneration, — a supposition which derives strength from the fact that several of them, evidently less advanced than the rest, contained a minute quantity of curdy, friable matter. The individual, moreover, was of a decidedly scrofulous habit, and numerous tubercles were detected in different organs.

Blood sometimes escapes into the substance of the liver, constituting the disease to which some of the French writers

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* London Cyclopedia of Practical Medicine, vol. iv. p. 611.

have applied the name of *hepatic apoplexy*. It generally proceeds from one or more ruptured vessels distributed through the parenchymatous texture, and occurs in small spots, varying in density and color according to the length of time they have existed, being always softer and darker the more recent they are. The disease, I presume, is extremely rare, as very few pathologists make mention of it. In my own dissections I have never met with an instance of it; nor am I aware that any of my friends have been more successful. No symptoms have yet been pointed out as indicative of hepatic apoplexy; nor is it reasonable to suppose that the organ would suffer much inconvenience, unless the effusion should be copious.

The liver is very easily *ruptured*, in consequence of external violence; and when this happens, large quantities of blood are liable to escape into the abdominal cavity. The accident is always fatal, the patient seldom surviving more than a few hours. To this statement, however, a remarkable exception is to be found in a case, the particulars of which have been recently given by Dr. Fazely, of the island of Trinidad. The individual, a man fifty years of age, survived the effects of the injury eight years, and finally died from a complication of disease. On examination, it was found that the right lobe of the liver had been ruptured throughout its whole length and substance, from the anterior to the posterior part, and that the lacerated edges had perfectly reunited through the medium of a broad, thick cicatrix, of a hard cartilaginous texture. In the interior of this cicatrix, at the depth of half an inch, a considerable cavity was seen, which communicated with the hepatic substance, and contained about fifty biliary concretions. The surface of the liver, it should be remarked, adhered extensively to the walls of the abdomen. The gall-bladder was empty and flaccid, and the alimentary tube perfectly sound.

That such accidents are not so fatal as has been generally imagined by the profession, may be inferred from some experiments performed by Professor Monro, of Edinburgh. He opened the abdomen of a living rabbit, and cut off one of the lobes of the liver. The divided vessels bled very profusely; but, by pressure, the hemorrhage entirely ceased in the course of three or four minutes. After the wound was sewed up, the animal appeared uneasy, but only for a short time, when it gradually recovered its spirits, and took food as before.

During the five weeks that it was kept and closely watched by the experimenter, it was in perfect health, the digestion going on well, and the alvine evacuations being of the usual color, quantity, and consistence.

In another experiment, also performed upon a rabbit, the results were precisely similar. The animal lived upwards of twelve weeks, when it was killed. On examination, the cut surface of the liver was found firmly glued to the walls of the abdomen, by means of lymph.* The results of these experiments are extremely interesting, as showing how large a portion of an organ, so important to life, may be ablated or destroyed, and yet the animal perfectly recover.

SECTION II.

Of the Gall-Bladder.

I. INFLAMMATION of the gall-bladder, characterized by the usual anatomical appearances, may be caused by irritating bile, by the presence of biliary concretions, or by external violence. Very frequently it coexists with duodenitis, or with inflammation of the substance of the liver, or of one or other of its envelopes. The disease commonly assumes the chronic type, though occasionally it enters into suppuration, the quantity of matter being sometimes very considerable. In a case recently reported by Dr. James Johnson, of London, the gall-bladder, dilated into an enormous sac, contained a pint of thick purulent fluid, mixed with a large number of calculi. The cystic duct was entirely obliterated, and the walls of the tumor, which had contracted extensive adhesions to the adjacent organs, were much thickened, and in some places ulcerated.† In many instances, the pus is of a peculiar greenish aspect, owing to the admixture of bile; more rarely it is thin, sanious, and extremely offensive.

Ulceration of the gall-bladder generally begins in the internal coat, being usually caused by the irritation of biliary calculi. In this manner extensive abrasions are sometimes

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* Elements of Anatomy, vol. i. p. 567. Edinburgh, 1831.
† Medico-Chirurgical Review, July, 1836.

produced, with hard, elevated edges; and when there is obstruction of the cystic duct the disorganizing process is very apt to implicate the other tunics, leading finally to per- foration and escape of the bile. The immediate effect of this accident is violent peritonitis, rapidly terminating in death. In a case of rupture of the gall-bladder, reported in the Western Journal of the Medical and Physical Sciences, by Dr. Rogers, the patient survived the escape of the fluid sixty hours; and in another, the particulars of which are given by Professor Drake, death took place at the end of the third day. In the former case, the gall-bladder contained a large, rough calculus, and the rent, which was about half an inch in diameter, occupied the side of the organ; in the latter, the viscus was contracted, and the opening, which was evidently caused by ulceration, was near the cystic duct, its dimensions being much smaller than in the preceding case. Professor Drake's patient was thirty-four years of age, and the rupture occurred soon after eating an ordinary supper, being announced by violent pain in the region of the liver, which continued, with slight intermission, until a short time before he expired. The abdomen was swollen, tense, and painful on pressure; countenance pale and haggard; stomach ex- ceedingly irritable; bowels constipated; secretion of urine suspended; pulse weak, small, and one hundred and twenty- four in the minute; drowsiness; dyspnœa; and inability to lie on either side.*

The gall-bladder may be affected with atrophy, accom- panied with partial or total obliteration of its cavity. In three or four instances I have seen it reduced to a mere fibrous mass, without any trace whatever of its normal con- figuration. In a specimen in the museum of the Cincinnati College, the cystic duct is annihilated, and the coats of the gall-bladder, considerably thickened, are rigidly contracted over five or six small calculi. When thus wasted, the reservoir may be easily overlooked, and induce the belief that it is entirely absent. The most common cause of atrophy of this organ is an obstacle in the cystic duct preventing the influx of bile; but in many cases it exists without any assignable reason.

The coats of the gall-bladder are occasionally in a state of

* Western Journal of the Medical and Physical Sciences for 1834, p. 521.

hypertrophy; and cases have been recorded where they were partially converted into cartilaginous, calcareous, or even osseous matter. Dr. Baillie mentions an instance where they were above a quarter of an inch thick, and studded with large tubercles, of a remarkably firm texture. Hydatids and worms are also sometimes found in the gall-bladder; but all these affections are extremely rare.

II. The *biliary ducts* are liable to the same lesions as the gall-bladder, in whose structure they participate. Thus they may be affected with inflammation, acute or chronic, softening, induration, ulceration, and even perforation. In the latter case the bile escapes into the peritonæal sac, and induces disastrous results. In more than half a dozen instances have I found the cystic duct obliterated and transformed into a dense, fibrous cord; and similar lesions have occasionally been observed in the hepatic and choledoch ducts. The affection, however, I have reason to believe, is much more common in the former than in either of the latter of these tubes. Most generally the obliteration arises from the irritation of a gall-stone, or from the pressure of some tumor, as the head of an enlarged pancreas or a scirrhous lymphatic ganglion.

Dilatation of these tubes, caused by some obstacle to the egress of the bile, is a common occurrence. Baillie saw the hepatic and choledoch ducts nearly an inch in diameter; and Cruveilhier details the particulars of a case where the latter of these passages was of the size of the duodenum. The same writer also relates an instance in which indurated absorbent glands, compressing the common duct, had caused enlargement of the gall-bladder to the size of the urinary reservoir. An equally astonishing example, in which it contained eight pounds of inspissated bile, is reported by Mr. Gibson, in the Edinburgh Medical Essays. When thus enlarged, the gall-bladder forms a pear-shaped tumor, which projects beyond the ribs, and sensibly fluctuates under the finger. There is no sign by which it can be discriminated from other lesions. Indeed, the diagnosis is not only obscure, but sometimes very deceptive. A distended gall-bladder has been mistaken for a hepatic abscess; an opening has been made into it under this belief; bile has escaped instead of pus, and this, getting into the peritonæal sac, has speedily destroyed life by inducing inflammation. A remarkable case

of this kind, which fell under the observation of the late Mr.
Todd, of Ireland, is related in one of the early numbers
of the Dublin Hospital Reports.*

III. Healthy bile is a greenish-yellow colored fluid, of a
viscid, ropy consistence, readily miscible with water, of a
peculiar sickening odor, and of a taste at first sweet and then
bitter.   Respecting the precise amount of bile secreted in the
twenty-four hours, our means of judging are too inaccurate to
enable us to arrive at any definite conclusions; probably,
however, it does not exceed two or three ounces.   From
these normal states of the fluid, there may be numerous
deviations, depending upon the condition of the liver, or the
period of its retention in the gall-bladder.   Thus it may be
unnatural in its color, augmented or diminished in quantity,
unusually acrid or bland, uncommonly thin or viscid.   In
some diseases of the liver, the bile is of a deep black, and in
several instances I have found it of the color and consistence
of a warm solution of arrow-root.   In addition to these tints,
there are often numerous intermediate shades of green, red-
dish, brown, orange, and yellow.   In warm weather, the
quantity of bile poured out is generally much greater than in
cold seasons, and the fluid, also, is more acrid and stimulating,
frequently inducing diarrhœa, cholera-morbus, and spasmodic
colic.   Its consistence may be as thin as pure water, or as
thick as molasses, tar, mucilage, or half-dissolved glue.   In
the diseases of tropical climates the bile is sometimes so hard
and viscid that it can scarcely be forced along the excretory
ducts.   In organic affections of the liver, it is occasionally of
the color and consistence of coffee-grounds; and in chronic
hepatitis I have several times seen the gall-bladder distended
with a thin reddish bile, not unlike the juice of the poke-
berry.   In some cases, if tasted, the fluid produces no particu-
lar inconvenience ; but, in others, it is so poisonous in its
qualities as to cause the most violent irritation, and even
death.   In most of these abnormal states of the biliary fluid,
there are important alterations in its different chemical
elements, consisting either in their modification, or in the
abstraction of some, or the substitution of new ones.   Simply
changing the food, or, in other words, modifying the

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* See Stokes's Lectures on the Theory and Practice of Medicine, Dunglison's
Library, vol. i. p. 137.

blood, enables us to alter at pleasure the composition of the bile.

IV. *Gall-stones* are sometimes formed in the ducts of the liver, but most generally they are found in the gall-bladder, where they are often accumulated in great numbers. J. Hunter examined a case in which there were above a thousand ; and Morgagni refers to one in which there were three thousand six hundred and forty-six. When thus numerous, they are commonly very minute, frequently not exceeding a small shot ; under opposite circumstances, however, they often attain a considerable magnitude. The largest I have ever seen was about the size of a walnut. Hildanus mentions one which weighed eighteen drachms ; and Dr. Baillie saw another which was fully the size of a hen's egg.

Much diversity prevails in relation to the form and color of these concretions. When numerous, they are often perfectly smooth, and marked off into regular sides and angles, evidently occasioned by their mutual friction. In this manner they may assume various mathematical figures, as the tetrahedral and the hexagonal. In the gall-bladder of a man fifty years old, whom I examined in 1828, there were seventy-one of these six-sided concretions, none of which exceeded the dimensions of an ordinary pea : they were of a deep brown color, and emitted a peculiar fragrant odor, not unlike frankincense, on exposure to heat. When there is only one gall-stone, it is usually of an oval shape, with a rough, grooved, tuberculated, or mulberry surface. The principal colors of these concretions are brown, cinnamon, and black ; but there are many minor shades, which it is very difficult to indicate, but which will readily suggest themselves to the reader. Sometimes they are semi-transparent, and of a white pearly lustre ; and, when they are formed in the substance of the liver, it is not unusual to find them of a dingy black, not unlike grumous blood.

Gall-stones often possess a considerable degree of solidity, and, when cut, are commonly found to consist of a number of concentric laminæ, placed around a radiating nucleus. This central structure is frequently much softer than the exterior, and is sometimes made up entirely of inspissated bile. The nature of these concretions has been investigated by numerous chemists ; but the most satisfactory analysis yet made is that by Chevreul, of France. According to this distinguished

philosopher, gall-stones are composed of the yellow coloring matter of the bile and cholesterine ; the latter generally predominating, and, in many instances, forming the entire concretion.

Professor Thomson, of the University of Glasgow, supposes that all biliary concretions may be referred to three species, — the *cholesteric*, the *mellitic*, and the *inspissated*. The first variety, composed nearly entirely of cholesterine, is of a white pearly lustre, with a slight shade of brown, of a spherical shape, and of a crystallized, laminated structure. It is of low specific gravity, without taste or smell, without acid or alkaline properties, insoluble in water, partially soluble in boiling alcohol, and fuses at a temperature of about 279°. The mellitic concretion, by far the most common variety of biliary calculi, has been thus named by Professor Thomson, from its dark, honey-like color. It is soft, smooth, and always of a polygonal shape, being generally composed of two tetrahedrons, applied base to base, with their edges and angles rounded off. Externally it consists of thin, concentric layers of cholesterine, spread over a nucleus of indurated bile, strongly resembling granulated honey. The third variety, as its name indicates, is composed wholly of inspissated bile : it is of a yellowish cinnamon hue, semi-concrete in its consistence, and much more uncommon than either of the other species just described.*

Biliary calculi induce *symptoms* only when they are in the act of passing towards the bowel. As long as they remain in the gall-bladder, they are productive of little annoyance, even though they be large and numerous. In the former case, that is, when they are about making their egress, they frequently create the most intense suffering that it is possible for a human being to endure. The pain is of a spasmodic kind, and usually comes on in sudden paroxysms, though occasionally it continues for hours together ; the stomach is oppressed with nausea and vomiting ; and the surface is bathed with a cold, clammy sweat, preceded and accompanied frequently by rigor. The bowels are constipated, the feces pale, the urine scanty and high-colored, the eyes sallow, and the skin of a deep yellowish tint. When all or most of these phenomena are present, there can, in general, be no doubt re-

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* London Cyclopædia of Practical Medicine, vol. i. p. 337.

specting the true nature of the complaint; yet it is important
to remember, as has been justly remarked by Dr. Marshall
Hall, that precisely similar symptoms may originate from a
diseased and crowded state of the colon.

Gall-stones are more common between the ages of forty
and fifty than at any other period of life. They are most
frequently observed in persons of sedentary habits, and hence
women are more subject to them than men. It is stated that
in England five sixths of all the cases of this affection occur
in the female sex. Whether the proportion is equally great
in this country, I am unable to say, as this is a subject which
has not been particularly investigated.

CHAPTER X.

Of the Spleen.

Normal characters of the Spleen. — Its Color, Weight, Dimensions, and Intimate
Organization. — Acute Splenitis. — Anatomical Characters. — May pass into
Suppuration or into Gangrene. — Softening. — Induration and Hepatization.—
Hypertrophy and Atrophy. — Tubercles. — Calcareous Concretions. — Fibro-
Cartilaginous and Osseous Matter. — Hydatids and Serous Cysts.— Sanguine-
ous Deposits.

THE spleen, situated deeply in the left hypochondriac
region, lies beneath the diaphragm, behind the descending
colon, and immediately over the left kidney.   Externally, it
is convex, and corresponds to the ninth, tenth, and eleventh
ribs ; internally, where it is slightly concave, it is perforated
by six or eight foramina for the passage of vessels, and in
contact with the stomach and pancreas.   Thus the spleen is
in relation with a number of highly important organs, upon
all of which it must encroach, to a greater or less extent,
when in a state of hypertrophy.   In case of excessive en-
largement, it might sensibly interfere with the motions of the
diaphragm, and thus cause difficulty of respiration ; with the
stomach, and thus occasion indigestion ; or with the colon
and small bowels, producing displacement, together with
difficulty of voiding the feces.   The great vessels would
also be apt to be compressed, and in this manner might result
an unequal distribution of the blood, some of the viscera
being surcharged, others sparingly supplied with it.   Moreover,
by interfering ·with the ready return of this fluid from the
abdomen and pelvis to the heart, as must necessarily happen
whenever there is an obstruction in the ascending hollow
vein, ascites will be induced, generally of the most intracta-
ble kind.   Naturally, the spleen is attached in a loose man-
ner by vessels and peritonæal folds ; but in certain states of
disease, it is more or less firmly agglutinated to the circumja-
cent viscera.

In shape, the spleen resembles the longitudinal section of

an ellipse, being convex, as before stated, on one side, and nearly flat on the other. Its margins are of unequal thickness, and not unfrequently, though not always, intersected by notches. The color varies from a pale gray to a dark brown, being considerably influenced by the age of the individual, the nature of the disease, and the kind of death. In the recent subject it is generally of a light bluish cast, which, in a few hours, changes into a deep purple, so as to resemble a mass of clotted blood. This alteration always takes place very rapidly when the spleen is exposed to the atmosphere. With respect to its texture, it is soft, somewhat spongy to the touch, easily torn, and, next to the brain, decidedly the most friable organ in the body.

The size of this organ is subject to so much variety, even within the bounds of health, as to render it impossible to lay down any definite rule concerning it. In the generality of cases, it is about five inches in length by three in width, and one and a half in thickness ; but from these dimensions, there are frequent deviations. Thus I have often seen perfectly healthy spleens that were not more than three inches in length by two in breadth ; and, on the other hand, some that were from seven to nine inches long, and from four to five inches wide. Not less variable is its weight. In the average number of cases, it does not exceed eight ounces ; but in one instance, that of an adult male subject, I found it range as high as fourteen ounces ; and in another, that of a full-grown female, as low as three and a half. The mean specific gravity of the organ, according to Krause, is 1060 ; according to Cloquet and Cruveilhier, 1160.

An additional spleen is occasionally found. This is more commonly the case, I believe, when the main organ is rather small. The greatest number of supernumerary spleens that I have ever seen was seven. Other writers have observed as many as ten, twelve, or even twenty. Of a rounded shape, they are about the volume of a nutmeg, and are usually situated in the gastro-splenic omentum, along the principal vascular trunks.

The spleen, like the liver, has two distinct tunics, which are so closely connected as to render is extremely difficult, nay almost impossible, to separate them. The external one is derived from the peritonæum, and consequently of a serous character, being thin, transparent, smooth and polished. The other is of a fibrous nature, grayish in its color, compact, ex-

tensible, and elastic. Like the corresponding covering of the liver, it detaches an immense number of processes, which extend into the interior of the organ, so as to convert it into a spongy structure, not unlike the cavernous body of the penis. These processes support the ramifications of the splenic vessels and nerves, and the cavities which they form communicate freely with each other; such at least is the conclusion I have arrived at from my own examinations. In the spleen of the horse and ox, the cells are remarkably large, and, by macerating the organ for a few days in water, their pulpy contents may be easily washed out, leaving nothing but the fibrous frame-work, together with the vascular and nervous ramifications.

The precise nature of the pulpy substance of the spleen is not well understood. It bears a very close resemblance to the blood, whence some have supposed that it is merely that fluid in a modified condition. In all probability, however, it is a peculiar structure upon which are spent the ultimate ramifications of the splenic vessels, nerves, and absorbents, though the manner in which these terminate is a point that remains to be settled. It is of a dark brownish color, similar to that of wine-lees, extremely soft, and so strongly impregnated with albumen as to form a dense coagulum on being steeped in alcohol. Interspersed through this pulpy substance are a great number of rounded corpuscles, varying in size from that of the smallest pin-head to that of a millet-seed. Occurring either separately, or in groups, they are of a grayish color, semi-transparent, and of a soft gelatinous consistence. Their nature is quite unknown. Ruysch considers them as being composed of convoluted vessels, whilst Malpighi regards them as small glands.

The spleen, in proportion to its size, receives a larger amount of blood than almost any other organ in the body. Its principal artery is derived from the cœliac axis, being the most capacious branch of the three which are detached from that vessel: it courses along the superior margin of the pancreas; and, as it approaches the fissure of the spleen, it divides into several trunks, which enter the parenchymatous substance at different points, having previously sent off five or six branches to the great tuberosity of the stomach. The accompanying vein is still more capacious: it is destitute of valves, and is one of the principal trunks which form the portal vein. The precise mode of termination of these ves-

sels is unknown. It would appear, however, from the dis-
sections of Assolant and others, that the communications
between them are not so free, by any means, as in other parts
of the body. It may be observed here, that the volume of
the spleen varies much in proportion to the amount of blood
it contains. If a ligature be thrown around the principal
vein, the organ augments considerably in size, whilst the
pressure exerted upon it by a distended stomach diminishes
it. Lieutaud asserts that the spleen always enlarges during
chymification; but this has been denied by others. The
absorbent vessels of this viscus are extremely numerous. Its
nerves are small, and are derived from the solar plexus: as
they proceed towards their destination, they creep along the
coats of the splenic artery, upon the surface of which they
form a beautiful and inextricable plexus.

Until recently, the diseases of the spleen seem to have
received but little attention from the pathologist; and hence,
as might be expected, our information concerning them is
still, in many respects, vague and unsatisfactory. Independ-
ently of the imperfect manner in which morbid anatomy was
cultivated in former times, various other circumstances have
concurred to retard our knowledge of the different lesions of
this singular organ. Amongst these not the least important
are, the obscurity which still envelopes the functions of the
spleen; the depth of its situation in the left hypochondriac
region; the mode of its connection with other viscera; and,
finally, the tardy and insidious way in which it becomes de-
ranged, years sometimes elapsing before the organ suffers
much inconvenience or before the rest of the body takes cog-
nizance of the particular disorder with which it is affected.
Another source of deception has arisen from a supposition, at
one time very prevalent amongst physicians, that the lesions
of the spleen are rare; but that this is not the case is a fact
which must be familiar to every one who has been at all
extensively engaged in the practice of medicine, where few
examples occur of abdominal or thoracic malady, in which
the organ in question is not more or less involved. In some
countries, as Holland, South America, and certain districts of
India, the diseases of the spleen are occasionally endemic;
and they are very common, indeed, wherever marsh miasm
has an opportunity of exerting its malign influence. Hence
intermittent fevers are rarely present without them, especially
when violent or of long standing.

The lesions of the spleen, so far as they have hitherto been observed, may be comprised under the following heads : 1. inflammation ; 2. suppuration ; 3. gangrene; 4. softening ; 5. induration ; 6. hypertrophy ; 7. atrophy; 8. tubercles ; 9. melanosis ; 10. calcareous deposits ; 11. hydatids ; 12. apoplexy.

Inflammation of the spleen may be seated in its parenchymatous structure, or it may be limited to its envelopes.   In many cases the serous coat remains perfectly sound, but there are probably few in which the fibrous is not more or less implicated, either primarily or consecutively.   Acute splenitis seems to be a very rare disease, both in this country and in Europe ; but it is very common in the East Indies, and often runs its course in a very short time.   In the milder grades of the disease, or in the early stages of its attack, the substance of the organ is of a red brownish color, verging towards livid, gorged with grumous blood, and somewhat indurated : it tears with more facility than in the healthy state, is considerably swelled, and the congestion frequently extends to the great omentum, the stomach, and the liver, the latter of which, according to Gendrin, is ordinarily augmented in volume.   At a more advanced degree of intensity, the spleen is reduced to a soft blackish mass, not unlike half-dissolved blood : it exhibits a homogeneous aspect, and readily breaks under the pressure of the finger.   In very violent cases, lasting several days, globules of pus are not unfrequently disseminated through the disorganized structure, or collected into one or more depots, which are either enclosed by a distinct sac, or surrounded by softened splenic substance.   The peritonæal and fibrous coats, also, are more or less inflamed ; and in many instances the organ is glued to the adjacent viscera, such as the stomach, colon, or diaphragm, by masses of lymph.   The splenic artery no longer admits injecting matter, and the splenic vein usually contains black grumous blood, mixed with pus.   This phenomenon, however, is far from being constant.

In acute splenitis, the patient commonly complains of a peculiar fulness and sense of pain in the left hypochondriac region, increased by coughing and external pressure.   Oftentimes the pain extends to the left shoulder, and is of a sharp lancinating nature, like that of pleurisy ; at other times, it is perceived over different parts of the abdomen, and leads to the inference that the individual is laboring under peritonitis or gastro-enteritis.   Much difficulty is experienced in lying

on the affected side ; there is a burning and oppressive sensa-
tion in the epigastric region ; and, in violent cases of the
disorder, those which rapidly terminate in a general dissolu-
tion of the structure of the spleen, incessant vomiting is a
frequent and distressing symptom, which is often attended
by a discharge of grumous blood, both from the stomach and
the bowels.   The same phenomena are present, only in a
more aggravated degree, when the inflammation attacks the
coats of the organ.   Of chronic splenitis, we shall speak
when we come to consider the subject of hypertrophy.

Suppuration of the spleen is a very rare occurrence, though
perhaps not so much so as the few cases of it which are to
be found on record would lead us to suppose.   The pus,
although frequently of the creamy kind, is sometimes hard and
flaky, or thin and dark-colored, like coffee-grounds.   In most
cases, it is collected in a distinct sac, round which the paren-
chymatous structure is more or less softened, broken down, or
even altogether destroyed.   Occasionally the pus is infiltrated
into the substance of the organ, or it occurs in minute yellowish
clots, intermixed with sanious matter.   In quantity, it varies
from a few ounces to several quarts.   In a case mentioned by
L'Hermité, a French author, not less than fifteen pounds
were found, the sac in which it was contained measuring
eighteen inches in length by twelve in breadth ; and in the
Memoirs of the Royal Academy of Sciences a still more
remarkable instance is recorded, the quantity of matter
amounting to the enormous weight of thirty pounds.   The
coats of the spleen are almost always sooner or later affected,
and, together with the neighboring viscera, are covered with
false membranes, which are sometimes perfectly organized.
Cases occur in which the whole organ is converted into one
great abscess, the sac being either fibrous, cartilaginous, or
even bony.

The matter may find its way into the peritonæal cavity,
the stomach, colon, or small intestines ; or it may burst
through the intercostal spaces, the loins, or the walls of
the abdomen.   Occasionally the spleen contracts adhesions
to the diaphragm, and the matter is discharged into the left
side of the chest.   In this way it may get into the lung, and
be finally expelled by coughing.

The symptoms of suppuration of the spleen are frequently
very obscure.   When the investing membranes remain sound,
the pain in the part is sometimes very trifling ; but there is

always uneasiness in the hypochondriac region, with progressive emaciation and debility. When the suppuration supervenes upon acute splenitis, the suffering is generally of the most poignant kind ; and, in such cases, the formation of matter often takes place very rapidly. In a young, robust farmer, for whom I prescribed several years ago, the pain, which was of a sharp, lancinating character, similar to that which accompanies acute pleuritis, continued almost uninterruptedly for nearly two weeks. The spleen gradually augmented in volume, and, at the expiration of the period here specified, it projected over towards the umbilicus, forming a large, rounded tumor, between the linea alba and the margin of the ribs. In a short time, fluctuation was perceived, and, on introducing a trocar, about three pints of fetid, dark-colored matter issued from the incision. The wound was kept open for several days, by means of a tent ; but in a short period it closed, and from thence on, the patient's health began gradually to improve. This case, decidedly one of the most interesting and instructive on record, supervened upon repeated attacks of intermittent fever, and was characterized by excessive irritability of the stomach, great pain and tenderness, and an impending sense of suffocation, caused, no doubt, by the pressure of the enlarged organ upon the diaphragm.

The termination of splenitis by *gangrene* is a very rare occurrence, notwithstanding the assertion of Portal, that the reverse is the case.* Morgagni records only two examples of it, in both of which there was a similar lesion of the intestines. Modern authors, also, say very little upon the subject, and we have good reason to complain of the neglect with which it has hitherto been treated. The spleen, in this disease, is converted into a soft, diffluent mass, of a brownish, livid, or blackish color, and extremely offensive to the smell.

A much more common effect by far of inflammatory irritation of the spleen, is a *softening* of its substance, or a conversion of it into a dark-colored, bloody colluvies. The disease is a very frequent attendant on intermittent and typhoïd fevers, chronic diarrhœa and dysentery, and affections of the brain and liver. In some countries it is occasionally sporadic, but more ordinarily it is epidemic. The regions most remarkable in this respect are the marshy districts of Italy,

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* Anatomie Médicale, t. v. p. 336, — " La Gangrene de la rate s'observe assez souvent."

Bengal, Denmark, La Vendée, the island of Walcheren, and East Friesland.* Animals are often affected with it; and it is asserted, though I do not know upon what ground, that it is much more common in women than in men. In softening, the spleen may be enlarged or diminished, or it may retain its normal dimensions; its whole parenchymatous structure is broken down into a soft, blackish mass, not unlike grumous blood, thin tar, or currant jelly, surrounded by thickened and indurated coats. In the more aggravated forms of the complaint, the organ sometimes bursts spontaneously, without any violence on the part of the patient, and the matter escaping into the peritonæal cavity induces fatal inflammation. Occasionally, however, the shell which encloses it is so strong as to prevent this. This was evidently the case with a spleen in the museum of the Cincinnati College, in which the parenchymatous structure, although perfectly softened, is surrounded by a layer of lymph at least one fourth of an inch thick.

Of the mode in which this change of structure is effected, nothing more is known than of mollescence in general. Most pathologists, however, concur in the opinion that it results from inflammatory irritation, breaking down the vascular and parenchymatous textures of the viscus by a kind of gangrene. This doctrine derives support from several circumstances, a brief examination of which will not be without interest in connection with this topic. In the first place, it may be alleged that the changes here spoken of do not occur all at once, but attain their perfection by degrees. In the incipient stage of the disease, the spleen is merely injected with dark, dirty-looking blood, and its reticulated structure is as yet not very materially altered. Indeed, it is not until the disorder has existed for some time that the organ assumes that black, tar-like aspect which characterizes the softening when it has reached its full developement. The disease, secondly, is often accompanied by inflammation of some of the other viscera, and by severe pain in the left hypochondriac region, corresponding to the seat of the spleen. Crendal and Abercrombie relate cases in which it coexisted with pneumonitis; and others refer to examples where it was complicated with lesion of the stomach, liver, pancreas, kidneys, and intestines. In many of the subjects who died of the celebrated Walcheren

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* Hackmann, on Softening of the Spleen, Medico-Chir. Rev. July, 1832.

fever, examined by Wardrop, Vetch, and other physicians, the spleen was greatly enlarged, often weighing from three to five pounds, and reduced to a mere bag, filled with a semi-fluid pulp, not unlike black currant jelly. In the malignant fevers of Italy, Sardinia, Bengal, and Hungary mollescence of this organ is a very common affection ; and the same change is often witnessed in those who die of typhus in France, England, and America. In forty-six dissections of typhus, Louis found the spleen softened in three fourths, and in a fifth part of these to such an extent as to be reduced to a pulpy mass with the greatest ease. In the Egyptian plague, this viscus is generally softened, and double its natural volume.* From all these facts, then, it may, I think, be justly concluded that mollescence of the spleen is uniformly dependent upon inflammatory irritation, generally of a high grade, though occasionally of a slow, chronic character.

Softening of the spleen is hardly ever to be observed at a very early period of life, but it is very common in middle and advanced age. Its progress is often very rapid, reaching its height in the course of four or five days. Occasionally, though rarely, it assumes a chronic form, as in the cases mentioned by Bonetus, Portal, and Hackmann. The symptoms resemble for the most part those of acute splenitis. The precordial distress is often exceedingly great, and is said never to be entirely absent in any attack of this disease. Towards the last, the patient is harassed with debilitating diarrhœa, vomiting of blood, and hectic fever, dissolution being not unfrequently preceded by a state of coma resembling apoplexy.

The spleen is sometimes *indurated.* This change is generally associated with hypertrophy, and is probably occasioned by chronic irritation, giving rise to congestion of the capillary vessels, and to effusion of lymph into the reticulated texture. The spleen seldom retains its natural color ; most commonly it is of a light brownish hue, tears with a granulated surface, and imparts to the finger the same solid feel as the substance of the liver. When these characters are present, the organ is said to be *hepatized,* — a phenomenon which is frequently witnessed in this country, in persons who die from the effects of intermittent fever. Induration of the coats of the spleen will be spoken of in another paragraph.

* Clot-Bey, on the Plague in Egypt: British and Foreign Medical Review, vol. i. p. 248.

One of the most common affections of the spleen is *hyper-trophy*, a state which I have observed in nearly three fifths of all the examinations that I have ever made. It gener-ally occurs in connection with intermittent, remittent and typhous fevers,* and seems to depend chiefly upon mechan-ical congestion, exciting ultimately, perhaps, irritative ac-tion. That this is probable, is proved by the fact that the spleen is usually more or less indurated, and otherwise changed in its structure. The enlargement is sometimes truly enormous. In many cases the organ is ten or fifteen times the natural size ; and, in an example recorded by Lieutaud, it weighed not less than thirty-three pounds. The patient was an aged female, and the hypertrophy had been gradually progressing for seventeen years. The hypertrophy is some-times partial, occurring in the form of a tumor, about the size of a walnut or an orange. Of this I have seen several well-marked examples. Some writers, and amongst others Dr. Abercrombie, speak of what they call simple enlargement of the spleen, unaccompanied with derangement of structure : if such a state exists, I have never met with it, and am much disposed to doubt the possibility of its occurrence. This re-mark applies of course exclusively to cases of permanent hypertrophy, and has nothing to do with that tumid and erected condition of the spleen which results from the tem-porary congestion that occurs during the cold stage of inter-mittent fever, or from violent emotions of the mind.

The hypertrophy is sometimes of a mixed character, some parts of the spleen exhibiting a healthy aspect, whilst others are indurated, scirrhous, broken down in texture, or in a state of suppuration. The coats of the organ are usually hardened, opaque, and thickened, either by interstitial effusion, or by depositions of lymph upon their surface.

The symptoms of this disease are often remarkably ob-scure. In many cases they are such as would lead us to believe that the patient is laboring under chronic splenitis ; but, oftentimes, no other inconvenience is experienced than what results from the increased size and weight of the affected organ. More rarely the symptoms are of an acute

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* Enlargement of the spleen is observed in a very large proportion of those who die of typhus. Louis and Chomel found the organ preternaturally volu-minous in nearly all their cases. In the majority of the patients, it was double the natural dimensions ; in others, it was three, four, or even five times the usual size.

character. As the hypertrophy advances, a firm, solid tumor is formed, which projects below the false ribs of the left side, occasionally as far down as the umbilicus, and imparts either a smooth, or notched sensation to the hand applied to the abdomen. In protracted cases, there is sometimes hematemesis, hemorrhages from various parts of the body, and at last general dropsy.

Atrophy of the spleen is by no means so frequent as hypertrophy. Various writers, especially amongst the ancients, relate cases of it ; but their statements are so contradictory that it is impossible to draw any useful information from them. Andral had seen the spleen no larger than a walnut ; and, in a case which came under my notice a few years ago, it was scarcely as big as a billiard-ball. It was of a grayish color, rounded in figure, indurated, almost bloodless, and weighed only one ounce. Both coats were thickened, and the internal one was partially converted into cartilage. The patient, an old man of seventy-two, had died of tubercular phthisis.* Hitherto, this wasting of the spleen has been observed chiefly in connection with chronic affections of the alimentary tube, the liver, and kidneys, with ascites, and profuse discharges of blood from different parts of the body. The lesion is sometimes partial, and consists apparently in a removal of the parenchymatous texture of the organ, leaving merely the original fibrous frame-work.

Tubercles are not uncommon in the spleen. I have seen them repeatedly in this organ in children, but only once in the adult, and never in the very aged. In one instance, I met with them in an infant only a few months old : they were very small, solid, and so numerous, that the organ was literally crowded with them. Tubercles of the spleen seldom occur in clusters, and, excepting in adults, they do not often acquire a great size. Occasionally, though rarely, they soften, and form numerous small abscesses, filled with thick, curdy matter. These little bodies are not peculiar to the human spleen ; Andral has repeatedly found them in the horse, and Reynaud in the monkey. They seldom lead to fatal results, either in man or in animals ; and, in the present state of our knowledge, we know of no symptoms which are indicative

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* Thonerus saw a case in which the spleen weighed only one ounce, and Portal refers to another in which it was not bigger than a nutmeg. Cruveilhier states that he has seen this organ reduced to the weight of a drachm.

of their presence. In most cases they exist at the same time in the lungs. When large and numerous, they are apt to excite inflammation in the neighboring portions of the peritonæum, leading to ascitic accumulations.

In some instances, the spleen is affected with *melanosis ;* but of this I have never seen an example. Authors also mention a deposition of fatty substance, as an occasional phenomenon ; and encephaloïd matter is likewise, I presume, sometimes found. All these lesions are extremely rare, and there are no symptoms, so far as we know, by which they can be discriminated during life.

Calcareous deposits are rarely observed in the spleen. They are of a whitish color, soft and friable, generally small, and few in number. Bonetus, however, mentions a case in which the organ was literally filled with them ; and Morgagni states that he saw a concretion of this kind, which weighed twenty-one drachms, and which was arranged in concentric layers. Similar cases have been witnessed by Valsalva, Baader, and Bartholin.

A very frequent affection of the spleen is a conversion of its tunics into a substance resembling *fibro-cartilage.* The change generally begins on the convex surface, to which it either remains confined, or gradually spreads over the rest of the organ. The cartilage commonly occurs in small, soft, thin patches, separated by considerable intervals ; but, in a few instances, I have seen it quite thick, hard, and occupying a very large extent of surface. This transformation, which may affect one or both tunics, is no doubt, slow in its progress, and is never marked by any special symptoms.

In some rare instances, these coats are transformed into *bony* matter, either in part or entirely. Lithe saw a spleen which was completely ossified : it was taken from an old man, who died suddenly in apparent good health, and weighed only one ounce and a half. A somewhat similar case was seen by Andral. The organ was converted into a mere osseous shell, intersected by numerous bony septa, and filled with a small quantity of thin, reddish fluid, like dirty wine.

Hydatids are occasionally found in the spleen, but I have never seen an instance. Their origin is probably the same here as in the liver, and hitherto they have been met with chiefly in persons of a cachectic constitution. The substance of the spleen immediately around these bodies is variously affected ; in most cases, it remains unaltered, but occasionally

it is indurated, softened, or even quite pulpy. The hydatids may be simply attached to the surface of the organ, grow between its tunics, or be developed in its parenchymatous structure. Andral states that he has occasionally seen them in the splenic veins, where they either floated about, or adhered by delicate foot-stalks.

Serous cysts are sometimes met with in the spleen ; they are generally of a globular shape, adhere to the surface of the organ, by short, delicate peduncles, and contain a clear, limpid fluid, like spring-water. Such vesicles I have seen in quite a number of instances. They rarely attain much magnitude ; and in some cases they are occupied by a sort of milliceric, atheromatous or steatomatous substance. No symptoms accompany these lesions, that can be considered as in the slightest degree pathognomonic. Their mode of origin is extremely obscure, and they admit of but little medical interference.

The spleen is occasionally affected with internal hemorrhage, so nearly resembling that of the brain that M. Cruveilhier, by whom this lesion was first accurately described, has been induced to designate it by the term *apoplexy.** The blood is deposited in one or more points, commonly of a rounded shape, and of variable size, and is evidently the result of a laceration of some of the branches of the splenic vessels. When the hemorrhage is connected with softening of the organ, the fluid sometimes accumulates in large clots, or it bursts the coverings of the spleen, and rushes into the peritonæal sac. The changes which the apoplectic deposits exhibit are of the same nature as under similar circumstances in the brain and other organs. This malady is not uncommon in some of the inferior animals. In the horse and cow it often proves fatal in the course of a few hours, the quantity of blood poured out sometimes amounting to several gallons. It is now well ascertained that ossification of the splenic artery is a very frequent lesion in old age ; and it is not improbable, I think, that this state of the vessel is the principal cause of the internal hemorrhage of the organ. This opinion has nothing in it that is at all absurd. Similar results, we know, often follow ossification of the cerebral arteries ; and if this lesion exists in the spleen, we have only to suppose

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* Dict. de Méd. et Chir. Pratiques, t. i. p. 296.

that the individual would have to expose himself to great exertion to bring about the same phenomenon.

The spleen, owing to its soft, brittle texture, is liable to be *lacerated* by external violence, such as a blow or kick, or by a fall from some height. In such cases, of which a great many are referred to by Portal and other authors, the individual usually expires in a short time, of hemorrhage, or from the shock of the nervous system.

CHAPTER XI.

Of the Pancreas.

Where situated, and how organized. — Weight and Dimensions. — Color. — Has no special Envelope. — Is liable to pretty much the same Diseases as the Salivary Glands. — Rarely the Seat of Acute Inflammation. — Is sometimes affected with Scirrhus. — Fatty Transformation. — Serous Cysts. — Tubercular Deposits.

The pancreas, situated deeply in the abdominal cavity, is stretched horizontally across the vertebral column, the aorta, and great hollow vein being concealed by the stomach and the arch of the colon, and extending from the spleen to the second portion of the duodenum, the latter of which it closely embraces. In its structure it bears the strongest resemblance to the salivary glands, being, like them, composed of numerous lobules and granules, which are of a faint pink color, firm in their consistence, and connected together by dense cellular substance. It is of an irregularly elongated form, slightly convex in front, and nearly flat behind ; the inferior margin is rounded, and the superior is grooved for the lodgement of the splenic vessels. Its dimensions, for about two thirds of its extent, are nearly uniform ; after which it becomes remarkably contracted, but soon expands again, so as to constitute what is called the head of the pancreas, or that part which adheres to the small bowel.

The following are the mean weight and dimensions of the healthy adult pancreas, as they were revealed to me in six examinations :

Weight,	℥2½
Length,	7 inches.
Breadth at the body and splenic extremity,	16½ lines.
" at the neck,	12 lines.
" at the head,	2 inches 3 lines.
Thickness at the body, neck, and splenic extremity,	4 lines.
" at the head,	8 lines.

The color of this organ varies somewhat in the different periods of life. In children it is of a rosaceous tint, in the

adult it is a shade or two lighter, and in old age it commonly exibits a pale yellowish appearance. Its consistence, considered in reference to the different stages of our existence, does not appear to be liable to much diversity.

The pancreas has no distinct envelope, unless we consider as such the delicate film of cellular substance which is spread over its exterior. Its excretory duct, which extends the whole length of the gland, is about the size of a crow-quill, and opens at an acute angle into the duodenum, either alone, or, as is more commonly the case, conjointly with the choledoch duct. The canal is almost always single ; sometimes, however, there are two, or even three. In one instance I found it enlarged to the size of a goose-quill, and filled with thick, whitish mucus, from a partial closure of its orifice. The nerves of the pancreas are derived from the solar plexus. Its vessels are numerous, but small.

There is much variety in the different organs of the body, with regard to their susceptibility of being excited to disease. Amongst these, there is none, except, perhaps, the thymus gland, which is less frequently affected than the pancreas. This exemption from derangement may probably be owing, certainly in part, to the singular structure of this viscus, to its concealed situation, and to the absence of every thing like a proper envelope. Occasionally it is attacked with inflammation, originating either in its substance, or propagated to it from the surrounding organs, especially the duodenum, the lining membrane of which, as before stated, is reflected into its interior along the rootlets of its excretory duct. In the acute form of this disease, the pancreas is of a light reddish color, and the interlobular tissue is infiltrated with serosity, by which the glandular texture is rendered unusually distinct. When the inflammation is violent, the color becomes more deep, not unfrequently of a brownish mahogany tint, and the proper substance of the organ undergoes such a degree of softening that it may be readily torn asunder.

Although acute pancreatitis generally terminates by resolution, yet cases occasionally occur where it passes into the chronic form, or leads to suppuration. The matter, as in the other viscera, may be diffused through the interlobular cellular tissue, or be collected into an abscess. In the former case, the pancreas is generally very soft, and its glandular structure of a reddish gray color ; in the latter, a portion of the organ is usually broken down, and the matter ultimately bursts

into the adjacent reservoirs, as the stomach, arch of the colon, or duodenum. In some instances, it escapes into the cellular tissue of the meso-colon, where it is either absorbed, or it erodes those of the lamina of this fold, and makes its way into the abdominal cavity. In a case mentioned by Gendrin, the abscess opened into the jejunum, and the gland was converted into a hard, reddish friable mass, the interior of which was filled with drab-colored, fetid pus. I am not aware of any instance being on record where the matter that was thus collected, discharged itself into the aorta and vena cava ; but I can readily conceive of the possibility of such an occurrence. The fluid is sometimes contained in a strong pouch, formed by the condensation of the cellular tissue which naturally surrounds the organ, aided by a deposition of fibrin.

There is considerable diversity observable in relation to the nature and consistence of the purulent matter. Most commonly it is thick, yellowish, and inodorous, as it occurs in healthy suppuration of other parts. In other cases, however, it has been known to be very thin, sanious, greenish, curdy, and highly offensive. The quantity of pus seldom exceeds a few ounces. In an example recorded by Portal, the abscess contained upwards of two pounds.

It is a remarkable fact, that, in most of the examples that have hitherto been reported of acute inflammation and suppuration of this organ, there was disease in some of the other viscera. In a case related by Portal, the patient had labored for some time under violent paroxysms of gout in the feet, and suddenly expired during an attack of vomiting. In other instances we find it to have been connected with continued and intermittent fevers, chronic diarrhœa, dropsy, epilepsy, and disease of the liver and spleen. In several cases recorded by Anthony Petit, the suppuration would seem to have supervened upon the extirpation of the testicle, with ligature of the spermatic cord,— a circumstance which induced that celebrated surgeon to write a memoir against the propriety of using the ligature in such operations. In a gentleman, who was attended by Dr. Percival, of England, and whose pancreas was much enlarged, and contained a considerable abscess, there was a distinct tumor in the epigastric region, with jaundice and bilious vomiting, a gradual failure of strength, and frequent discharges of bloody and fetid pus from the bowels. On the whole, we are unable to point out any particular symptoms or series of phenomena that indicate the existence of this disease during life.

In regard to the *softening* of the pancreas, our knowledge is still extremely limited and imperfect. The disease, which is marked by the usual anatomical characters, has hitherto been observed chiefly in persons that have died of scurvy, small-pox, scrofula, and measles. In two children who succumbed under the latter malady, Portal found the pancreas remarkably softened, without any alteration of color or increase of volume.

Acute pancreatitis, especially when it supervenes on a chronic attack, sometimes ends in *gangrene*. Of this termination, instances are related by Greisel, Portal, and other respectable authorities. In the case mentioned by the first of these writers, the whole organ seems to have been sphacelated, as well as the parts immediately around it. Indeed, violent inflammation of the surrounding viscera is one of the most common complications of gangrene of the pancreas. When this event has taken place, the substance of the pancreas is of a dark livid color, greatly softened, and exudes a blackish, fetid fluid on pressure, like mortified structures in other situations.

Chronic inflammation is no doubt much more frequent than the form of the disease which we have just been considering. Under the influence of this disorder, the pancreas becomes hard, firm, crisp, and of a dull reddish color, at the same time that it augments considerably in volume, from the interstitial deposition of lymph. This increase of size, however, is far from being a constant phenomenon. Indeed, I am inclined to believe that, in very many cases, the organ experiences a real diminution, its lobules and granules becoming more closely aggregated than they are in the normal state. When the irritation is protracted, the pancreas often assumes a pale grayish aspect, and a hard gristly consistence, giving rise to a real scirrhous induration.

The scirrhous induration may pervade the entire gland, or occur in small patches, separated by portions which retain their normal structure and appearance. In a case mentioned by Dr. Abercrombie, the pancreas was more than seven inches in length, five in breadth, by three inches in thickness, and presented a singularly mixed state of disease. Some parts being almost as hard as cartilage, others quite soft, and composed of alternate strata of white and yellowish matter. The patient, a youth of sixteen, had complained for several months of pain in the back and stomach, and died, gradually

exhausted by vomiting and diarrhœa, a large, irregular tumor having been latterly observable in the epigastric region. Malignant disease rarely attacks the pancreas alone, but, in common with it, almost always involves the stomach, liver, duodenum, or spleen. Dr. Southwood Smith states that this organ is very constantly diseased in fever. It is generally more firm, he avers, than natural, and sometimes nearly cartilaginous. This, if true, is certainly an interesting circumstance, and one which should engage further attention.

There are no symptoms, unfortunately, which can be regarded as pathognomonic of these chronic affections of the pancreas. In most cases, the phenomena are such as indicate a deranged state of the digestive apparatus. The pain, which is occasionally quite acute, is commonly of a dull, aching character, shooting along the spine, and augmented by pressure; often there is great irritability of the stomach, so that the individual retains his food with difficulty; and, in some instances, there is deep jaundice, arising probably from the enlarged and indurated mass choking up the biliary ducts. When the tumor is considerable, it can be readily felt in the epigastric region, and, by compressing the nerves of the abdomen, frequently gives rise to pain in the hips, and numbness of the lower extremities. The outline of the swelling will be most distinct when the stomach is empty, and the examination, in order to be satisfactory, should always be made during this state.

The pancreas is sometimes transformed into a substance resembling fat. Examples of this disease have been reported by Dupuytren, Becourt, and Lobstein, the latter of whom has delineated a specimen of it in his plates of morbid anatomy. When the pancreas is thus affected, it is of a pale yellowish color, more or less soft, indistinctly lobulated, and readily greases the scalpel. Its size is usually augmented, and the vessels preternaturally small and brittle. This degeneration is extremely rare, and the causes which give rise to it are still involved in obscurity.

Of *serous cysts*, as occurring in the substance of this gland, very little is known. Indeed, there are only two cases of this disease on record of which I have any knowledge. One of these has been recently published by Dr. Becourt, a French physician. The tumor, which is contained in the medical museum of Strasburgh, is fully as large as the head of a child four years old, and is composed of very strong, fibrous walls,

the twelfth of an inch in thickness. The other case came under the observation of Dr. Duponchel, in the military hospital at Cadiz. The cyst, in this instance, was somewhat smaller, and had entirely supplanted the pancreas, not a vestige of which remained. It had thick, dense parietes, and was occupied with a brownish, bloody-looking matter, not unlike the gray substance of the brain.*

The same remark may be made in reference to *tubercular* disease of the pancreas. In one hundred children who died of scrofula, Dr. Lombard met with this affection only five times in the present organ; and Professor Carswell declares that he has never seen an example of it in the human subject, and but one in an inferior animal, — the monkey. Dr. Louis does not seem to have paid any attention to the pancreas in the dissections which he made of persons who died of pulmonary phthisis under his care in Paris. Had it been found diseased, however, he would no doubt have mentioned the circumstance; his not having done so is a sufficient proof, it seems to me, that it was always healthy. In an interesting case recorded by Mr. Mayo, the pancreas was partially infiltrated with tubercular matter, which was converted, in some places, into thick pus. Similar depositions were observed in one or two of the mesenteric ganglions, in the kidneys, and in the thymus gland. In another instance, which came under my own notice, the head of the pancreas contained nearly a dozen tubercles, of a spherical shape, whitish in their appearance, and of a firm, solid consistence. The subject was a negro boy, between eight and nine years of age, who died of pulmonary phthisis. Suety, atheromatous, and meliceric substances have been observed in the pancreas; but this is extremely rare; I have never met with an instance.

The pancreas may be in a state of *atrophy*. This is sometimes congenital, but most commonly it is induced by compression of the neighboring viscera, as an enlarged spleen, a scirrhous duodenum, or a hypertrophied liver. In a case of this kind which I had an opportunity of observing, not long ago, in a young female who died of chronic hepatitis, attended with peritonæal effusion, the pancreas was scarcely four inches in length, by eight lines in width, and did not weigh more than an ounce and a half: its substance was of a pale grayish color, remarkably soft, and the excretory duct

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* Bull de la Soc. Méd. d'Emul, Mars, 1824.

nearly obliterated. Similar examples are recorded by Morgagni, Guerin, Lobstein, and other authors. Berjaud saw a case in which the wasting was produced by the pressure of a large aneurism of the abdominal aorta. It might also be caused, I should suppose, by contraction of the splenic artery, interrupting the nutritive function of the organ.

The duct of the pancreas, like that of the liver and gallbladder, is liable to be obliterated, and choked up with tubercular matter, or earthy concretions. Of these morbid states, I have never witnessed an example. The calculi vary in size between a small pea and a nutmeg, are of a whitish color, hard, friable, and of a spherical shape, with a rough, irregular surface. They are easily dissolved by muriatic acid, and are composed chiefly of carbonate of lime, in combination with a minute quantity of animal matter. The number of these concretions is sometimes considerable, as many as a dozen having been found in a single subject. We are not acquainted with any symptoms which may be considered as indicating the presence of these bodies. It may be imagined that, when they are large, rough, or numerous, they would probably occasion a good deal of pain and irritation, together with gastric distress. But these symptoms, as just stated, would not be characteristic, as they could not be distinguished from those which attend disease of the neighboring organs.

CHAPTER XII.

Of the Urinary Apparatus.

SECTION I.

Of the Supra-renal Capsules.

I. *Supra-renal Capsules.* — Their Structure and Diseases enveloped in obscurity. — II. *The Kidneys.* — Observations on their Normal Characters and Congenital Vices. — Lesions of their Fibrous Covering. — Nephritis, Acute and Chronic. — Abscesses. — Softening. — Induration. — Gangrene seldom or never observed. — Bright's Disease. — Scirrhus and Encephaloïd. — Tubercles. — Serous Cysts. — Hydatids. — Fibro-Cartilaginous, Osseous, and Fatty Degenerations. — Enlargement and Atrophy. — Renal Calculi. — The Strongylus. — III. *The Ureter.* — Liable to Deposits of Tubercular Matter. — Effusion of Lymph, Thickening and Attenuation of its Parietes, with Contraction or Enlargement of its Cavity. — IV. *The Urinary Bladder.* — Is rarely affected with acute Inflammation, Suppuration or Gangrene. — Hypertrophy of the Mucous and Muscular Tunics. — Developement of Cysts. — Ulceration. — Encephaloïd Disease. — Neuralgia. — Calculous Concretions. — Healthy and Morbid Urine. — V. *The Prostate Gland.* — Situation, Weight, and Volume. — Is liable to various forms of Disease, especially to Enlargement.

THE supra-renal capsule, situated at the upper extremity of the kidney, is seldom found diseased. In the adult it is always much smaller, relatively speaking, than in the infant, in whom it probably performs a very important function, though what that function is we are still ignorant of. As life advances, this body gradually diminishes in size, becomes indurated, brittle, and assumes a peculiar dark color. These changes, which I have frequently noticed in young persons, are generally very conspicuous in old age. The atrophy is sometimes very great, the organ scarcely retaining a vestige of its original shape and structure.

In a few instances, I have seen the supra-renal capsule very red, injected, and softened, without, however, being able to satisfy myself that it was inflamed. This disease, I suppose, rarely exists independently; in most cases, it is no doubt propagated to it from the kidney or some other organ. Ab-

scesses have been known to form in this viscus. Such an appearance has never come under my own observation, and I am persuaded is extremely rare.

Earthy concretions have occasionally occurred in the supra-renal capsule, and in a few rare instances it has been observed to be changed into a substance like cartilage. Baillie once saw tubercles in this organ, and two cases of a similar kind have come under my own notice. In one of these, a young man twenty-seven years of age, the right supra-renal capsule was remarkably hard, dense, of a grayish mottled aspect, and filled with concrete tubercles, many of which were quite large. The left capsule was of a light slate color, and like-wise contained several scrofulus deposits.* In the other instance, that of a child of fifteen months, the disease was connected with pulmonary phthisis, and consisted of a large yellowish mass, of the consistence of soft putty. In both these cases, the affected organs appeared to be of the natural size.

SECTION II.

Of the Kidneys.

THE kidneys are two glandular organs, whose office it is to secrete the urine, and assist in depurating the blood. Situated deeply in the lumbar regions, a little exterior to the spinal column, they are five inches in length, three in breadth, and one and a third in thickness, their weight being usually about five ounces. These statements comprise the average results of twelve examinations, made with a view of determining the standard bulk of the kidney. But, it should be observed, that there is no organ, excepting the spleen, which is so liable to variation. Hence the weight of a healthy kidney may range from four to eight ounces, its length from four to six inches, its breadth from two and a half to three, and its thickness from one to one and three quarters.

The color of these organs is of a reddish brown, not unlike that of the muscles, and their parenchymatous structure is harder and denser than that of any other glandular viscus

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* See Western Journal of the Medical and Physical Sciences, vol. xi. p. 21.

in the body. Such, indeed, is their fragility, that they are very easily ruptured by external violence, applied either directly to the lumbar region, or communicated to them in the form of a general shock. The kidneys are sometimes remarkably pale, in consequence of extreme emaciation of the system, from protracted and painful maladies of the other viscera; and not unfrequently they are of a dark purple color, and greatly loaded with blood, from congestive stagnation of this fluid in the capillary vessels. These phenomena should not be mistaken for those of disease of the renal tissues.

The kidney is enveloped by a thin fibrous capsule, which is loosely connected to its exterior by short cellular substance. On making a section of the organ, it will be found to be composed of two substances, differing from each other in color, situation, structure, and function. Of these, the exterior is essentially vascular, being made up of the ultimate ramifications of the renal artery and vein; and it is in this portion of the kidney that is secreted the urine. It is of a soft glandular consistence, of a red dusky color, and about two lines in thickness. Occupying the exterior of the viscus, it is in contact, on the one hand, with the fibrous capsule, and sends off prolongations on the other, which extend between the cones of the tubercular texture, and thus insulate them from each other. Thickly scattered through this substance are small granulations, not larger than a pin-head, which are supposed by Malpighi to be hollow, but the precise nature of which is still undetermined.

The other substance is of a rose tint, inclining to grayish, its color being usually a few shades lighter than that of the vascular structure by which it is surrounded. It is arranged in the form of cones, of which there are, on an average, about ten in each kidney. The substance of these bodies is essentially tubular, being composed of an immense number of the most delicate canals, which give the part, when torn, a striated fibrous arrangement. The office of these canals is to convey the urine into the calyces of the kidney as fast as it is secreted by the vascular texture; and they are all lined by a prolongation of the mucous membrane of the ureter.

The kidney receives an immense supply of blood through the renal artery, more so, in proportion to its size, than any other organ in the body. Its nerves, which are derived from the solar plexus and from the small splanchnic, are also ex-

tremely numerous, and establish important sympathetic rela-
tions with all the other viscera, especially with the stomach,
brain, urinary bladder, testicles, and penis.   A little attention
to the distribution and relation of these nerves will enable us
to comprehend the sympathetic irritations which so frequently
accompany the diseases of the renal tissues.

Considerable variety is observed in regard to the original
conformation and situation of the kidney.   No well authenti-
cated case has yet been recorded, I believe, of the complete
absence of both these organs in the adult.   Dr. Klein, a
German physician, has, it is true, reported an example of this
kind ; but his account is too loose and unsatisfactory to be
entitled to the implicit confidence of the pathological anato-
mist.   Nor is it at all common to find one of the kidneys
wanting.   In all my dissections, I have never met with an
instance, and Andral seems to have noticed only two.   When
this anomaly exists, the other kidney is generally unnaturally
large, to compensate for the deficiency.

It is not rare to see one of these viscera in front of the
spinal column, or in the cavity of the pelvis, the other occu-
pying its usual situation.   Cruveilhier states that he has sev-
eral times observed the right kidney very low down in the
corresponding iliac fossa, in women who had been in the
habit of wearing tight corsets.   The renal organs are some-
times joined together by a narrow isthmus.   When this is
the case, they lie close to the vertebræ, forming a kind of ·
arch, with the concavity directed towards the diaphragm.
They are more compressed than usual, the fissure is absent,
and the vessels enter lower down, generally at the anterior
surface.   The situation of the ureter is likewise different.

Instances have been recorded of individuals who had three
kidneys.   In these cases, either two of the organs were on
the same side, or they occupied their usual place, whilst the
supernumerary one was situated in front of the spine, or
within the pelvic cavity.

The fibrous capsule of the kidney is seldom implicated in
disease.   Dr. Baillie remarks that he has never seen it under
acute inflammation, and the same is the result of my own
dissections of several hundred subjects.   The reason why
this affection so seldom occurs in this structure, probably is,
that it has no connection with the peritonæum, as is the case,
for example, with the spleen and liver, the envelopes of
which, as is well known, are very prone to inflammation.

Another reason, no doubt, is the fact that this membrane sends no processes into the glandular structure of the organ, the attachment between it and the outer surface of the kidney being effected by very short cellular tissue, which, we may suppose, rather prevents than admits of the propagation of diseased action from the one to the other. When inflamed, this membrane will exhibit the same anatomical characters that are found under similar circumstances, in the other viscera.

In tubercular and scirrhous disease of the kidney, I have found the fibrous capsule, in several instances, very much thickened, opaque, preternaturally strong, and covered with patches of organized lymph. In the fatty degeneration, it is sometimes remarkably attenuated, and hangs almost loose around the organ, from the destruction of the connecting cellular tissue. Portal states that he has seen the capsule of the kidney partly ossified; and cases are recorded by Bonetus, Morgagni, and Voigtel, where it was converted into a substance like cartilage. Not unfrequently it is glued to the surrounding organs by thick masses of lymph.

The kidney itself is little liable to disease, which seems surprising when we consider the great activity of its functions, and the facility with which its secretions are modified by the most trifling deviations from health. The principal affections of this gland may be referred to inflammation, suppuration, softening, induration, scirrhus, encephaloïd, tubercles, serous cysts, hydatids, hypertrophy, atrophy, and earthy concretions.

Acute inflammation of the kidney is a very rare disease in this country, and, as might be supposed, is much more frequently observed in the vascular than in the tubular substance. It seldom involves the entire organ, and the redness which accompanies it varies from a slight increase of the natural color to a deep chocolate. This change is ordinarily combined with softening of the structure of the kidney, slight intumescence, and sero-purulent infiltration. The injection on which the redness depends differs as it occurs in the tubular or vascular substance. In the former, it is striated; in the latter, capilliform, the vessels forming beautiful wreaths around the granulations. When the inflammation is seated superficially, the affected parts can be readily distinguished by their deep color, the arborescent arrangement of the capillaries, and the effusion of serous fluid beneath the fibrous envelope.

Nephritis — for so this disease is termed — is commonly attended with great constitutional excitement, irritability of the stomach, and a discharge of bloody urine, or urine mixed with pus. It is a singular fact, in connection with this lesion, that there is sometimes scarcely any pain experienced by the patient ; or it is so obtuse as almost to escape attention. Nevertheless, in the majority of cases the pain is extremely severe, and is not only felt in the region of the kidney, but darts along the ureter into the pelvis, and up towards the chest and spine. With these symptoms there is more or less numbness of the thighs, the testicle is retracted and tender on pressure, and there is a frequent desire to void the urine, which, when the disease is severe, is either limpid and scanty, very high-colored and bloody, or entirely absent. When this happens, we observe the same phenomena as in animals from which both kidneys are removed ; that is to say, the constitutional excitement becomes extremely violent, the skin exhales a strong urinous odor, deep coma sets in, and the patient expires in great misery.

Nephritis may terminate by resolution, or it may relieve itself by softening, by passing into the chronic state, or by the formation of purulent matter. In the latter case, the pus, on inspection, will be found infiltrated into the glandular substance, or collected into an abscess. When infiltrated, the fluid oozes out muddy and blood-tinged on pressure ; and, when there is much softening, it sometimes gives the organ a dark pultaceous appearance, like the lees of wine.

When abscesses occur, they are sometimes seated upon the outer surface of the organ, beneath the fibrous capsule, sometimes in its interior. Occasionally they are very small, scarcely exceeding the diameter of an ordinary pea ; now and then, however, they are of the size of a large walnut, and so numerous as to destroy effectually the parenchymatous structure. These collections generally open into the pelvis of the kidney, and are thence discharged with the urine. In a few instances, they have been known to burst into the colon, the rectum, and small bowel ; and they have also been found, though very rarely, to open into the loins, an inch or two from the spine. Most commonly the pus is of the curdy, scrofulous kind. Calculi are sometimes contained in these abscesses, and are abundantly discharged along the ureter, or through a fistulous aperture in the region of the kidney.

The whole kidney is occasionally converted into one im-

mense purulent cyst. Of this description was the case of a gentleman, forty years of age, whose body I examined in Philadelphia, in 1828. He had long suffered under symptoms of chronic nephritis; and, on inspection, the left kidney was found reduced to a mere membranous shell, containing three pints of a thin chocolate-looking fluid. All the other viscera were healthy, excepting the stomach, which exhibited marks of former inflammation. Very often the sac is thick, laminated, and multilocular; the intersecting bands, of a hard, fibro-cartilaginous consistence, grating under the knife.

Abscess of the kidney seems in some instances to be connected with disease of the spinal marrow, and the nerves which are detached from it. Four highly interesting cases of this kind have been recently published by Mr. Stanley, an English physician, in the eighteenth volume of the London Medico-Chirurgical Transactions. Most of the patients had been affected with paralysis of the lower half of the body, with tenderness of the spine, pain in the loins, and irritability of the bladder. The kidneys, in nearly all, were gorged with blood, of a dark color, remarkably flaccid, and infiltrated with purulent matter. From the apparent absence of disease of the spinal marrow in several of the cases recorded by Mr. Stanley, he seems disposed to conclude, very erroneously as I think, that the paralytic symptoms were caused by the renal lesion. The relations between these affections are certainly interesting, and will, I doubt not, receive the serious attention of the pathologist.

Although inflammation sometimes terminates in *softening*, yet this is unquestionably a very rare occurrence. Of this affection there are two varieties. In one, the substance of the kidney is of a pale grayish tint, with small dot-like points, and the patient lives a long while without being sensible of any disease of the urinary apparatus; in the other, which is generally attended with serious derangement of the health, and which occasionally proceeds to a fatal termination, the renal tissues are converted into a soft, spongy mass, resembling, when shook in water, the shaggy vessels of the placenta. The color in this species of softening may be red, gray, brown, or even purple. The symptoms in both varieties are obscure, and consequently uncharacteristic. Like acute nephritis, of which this disease is commonly the result, it seldom implicates the entire viscus.

The kidney is seldom affected with *gangrene;* indeed, I

am not certain that it is susceptible of this disease. At all events, very little is known respecting it. Portal asserts that it is frequently observed as a consequence of inflammation, and that it is always preceded by severe pains in the lumbar region, acute fever, vomiting, and retraction of the testicles, with scanty secretion of urine, or even entire suppression of this fluid. In persons who die of this disease, the kidney is generally tumid, softened, and pervaded by a foul, offensive serosity. Some parts occasionally lose their consistence to a much greater extent than others, being of a black, livid color, and converted into a shreddy, putrilaginous substance.

In *chronic* nephritis, the redness is of a duller hue, and the affected parts frequently exhibit a marbled aspect. The structure of the kidney becomes hard and granulated, and the patient is gradually worn out by slow, hectic fever. Diabetes is a frequent attendant on this disease. In a few cases, I have seen the kidney converted into a yellowish homogeneous mass, without being able to discern the least trace of the original textures. Its size is also sometimes very much diminished, as I have repeatedly had occasion to remark in my dissections. This is especially the case in the *granular* disease of this organ, so ably described by Dr. Bright, of London. (Fig. 75.)

Fig. 75.

On tearing a kidney that is thus affected, the surface will be found studded with hard, whitish, spherical bodies, from the size of a clover-seed to that of a gooseberry : they are occasionally extremely numerous ; and, in some instances, they project beyond the surface of the organ, so as to be discernible through its fibrous envelope. What the nature of these bodies is, is still a litigated point. The most plausible opinion, I think, is that which refers them to a hypertrophied condition of the granulations which are supposed, by Malpighi and others, naturally to exist in
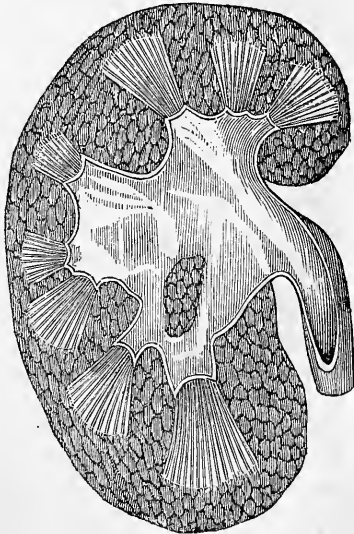
the vascular substance. The affection may thus be said to
be analogous to the mammillated state of the liver. Like it,
it is frequently connected with dropsy of the abdomen, and
with the secretion of albuminous urine. Andral remarks
that he has seen the granulations, in one instance, in the
tubular structure; but this is probably a mistake. Accord-
ing to the theory we have advanced above, they should al-
ways be confined to the vascular substance; and this, as we
are informed by Bright, is uniformly the case.

Induration of the kidney, like mollescence, may be divided
into two species, one of them being attended with increased
vascularity, the other with remarkable pallor. In the former,
the organ is generally enlarged; in the latter, diminished.
In the pale induration, the kidney occasionally retains its
natural structure, excepting that it is unusually firm; some-
times, indeed, as will be shown hereafter, it may even be of
a fibro-cartilaginous consistence. When both organs are
thus affected, very little urine will be secreted, and the
patient will complain of the various symptoms which charac-
terize chronic disease of the other viscera.

Scirrhus of the kidney is a very rare disease, and hither-
to I have met with it only once in the human subject,
though I have often seen it in the hog. The organ, in the
case to which I refer, was at least six times the usual bulk.
It adhered to the liver, colon, and wall of the abdomen, and
formed a big tumor which could be prominently felt in the
right lumbar region, between the lower rib and the crest of the
iliac bone. In the interior of the kidney were eight large
scirrhous masses, some of which were of a white bluish tint,
hard, gristly, and intersected with yellowish-looking filaments;
others were broken down, and converted into a thin chocolate-
colored fluid. All traces of parenchymatous structure were
lost, except towards the upper extremity of the viscus, where
it still retained some of its normal features. Both the pelvis
and ureter were closed up by the heterologous substance.
The opposite kidney was of the usual size, but extremely
pale, and the cortical and tubular textures were so blended
that it was impossible to distinguish them from each other.

This disease occurred in a child, two years and a half old,
whom I saw in consultation with Dr. Marshall, of this city,
in 1836. The body was excessively emaciated, the abdomen
hard and distended, and the right lumbar region unusually
prominent. All the intestines were firmly agglutinated to-

gether, and the mesenteric ganglions, of a white rose color, and gristly hardness, presented one agglomerated mass of disease. Individually they varied in size between a cherry and an orange. The entire mass nearly equaled a musk-melon, and embraced loops of intestine, the aorta, vena cava, and choledoch duct. The thoracic viscera, the stomach, small bowel, spleen, and urinary bladder, were perfectly healthy ; the anterior margin of the liver had a few tumors similar to those of the kidney ; and the mucous membrane of the colon exhibited patches of inflammation, with here and there a small ulcer.

There are no symptoms, which, so far as we know at present, can be considered as diagnostic of this disease. In the case just detailed, the little patient frequently suffered under severe pain in the region of the right kidney, but at no time was there, I believe, any particular disturbance of the urinary function. The disease is most common in persons after the middle period of life.

Much more common than scirrhus is *encephaloïd*, a disease which may make its appearance at any period of life, though it is by far most frequent in young children. The heterologous matter may be deposited into the renal vein and the ex-cretory tube ; and in some instances the whole organ is trans-formed into a soft pulpy mass, of the color and consistence of the brain. Andral alludes to a case of encephaloïd, where one of the kidneys had attained the dimensions of the right lobe of the liver ; and Mr. Langstaff, of London, has described another, in which the diseased mass weighed nearly twelve pounds. Externally, the tumor was irregularly lobulated, and on cutting through it, a large clot of blood was found, composed of loose, concentric layers, as in a rapidly formed aneurism.

When this disease is present in the kidney it usually exists also in some other part of the body. In general it is attended with severe suffering, though the symptoms are often vague and unsatisfactory. In the majority of cases there is pain in the region of the affected kidney, difficulty of voiding the urine, which is often tinged with blood, and great irritability of the bladder, the uneasiness extending along the rectum and urethra, and in the female along the uterus. In the lumbar region, there is gradual enlargement, with more or less pain on pressure, and inability of lying on the affected side.

In the sixteenth volume of the American Journal of the Medical Sciences is related a case of encephaloïd disease of the kidney, in a female thirty-five years old, which, as has been justly observed by the reporter, Dr. Weems, of Washington city, was remarkable for the total absence of every symptom, direct or indirect, that could have caused a suspicion of the existence of renal disorder. The left kidney, increased to the weight of seven pounds, was completely disorganized, and converted into a soft, bloody, cerebral mass, in which it was impossible to discern any thing of the normal structure. The disease had existed for about four years, and been treated for an enlarged spleen. An instance of a somewhat similar character is mentioned in the London Medical Gazette for May, 1831: it occurred in a child only four years old: the symptoms of renal affection here were so trifling that the medical attendant never suspected that it was the cause of the patient's distress. Thus, then, whilst encephaloïd of the kidney is sometimes accompanied with sufferings the most excruciating, at others its features are so masked as to render it utterly impossible to distinguish its true character.

Tubercles are likewise of rare occurrence, and are seldom seen except in connection with this disease in other organs. Their number is sometimes immense. Thus, in the right kidney of a young man, of twenty-seven, who died last summer of psoas abscess, in the Cincinnati Hospital, there were upwards of five hundred in the cortical substance, of all sizes between that of a mustard-seed and a cherry-stone. In some parts they were agglomerated, in others isolated. They were of a white opaque appearance, semi-cartilaginous in their consistence, and evidently organized, since, in cutting through some of them, I could distinctly trace the existence of vessels, the blood standing upon the incised surface in minute dots. Externally the organ had a dark mottled aspect, and in its interior were two tubercular excavations; one, situated in the superior extremity of the gland, was scarcely larger than a hazelnut; the other, which occupied the lower half of the viscus, was about the size of a turkey's egg, and filled with thin, ropy, whitish pus, destitute of smell. The abscess was lined throughout by a thick layer of lymph, and intersecting it in different directions were four rounded cords, the remains, probably, of the tubular texture, which resembled a good deal the fleshy columns of the heart, or the bands which we so often see in tubercular excavations of the lungs. The

kidney was very little enlarged, and some tubercular matter was also found in the excretory passages, the cavity of the ureter having been nearly obliterated by it.

In this case not a tubercle could be detected in the lungs. They were, indeed, perfectly sound, as were also the heart and brain, together with most of the abdominal viscera. Strumous matter was abundantly contained in the lymphatic ganglions of the pelvis, and the seminal vesicles were completely distended with it.

In the human kidney, *serous cysts* are occasionally found, but not so frequently, I am inclined to think, as is supposed by Cruveilhier, Andral, and Hope. They are very common in the hog, and it is here that the best opportunity is afforded for examining them in the different stages of their developement. In reference to their origin, these cysts may be arranged into three classes. In the first class are comprised the little bags which are developed upon the exterior of the kidney, immediately beneath the fibrous covering. These are generally small, not exceeding a hazelnut, of a spherical shape, and filled with a thin, pellucid fluid, which possesses all the properties of the serum of the blood. This variety of cysts sometimes attains an enormous magnitude, giving rise to much pain, great constitutional disturbance, and excessive enlargement of the lumbar region. In the case of a child, six years old, detailed by Mr. Hawkins, of London, the tumor, which displaced the ribs and liver, and protruded slightly below Poupart's ligament, through the femoral ring, contained five pints of fluid, partly clear and limpid, partly opaque and semi-purulent.

The second class consists of cysts which are developed in the midst of the cortical structure. The granulations which exist in this substance, it will be remembered, are hollow, at least such was the opinion of Malpighi, which has been adopted by some highly respectable anatomists of our own times. When from any cause the cavities of these bodies become irritated, they pour out serous fluid ; and, as the secretion advances, a bag is thus formed, varying in size from a pea to that of a walnut, the walls of which consist, for the most part, of a thin fibrous membrane. By degrees the pressure exerted by the effused matter produces absorption of the cortical substance, until finally the cyst approaches the surface of the organ, presents a globular shape, and receives an adventitious covering from the proper capsule of the organ.

The contained fluid is not always of a serous character, but frequently possesses all the properties of urine, only that it is more limpid, and less strongly impregnated with saline ingredients.

In the third class are included the serous bags that are formed in the tubular structure, by some obstruction in the excretory passages. This is a very common variety, and the tumor is sometimes of considerable size, fully as large as the fist. The manner in which it is formed is of very easy explanation. Let us suppose that one of the funnel-shaped tubes of the kidney becomes closed through inflammation, and that the renal structure above remains perfectly sound. Under these circumstances, the cortical substance would continue to secrete its usual amount of urine, which would be as readily conveyed by the tubular texture into the proper excretory duct. Here, however, its passage would be resisted by the obstruction, and the consequence would be, that, as the accumulation increased, it would encroach upon the corresponding pyramid, and finally upon the cortical substance, destroying them by absorption. In this variety, the cyst may be supposed — for this cannot be satisfactorily demonstrated—to consist of two coverings, similar to those of the funnel-shaped process of the pelvis of the kidney.

The three species of serous cysts now described I have had frequent opportunities of studying, both in the human subject and in the lower animals. The views that have been advanced will be found not to differ materially from those of Bouillaud, Cruveilhier, and other anatomists, on the same subjects.

The serous cysts of which I have just given an account, differ remarkably from true *hydatids*, which are always thicker, much firmer, and composed of two lamellæ, as hydatids are in other parts of the body. Very often they possess the hardness of a fibrous membrane, and have clusters of smaller ones attached to their inner surface, or floating about in their serous contents. Hydatids may be developed, first, on the external surface of the kidney, beneath its proper capsule ; secondly, in its parenchymatous substance ; and, thirdly, in its excretory passages. Sometimes there are only a few ; at others, several hundred. In their size, they vary between a hemp-seed and an orange. Occasionally they are discharged along with the urine ; and this affords the only distinct evidence of their existence during life, — all the other

phenomena, such as pain in the back, symptomatic fever, and gastric irritability, belonging equally to other renal affections.

In a few instances I have seen the kidney transformed into a substance resembling *fibro-cartilage.* In one of the cases to which I refer, the organ was less than one third the natural volume, remarkably white, dense, fibrous, and creaked sensibly under the scalpel on being cut. The fibrous capsule was inseparably adherent to the outer surface of the kidney, the ureter and funnel-shaped processes were obliterated, and scarcely a trace remained of the tubular structure. The renal vessels, both artery and vein, were much diminished in size, and many of their larger branches, with nearly all the smaller ones, had disappeared. This transformation sometimes occurs in small patches, which are generally of a light bluish tint, and distinctly fibrous in their texture.

The kidney has been found partially *ossified.* The earthy matter is mostly confined to the uriniferous tubes, where I have seen it form narrow, slender pencils, running the whole length of the pyramids. The number of these lines, which are commonly of a pale yellow color, is sometimes very considerable, hundreds of them occurring in a single specimen, perhaps in a single cone. In several cases in which I carefully examined this lesion, it appeared to me that the earthy substance was deposited into the walls of the uriniferous tubes. Occasionally it is not improbable that the appearance is caused by small arterial branches, in a state of ossification.

Morbid anatomists have alluded to what they call the *fatty degeneration* of the kidney. Such an appearance I have never witnessed in the human subject, but have repeatedly met with it in the hog. It seems to be analogous to the adipous transformation of the liver, and is seldom attended with any serious symptoms. Indeed, in many cases it would appear to be compatible with the most perfect health. When this state is present, the kidney is of a light yellowish complexion, has a soft fatty feel, and greases the scalpel that is employed in cutting it. The fibrous capsule can be peeled off much more easily than in health, and in most of the cases that have fallen under my observation, the transformation was confined to the cortical substance, the pale color of which strikingly contrasted with the fleshy red of the uriniferous cones. The fatty kidney rapidly putrefies, and yields a peculiar oily principle by boiling. The cause of this degeneration is entirely unknown.

Andral has seen the kidney converted into a semi-fluid, glass-like substance, resembling a thick solution of starch. Such a lesion has never come under my observation, and I presume that it is very rare. In the case mentioned by the French anatomist, the transformation was confined to the cortical substance, and the individual showed no symptoms of urinary disease during life.

Hypertrophy generally exists only in one kidney, the other being either reduced in volume, or else absent. It is recognized by the following characters: the kidney is one fourth, one third, or one half larger than in the normal state; and its substance is of a deeper color, more firm and compact. A developement of this kind, under whatever circumstances it may occur, may be supposed always to depend upon an increased determination of blood to the sound organ. Hence we frequently find that the enlarged kidney is furnished either with two arteries, or with a single one of unusual size. In other cases, chronic irritation gives rise to this preternatural bulk of the organ, by keeping up an habitual congestion. This state of the kidney, combined with augmented vascularity, is a common appearance in diabetes.

Not unfrequently the state of the kidney is diametrically opposite to the one just described, its size being much less than natural, and its parenchymatous structure pale, indurated, and shriveled. As hypertrophy is the result of an unnatural supply of blood, so atrophy of the kidney may be regarded as the consequence of a deficiency of this fluid. In some instances, this appearance is strictly congenital; but most commonly it is caused by an obstruction in the circulation of the blood, arising from the pressure of a tumor in its vicinity, an enlarged liver or spleen, or a collection of pus around its exterior. I have a specimen of atrophy of the kidney in which the parenchymatous texture was nearly entirely destroyed by a number of serous cysts that were developed in its interior.

The *concretions* which are so often found in the kidney, may be developed either in its parenchymatous substance, the calices, funnel-shaped processes, or the pelvis of the ureter. In most cases, it would seem that they are the result of a peculiar diathesis of the system, and they generally consist of the same chemical elements as those of the bladder. The commonest variety is the uric calculus, which is usually of a light brownish color, and of a spherical shape,

with a perfectly smooth surface. Next in point of frequency is the oxalic concretion, of a dark complexion, and of an irregular, oval figure, with a rough mulberry exterior. A third variety of renal calculus is the ammoniaco-magnesian. This generally occurs in connection with one or the other of the preceding species, forming an external layer around them, varying in thickness from a line to half an inch or more. The phosphatic concretion is seldom met with in the kidney, and seems not to proceed from the urine, but from other secretions of the affected organ.

Renal calculi may exist for a long time unsuspected. Most generally, however, they produce hemorrhage, inflammation, abscess, or ulceration, with pain in the loins, obstruction to the flow of urine, uneasiness in the ureter and bladder, and constitutional disturbance. Should the concretion become immovably fixed in the excretory duct, the urine, which is still secreted, will accumulate in the passages above ; and, by the pressure which it exerts upon the parenchymatous structure, it will gradually effect its absorption, until the organ is wasted to a mere remnant. At other times, the ureter bursts, as the urethra sometimes does behind a stricture ; or suppression of urine ensues, and the patient dies. Of these occurrences, interesting cases are recorded by Morgagni, Brodie, Travers, and other pathologists. The symptoms which denote the passage of a renal calculus are, violent pain in the lumbar region, excessive irritability of the bladder, discharge of bloody urine, numbness of the thighs, and retraction of the testicles, with sickness at the stomach and severe constitutional disturbance.

The *large strongylus*, a species of lumbricoïd worm, has been observed in a few rare instances in the human kidney. It is oftener met with in the inferior animals, as the horse, ox, wolf, dog, otter, and racoon, and is exceedingly common in the hogs which are brought to the slaughter-houses in the environs of Cincinnati. The situations in which it is ordinarily found are the pelvis and infundibular prolongations of the ureter, in which it is frequently coiled up in considerable numbers. Occasionally it makes its way into the parenchymatous structure, where it produces suppuration, atrophy, or other mischief. Mr. Owen supposes that the parasite is originally developed here, but this is probably a mistake.

The strongylus is a very slender cylindrical worm, from two to three inches long, of a light grayish color, interspersed

with dark spots: in some instances it has been known to attain the length of three feet, with a diameter of from four to six lines. The male is smaller than the female, and tapers slightly towards each extremity. The head is obtuse, and furnished with an orbicular mouth, encircled by six hemispherical papillæ : the body is transversely striated, and marked by two longitudinal impressions ; and the tail, which is incurvated, ends in a dilated pouch, from the base of which projects a single penis. In the female, the caudal extremity is less pointed than in the male, with the anus just below the apex : the vulva is situated at a short distance from the head, and communicates with a slender cylindrical vagina : the uterus, in the larger individuals, is about three inches long, and leads to a simple ovary, which is nearly four times the length of the body. A nervous system can be distinctly demonstrated in this parasite. It consists, according to the statement of Mr. Curling, of London,* of two delicate rings, one encircling the œsophagus, the other the anus, connected by a single cord running in a straight line along the middle of the ventral aspect.

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SECTION III.

Of the Ureter.

THE principal lesions of the ureter are, deposits of tubercular matter, effusion of lymph, thickening and attenuation of its walls, with contraction or enlargement of its cavity. Dilatation is generally produced by the retention of a renal calculus, or by some tumor seated along the course of the tube, and interfering with the egress of the urine. In the male, it is sometimes caused by stricture of the urethra ; in the female, by the pressure of a carcinomatous uterus. In a case of this description, which fell under my notice several years ago, the left ureter was fully as large as the thumb, with remarkably thin, transparent walls. Sir B. Brodie mentions an instance where, in consequence of obstruction, both tubes were dilated to the size of the small intestine.

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* See his Lectures on the Entozoa, in the London Medical Gazette, part v. vol. i. p. 712.

Occasionally the duct presents a singularly sacculated arrangement, some portions of it being greatly expanded, others very much constricted.   Sandifort mentions * an instance where the dilatation, alternating with slight contractions, was more than two inches in circumference ; and a still more extraordinary example has been recently recorded by Dr. Thurnam, of England.   In both cases, there was congenital malformation of the urinary organs.

The ureters may be absent, and in some instances they have been known to terminate in a cul-de-sac.   When the bladder is wanting, they open either into the urethra, the vagina, or the rectum.   Occasionally, again, they are reduced to small, narrow, almost impervious cords ; and when this happens, the pelves of the kidneys are generally dilated into large pouches, capable of holding many ounces of fluid.   I have never seen valves in the interior of these tubes ; but examples of this have been recorded by Coschwitz, Morgagni, Desgranges, and other writers, and are perhaps more frequent than is generally supposed.   These folds, it may be remarked, are usually connected with a dilated and tortuous state of the ureters.

SECTION IV.

Of the Urinary Bladder.

THE urinary bladder, situated in the pelvic cavity, and composed of the same anatomical elements as the stomach, is seldom affected with disease.   Acute inflammation, which is so common in the alimentary tube, is extremely rare in the organ now under consideration, and in my own dissections I do not remember to have met with it more than twice. Such also is the result of the more extensive observations of Louis, Andral, and Hope.   In five hundred individuals examined by the former of these distinguished pathologists, the mucous membrane of the bladder was found preternaturally red, and injected only in six cases, and ulcerated only in one.

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* Observ. Anatomico-Patholog. t. iii.

The disease usually occurs in small irregular patches, which present the arborescent, dot-like, or capilliform injection ; but, in some instances, it affects the greater part of the organ, and is attended with effusion of lymph, or even extravasation of blood. Acute cystitis may terminate in several ways, — in resolution, suppuration, and even in gangrene.

The termination by suppuration is by no means infrequent. The matter, in most cases, is poured upon the inner surface of the bladder, where, mixing with the urine, it imparts to this fluid a peculiar lactescent aspect, and sometimes a very offensive odor. In other cases, the pus collects in the sub-mucous cellular tissue, or between the muscular and serous tunics, and finally escapes into the pelvic cavity. Occasion-ally the bladder contracts adhesions with the rectum of the male or the vagina of the female, and the matter finds an outlet in this way. The quantity of pus seldom exceeds two or three ounces. The mucous membrane of the bladder is sometimes greatly softened, without any attendant vas-cularity. The lesion occasionally extends to the other tunics, and so leads to spontaneous perforation.

Gangrene of the bladder I have never noticed, and I pre-sume that this termination is extremely rare. The disease is most frequently seated at the neck of the viscus, and has hitherto been remarked chiefly as the result of the protracted retention of urine. The eschars are of a dark, livid color, soft, easily torn, and bathed with a thin sanious fluid, of an exceedingly fetid odor.

Chronic inflammation is much more frequent than acute, of which it is sometimes the result, and gives rise to various alterations, among which the more important are, hypertro-phy, the formation of cysts, and fungous excrescences, not unlike those that have been described as occurring in the large bowel. Hypertrophy, although it may be seated in either of the tunics, is most common by far in the muscular, which sometimes acquires the thickness of an inch or more. Oftentimes the lesion is partial, that is to say, it is limited to a small number of fleshy fibres, which are of a deep florid color, very strong, and collected into large bundles. When this happens, the inner surface of the organ becomes fascicu-lated, like the interior of the ventricles of the heart, and thus constitutes what the French term the *columniform* bladder. Hypertrophy of the muscular tunic, whether partial or gener-al, is usually referrible to obstruction at the mouth of the

urethra, to overcome which it is obliged to make increased exertion ; a larger flow of blood is invited, and excess of nutrition, with diminished capacity of the reservoir, is the consequence. This condition frequently coexists with vesical calculi, enlargement of the prostate gland, and stricture of the urethra.

When the hypertrophy is seated in the lining membrane, or in the subjacent cellular substance, there is generally a great developement of the mucous follicles, which, instead of being small and scarcely perceptible as they are in the normal state, are rendered extremely prominent, and pour out an unusual amount of thick, ropy fluid. In some instances we meet with well-developed villosities; and, more frequently still, with pretty large, fungous-looking excrescences. These vegetations, as they may be termed, are commonly of a light slate color, firm in their consistence, and of a pyriform shape, with a short, slender peduncle. Around their base are occasionally to be observed beautiful vascular wreaths, showing that they originate in inflammation.

A frequent consequence of hypertrophy of this viscus is the developement of small *cysts*, caused by the outward protrusion of the mucous membrane, or by the interlacement of the muscular fibres. In the latter case, considerable cavities are sometimes intercepted, which become lined with a sheeting of lymph, and filled with different fluids, such as serum, urine, or pus. When the lining membrane is forced between the enlarged fascicules, it occasionally dilates into a large pouch, perhaps half as large as the bladder itself, with which it communicates by a narrow aperture. This appearance is generally observed near the fundus of the organ, and is much more common in the male than in the female, as in the latter, from the peculiar construction of the urinary passages, there are fewer causes to produce it. The walls of these cysts are often much thickened by new deposits, and not unfrequently they contain calculous concretions. The bladder, in this state, is almost always irritable, and admits of very little distention. The number of sacs varies from one to six or ten.

We sometimes find the bladder *ulcerated*. Of this, I have seen only one well-marked example, in a young man of thirty. The ulcers, which were five in number, and situated around the mouth of the urethra, were of a circular shape, with reddened, elevated, and slightly undermined edges, re-

posing upon the submucous cellular tissue. The largest was an inch in length, by half an inch in width; the smallest about the size of a split pea. In several of these erosions there was an evident effort at reparation, as was indicated by the strongly adherent lymph which was stretched across their surface, and which gave them a rough, uneven appearance. The bladder itself was very much contracted, being scarcely larger than that of an infant, and contained about two ounces of thick, purulent fluid, resembling that which was found in the right kidney. Sometimes the ulcerative process extends through the muscular tunic, and the individual perishes from the extravasation of urine. In a few cases, the inner membrane of the bladder has been found entirely destroyed, the fleshy fibres being as bare as if they had been neatly dissected.

Encephaloïd seldom occurs in the bladder as an original disease; most commonly it is propagated to it from the surrounding organs, as the rectum and the uterus. On the whole, however, it is a very rare disease, and is seldom witnessed except in old people. It appears to have its origin in the submucous cellular tissue; and, as it advances, it forms a large tumor, which projects into the cavity of the organ, and greatly diminishes its capacity. In some instances, as observed by Sir B. Brodie, it makes its way in other directions, passing outwards, and contracting adhesions with the sides of the pelvis, the uterus, or the bowels. Such tumors are sometimes of a mixed character, scirrhous, cartilaginous, and fungous; and, occasionally, they have been found studding the inner surface of the bladder in great numbers, not larger than a common pea, and of a soft medullary texture.

This disease is sometimes protracted for eight or ten years; but in the majority of cases it runs its course with great rapidity, destroying life in six or eight months. Frequent desire to void the urine, pain at the neck of the bladder, extending to the perinæum, and along the track of the urethra, and constant discharge of clotted blood, are the most prominent symptoms of the complaint. In the advanced stage of the disease, the urine is of a dingy brown color, extremely offensive, and often contains fragments of medullary substance. The hemorrhage is occasionally quite abundant, and at length leads to fatal exhaustion.

In old persons, of nervous, irritable temperament, the blad-

der is sometimes the seat of severe pain, slanting through the pelvis in different directions, and recurring in regular paroxysms. In its nature, it is evidently *neuralgic*, and it is often associated with similar uneasiness in other parts of the body, especially the face and scalp. In some cases, it seems to be produced by sympathy with the kidney, or by an altered state of the urinary fluid.

The bladder, lastly, is subject to atrophy, a lesion which is sometimes congenital, sometimes the result of disease. It is most commonly seated in the muscular tunic, the fibres of which are extremely thin and pale ; and it is apt to be attended with outward protrusion of the mucous membrane. Cases sometimes occur in which the bladder is totally absent, or where there is a deficiency of its anterior wall. This malformation almost always coexists with an imperfect developement of the straight and pyramidal muscles, which, instead of passing down to the pubes, leave an aperture there, of greater or less extent, through which there is a constant trickling of urine. *Ectropia* is the term by which this state of the bladder is designated. Strong partitions are sometimes thrown across the interior of this organ, so as to divide it into several distinct chambers. They are frequently situated along the middle line, but now and then transversely ; and when this happens, the bladder has a singular hour-glass contraction. These compartments, whether the result of disease, or of original malformation, generally communicate with each other ; in some instances, however, they receive each a ureter, and open directly into the urethra.

Having thus briefly considered the several lesions of the bladder, I shall bring this section to a close by making a few remarks on the morbid states of the urine, and on the nature of vesical calculi.

Calculous concretions are much more common in the urinary bladder than in any other organ of the body. Much diversity obtains in regard to their prevalence amongst individuals of different ages, and the inhabitants of different districts. Children are particularly prone to them, as are also persons who are far advanced in life ; and men are infinitely more frequently affected than women, owing, no doubt, to the more complicated construction of the urethra and to their more intemperate mode of living. In some instances the disorder seems to be of a hereditary nature, like the kindred diseases of gout and rheumatism, — the calculous diathesis

being transmitted from parent to child through several generations. Dr. Prout contends that hard, impure waters are favorable to the production of vesical concretions, from the changes which they are supposed to induce in the renal secretion. The explanation, however, is not very satisfactory, and the subject demands further investigation. Paralysis of the bladder, stricture of the urethra, enlargement of the prostate gland, injuries of the back in the region of the kidneys, and impairment of the digestive apparatus, especially of the stomach, may be enumerated as so many exciting causes of this disease.

The number of urinary calculi is extremely variable. Very frequently there is only a single one, whilst at other times there are a great many. Sir Astley Cooper met with one hundred and forty-two; Dessault with two hundred; Boerhaave with three hundred; Murat with six hundred and seventy-eight; and Physick with upwards of one thousand. This case occurred in the person of the late Chief Justice Marshall, and is perhaps the most remarkable of the kind on record. The concretions were all of an oval shape, and varied from the volume of a partridge-shot to that of a bean. When numerous, they are always more or less polished from continued friction against each other; and, although they generally lie perfectly loose in the bladder, it sometimes happens that they are encysted, impacted in the urethra, or lodged in the ducts of the prostate. These concretions are of all sizes, from a hemp-seed to that of the fist; and, in their weight, they vary from a few grains to a pound or more, their average being from three drachms to an ounce.

Urinary concretions are generally arranged under different heads, according to their color, consistence, and intimate characters. Their chemical composition has attracted much attention during the last forty years in Europe, and the individuals who have particularly distinguished themselves for their researches in this respect are Scheele, Bergmann, Wollaston, Marcet, Fourcroy, and Prout. Much, however, as they have done, the subject is far from being exhausted; and an interesting field is still open, which, if properly cultivated, cannot fail to be of the greatest benefit to the human race. The subjoined arrangement includes the most important species of urinary concretions that have hitherto been described.

The *uric* calculus, the most common species of all, was

first noticed by Scheele, in 1776. In its color, it is brownish, inclining to that of mahogany, of a flattened, oval shape, occasionally finely tuberculated on the surface; but most generally smooth, though not polished, unless there are several concretions at the same time, and from the size of a currant to that of a hen's egg. If the uric calculus be divided with the saw, it will be found to consist of several layers arranged concentrically around a common nucleus, the laminæ being frequently distinguishable from each other by a slight difference in color, and sometimes by the interposition of other ingredients. Water has but little action upon it; it is perfectly dissolved by caustic potash; disappears with effervescence in hot nitric acid, the solution affording, on evaporation to dryness, a bright carmine-colored residue; and, before the blow-pipe, it becomes black, emits a peculiar animal odor, and is gradually consumed, leaving a minute quantity of white, alkaline ashes.

As a variety of the preceding, the *uro-ammoniac* calculus may be here mentioned. It is principally observed in children, and is so extremely rare that several distinguished chemists have been induced to deny its existence. It is generally of small size, with a smooth surface, of a clay color, and consists of concentric rings, which present a very fine earthy appearance when fractured. Much more soluble in water than the uric calculus, it gives out a strong ammoniacal smell when heated with caustic potash, and deflagrates remarkably before the blow-pipe. This variety of calculous concretion was first described by Fourcroy.

Next to the uric calculus, in point of frequency, is the *oxalic*, which is generally of a dark brown color, rough and tuberculated on the surface, very hard, compact, and imperfectly laminated, seldom larger than a walnut; spherical, and always single. Under the blow-pipe, it expands and effloresces into a white powder; and it dissolves slowly in muriatic and nitric acid, provided it be previously well broken up. In the alkalies, it is perfectly insoluble. This species of urinary concretion, called by many the *mulberry* calculus, from its resemblance to the fruit of the mulberry, was first correctly analyzed, in 1797, by Dr. Wollaston, who proved it to consist essentially of oxalate of lime.

A variety of this species of calculus has been described by the term *hemp-seed*, from some resemblance which it bears in color and lustre to that substance. It is always of small

size, remarkably smooth, and generally exists in considerable numbers, being rarely if ever found alone.

The *phosphatic* calculus, described by Wollaston in 1797, is of a pale brownish color, and of a loosely laminated structure, with a smooth, polished surface, like porcelain. The shape is mostly oval, and the size, though generally small, is sometimes very considerable. It whitens when exposed to the blow-pipe, but does not fuse ; and readily dissolves in muriatic acid, without effervescence. This calculus, composed essentially of phosphate of lime, is extremely rare, as forming entire concretions, but frequently constitutes alternate layers with other matters. It is sometimes called the *bone-earth* calculus, and occasionally contains small quantities of carbonate of lime.

The next species is the *ammoniaco-magnesian*, so called from its being composed of the phosphate of ammonia and magnesia. This mixed calculus is of a white color, friable, crystallized on the surface, and looks a good deal like a mass of chalk : its texture being never laminated, it easily dissolves in dilute acids, but is insoluble in caustic potash : before the blow-pipe, it exhales an ammoniacal odor, and at length melts into a vitreous substance. This species of concretion, first noticed by Wollaston in 1797, sometimes attains an immense size. In a case mentioned by Dr. Thomson, the circumference was fourteen inches, and the weight nearly two pounds.

The *fusible* calculus, the nature of which was first determined by Wollaston, consists of a combination of the two last. It is of a white color, extremely brittle, leaves a soft dust on the fingers, and is easily separated into layers : when broken, it presents a ragged, uneven surface. It is insoluble in caustic potash, but gives off ammonia ; and, under the blow-pipe, it is readily converted into a transparent, pearly-looking glass. This concretion is very common, and sometimes attains a very large size. It is frequently met with as an incrustation of foreign bodies.

A very rare species of urinary concretion is the *cystic*, so called from an erroneous supposition that it was peculiar to the bladder. It consists of a confused, crystallized mass, of a white, yellowish color, with a smooth surface. The structure is compact, and the fracture exhibits a peculiar glistening lustre, like that of a body having a high refractive density. It exhales a strong characteristic odor under the blow-pipe, and

is very abundantly dissolved in acids and alkalies, with both of which it crystallizes. This species is commonly of an irregular, spherical shape, and seldom attains a large volume. Wollaston termed it an oxide, and gave it the name of cystic, from a belief that it occurred exclusively in the urinary bladder. It has since been detected, however, in the kidney.

The *xanthic* calculus was first pointed out by Dr. Marcet, whose account of it is the best that is extant. It is extremely rare, having hitherto been met with only several times. Its texture is compact, hard, and laminated ; its color is of a cinnamon brown, its surface smooth, and its volume small. It dissolves very readily in acids and alkalies, and is gradually consumed before the blow-pipe, leaving a minute quantity of white ashes.

There is, lastly, what is called the *fibrinous* calculus. Like the preceding species, this is also extremely rare, and appears to be composed principally of the fibrin of the blood, — a property to which it owes its name, and by which it is characterized. Sir Benjamin Brodie has described a concretion of this kind, which was about the size of a horse-bean, of an oval shape, and of a yellow transparent appearance, not unlike amber, but less hard. When dried, it shrunk to a small size, and became considerably shriveled.*

Such is a succinct account of the relative frequency of the different species of urinary concretions, their physical properties and chemical composition. In many cases they are formed in the kidneys, whence they descend into the bladder, where they gradually acquire the characters that have just been ascribed to them ; but at other times they take their origin entirely in the urinary reservoir, and not unfrequently they grow around a foreign body as their central nucleus. A substance like mortar is occasionally contained in the bladder, filling up a large portion of its cavity. It is of a pale yellowish color ; is composed principally of phosphate and carbonate of lime ; and is usually connected with chronic inflammation of the lining membrane, leading to effusion of lymph. Hair is sometimes found in the softer varieties of urinary calculi, but this, I presume, is very rare. The immediate cause of the formation of vesical calculi consists in the inordinate deposition of the earthy salts of the urine, which, instead of being discharged with that fluid, sink to the bottom of the bladder,

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* Lectures on the Urinary Organs, p. 214, second edition. London, 1835.

and so become the nuclei around which the accretion gradually takes place.

The symptoms of stone vary in different cases, according to the size of the concretion, the roughness of its surface, and the accompanying state of the bladder When the disease is fully developed, there is a frequent desire to make water, the calls to which are often sudden, irresistible, and liable to be induced by the slightest change of posture. A small aching pain is usually felt at the neck of the bladder, which, extending along the urethra, is always most severe immediately after micturition, or during the flow of the last drops of urine. Itching of the head of the penis is a very common and distressing symptom, and is usually more distinctly marked in children than in adults. The urine is frequently tinged with blood, especially after exercise; and, as it flows from the bladder, it is liable to be stopped by the stone falling against the inner orifice of the urethra. With these phenomena are often observed uneasy sensations in the perinæum, groin, testicle, and lumbar region, a peculiar expression of suffering and anxiety in the patient's countenance. Tenesmus is sometimes experienced from the propagation of the irritation to the rectum; and the urine, upon settling, generally deposits a considerable quantity of mucus. The only diagnostic sign, however, is the recognition of the stone by the sound.

There is no fluid which, even within the limits of health, is liable to so many variations in its physical and chemical properties as the urine. Its quantity, also, is extremely uncertain, as it is influenced by numerous causes, especially by the state of the skin and the amount of liquids received into the stomach. On an average, however, a healthy person voids about forty ounces in the twenty-four hours. When perfectly normal, the urine is of a pale amber color, transparent, saline in its taste, and slightly aromatic in its odor. It is of the average specific gravity of about 1.025; is supposed, from its giving a red tint to litmus paper, to contain a free acid; and deposits, on standing, an insoluble substance, consisting of mucus and the super-urate of ammonia. The quantity of solid matter that passes off by this excretion daily is about sixteen drachms, and does not seem to be subject to much variation.

The most elaborate analysis of this fluid is by Berzelius.

According to this distinguished chemist, 1000 parts of urine are composed of

Water,	933.00
Urea,	30.10
Uric acid,	1.00
Sulphate of potash,	3.71
Sulphate of soda,	3.16
Phosphate of soda,	2.94
Phosphate of ammonia,	1.65
Muriate of soda,	4.45
Muriate of ammonia,	1.50
Phosphate of lime and magnesia,	1.00
Siliceous earth,	.03
Vesical mucus,	.32
Free lactic acid, lactate of ammonia, and animal matter not separable from them,	17.14

Besides these ingredients, the urine likewise contains a small amount of sulphur, phosphorus, and a peculiar yellow coloring matter, which has not yet been obtained in a separate state. In the urine of infants there is also generally some benzoic acid.

Such, then, in a few words, are the characters of this excretion in the normal state of the system. But, as might be expected, this fluid undergoes great changes in various disorders of the body, which may be conveniently reduced, as has been suggested by Andral, to three classes. Under the first category are comprised those cases in which there is merely deficiency or excess of the natural constituents of the urine; in the second, there is an addition of new principles, analogous to those that are contained in the blood; and under the third head are embraced such substances as are deposited with the urine, but are not found in the circulating fluid, either in the healthy or diseased state. Each of these classes affords interesting topics of inquiry, which demand brief consideration in this place, referring for more ample details to the excellent treatises of Berzelius* and Prout.†

1. Water and urea, being naturally present in greatest abundance, are more liable to variation than any of the other constituents of the urine. In nervous diseases, especially

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* Traité de Chimie, t. vii. Paris, 1833.
† Inquiry into the Nature and Treatment of Gravel, &c.

such as are of a hysterical nature, this secretion is generally
copious, remarkably limpid, and of an aqueous character.   In
diabetes insipidus, the urine, which is discharged in immense
quantities, is almost wholly composed of water ; the urea is
entirely absent ; and the fluid, on evaporation, leaves a yel-
low-brownish sirup, in which there is no appearance of crys-
tals, and which possesses a very feeble acid reaction.   Urea
is furnished sparingly in chronic inflammation of the liver, in
the granular disease of the kidney, in dyspepsy, pulmonary
phthisis, gout, and intermittent fevers.   This substance has
been supposed, but erroneously, to be wanting in diabetes
mellitus.   Both Barruel and Henry have shown that it is
generally present, and they suppose that the error into which
other chemists have fallen in respect to this matter, has arisen
from the tendency which the sugar has to prevent the nitrate
of urea from crystallizing.   Urea sometimes exists in excess.
This state is usually combined with preternatural activity of
the renal function, and can be easily recognized by mixing
with the urine an equal quantity of nitric acid.

The lactic acid, which, according to Berzelius, naturally ex-
ists in the urine, is seldom or never altered either in quantity
or quality.   But this is not the case with the uric and phos-
phoric.   The former of these, supposed by Dr. Prout never to
be present in healthy urine, generally greatly predominates in
arthritic affections, as is shown by the formation of the earthy
concretions, which are so frequently seen in the joints of the
extremities, and which seem to be composed principally of
the urate of soda, with a small quantity of the urate of lime.
Gravel commonly consists of uric acid, and it is well known
that this substance forms the basis of one of the worst kinds
of urinary calculi.   In diabetes mellitus this acid is entirely
absent, no trace of it whatever being discoverable by the
most delicate tests.

In some instances this acid occurs in a free state ; but most
generally it appears in combination with an alkali ; and, so
long as this is the case, it does not yield a crystalline deposit.
The undue secretion of this substance is usually produced
by errors in diet, and by whatever has a tendency to impair
the digestive powers.   Hence it is most commonly met with
in dyspeptic persons, of a gouty, irritable habit, in whom it
sometimes prevails to a most unhappy extent, constituting a
sort of uric acid diathesis.

A deficiency of phosphoric acid is not less injurious than

an excess of uric.   Prout supposes that, when this acid is not secreted in due proportion, the earthy materials of which it is the base are converted into neutral salts, and then precipitated, so as to afford an opportunity for the formation of a stone.

The alkalies which enter into the composition of this fluid are sometimes secreted in excess, and, by combining with the acid ingredients, may form salts, which, on being deposited in the bladder, give rise to calculous concretions.   This is especially the case with the lime and ammonia, the soda and potash producing little or no inconvenience.

2. The process of secretion, which is constantly going forward in the kidney, sometimes proceeds to a morbid extent, in consequence of which substances are generated which do not naturally occur in the urine.   The most important of these, in reference to the pathology and treatment of diseases, are albumen, fibrin, and the coloring matter of the blood. Other substances are occasionally observed, which get into the urine accidentally, and impart to it their peculiar properties.   Of this description are the yellow matter of the bile, asparagus, oil of turpentine, and most of the balsamic preparations.   Cantu detected mercury in the urine of persons who had been subjected to frictions with that substance, in the form of ointment ; and the ferro-cyanate of potash, tartaric acid, iodine, and a hundred other articles have been observed by different chemists in this fluid, after they had been used as medicines.

In severe cases of jaundice, whether resulting from duodenitis, inflammation of the liver, or obstruction of the natural outlets of this organ, the bile passes from the blood into the kidneys, and communicates a yellow tint to the urine, at the same time that it renders it more acid.   The most delicate test of its presence is muriatic acid, which causes either a green or brownish hue, according to the peculiar modification of the coloring . principle of the foreign ingredient.   Linen and paper will receive a very distinct yellow stain, which remains when dried.   The muriate of iron and the acetate of lead produce a yellow precipitate, the sulphate of copper, a dirty green one.

Albumen is said by some to be always contained in very minute quantity in healthy urine ; but, however this may be, this substance is frequently present in certain diseases, in large proportion.   In the granular affection of the kidney, so

ably elucidated by Dr. Bright, albumen generally exists in considerable quantities, though it cannot be regarded as pathognomonic of that singular lesion, as it has been repeatedly observed in pneumonitis, dropsy of the abdomen, tubercles of the lungs, prurigo, and typhoïd fevers.   Both Bouillaud and Piorry declare that they have frequently noticed this substance in diseases which had no connection whatever with the urinary organs.   According to Dr. Blackall, it is characteristic of certain kinds of dropsy, especially such as are accompanied with a phlogistic diathesis, — an opinion which has been amply confirmed by the researches of other pathologists.

Albuminous urine is generally of low specific gravity, from deficient quantity of urea and salts, of a pale, opaline color, and readily coagulates on exposure to heat.   The ferro-cyannate of potassium, alum, and nitric acid will also curdle it.

The urine may also contain fibrin; but this, I presume, is very rare; at all events, the subject is seldom alluded to by writers.   Dr. Prout saw a remarkable instance of this deposit, in a middle-aged woman, who had a most voracious appetite, but was otherwise perfectly healthy.   Her urine, which was of a pale yellow tint, was extremely thick, and contained a large quantity of matter, which bore the greatest resemblance to the fibrin of the blood.   The appearance of this substance is occasionally associated with certain forms of dropsy; but how it is produced it is impossible, in the present state of our knowledge, to determine, as nothing is yet certainly known respecting it.   Perhaps it may depend upon some structural lesion of the kidney, that has hitherto escaped the attention of the anatomist, or it may be that it is connected with a sort of inflammatory diathesis, either of the renal tissues, or of the system at large.

The coloring matter of the blood is sometimes found in the urine.   It may get into it either in consequence of external violence, giving rise to the laceration of some of the vessels of the urinary organs; or it may be a product of exhalation of the mucous membranes; or, finally, a secretion from the kidney.

3. In the third place, the urine may be altered by the ingress of principles which, so far as we know, are not naturally contained in the blood.   Amongst these, the most common are the cystic and xanthic oxides, oxalic acid, and a peculiar saccharine substance, like the sugar of grapes.   The

cystic and xanthic oxides are never observed in healthy
urine : they form the base of several varieties of vesical con-
cretions, and the causes which predispose to their develope-
ment are still unknown. Oxalic acid is more frequently seen,
and is often traceable to articles of diet, which naturally pos-
sess a large quantity of this substance.

An abundant secretion of sugar is a circumstance by no
means uncommon. In *diabetes mellitus*, where it is gener-
ally present in large proportion, it forms the characteristic
feature of the disease. The urine in this complaint is com-
monly of a pale straw color, of a faint, whey-like odor, and
of a decidedly saccharine taste : it has a greater specific
gravity than in health, yields a sirup by evaporation, has
little tendency to putrefy, and is susceptible of undergoing
the vinous fermentation. Diabetic urine almost always con-
tains the usual proportions of saline matters ; but, in the
majority of cases, there is a great deficiency of urea and
lithic acid. In a specimen of this fluid, examined by Mr.
Kane, of England, 1000 parts were found to be composed of
913 of water, 60 of sugar, 7 of urea, and 20 of salts.

The quantity of urine discharged in diabetes is sometimes
surprising. Cases are on record, in which from two to four
gallons have been voided every twenty-four hours for a num-
ber of weeks, and even months. The amount of saccharine
matter is also very great. From some observations of Dr.
Henry, of England, it appears that ten pints of diabetic
urine, of the specific gravity of 1.040, contain upwards of a
pound and a quarter of solid extract. The proximate cause
of this disease is still unknown. From the facility with
which the saccharine matter is furnished by the kidneys, it
has been supposed to exist in the blood. No chemist, how-
ever, has hitherto succeeded in detecting it in this fluid ; and,
until this be done, it would be idle to indulge in specula-
tions. The kidneys are generally large and flabby, and there
is almost always great disorder of the digestive apparatus.

Though *oil* is not contained in healthy urine, it is found
in certain diseases. In one instance, Mr. Prout observed a
substance like butter ; and, in some cases, the fluid has the
aspect of milk. Of oily urine, Raciborski has pointed out
three varieties. In the first, the fluid is of a reddish yellow
color, and of a viscid, ropy consistence ; in the second, it is
of a mahogany brown. When this appearance is witnessed
in acute diseases, it is always indicative, according to Landré-

Beauvais, of great danger; in the third, the fatty matter floats on the surface of the urine, forming a thin pellicle, not unlike a spider's web.

The urine is occasionally of a *bluish* tint, owing to the presence of a peculiar coloring matter, which it holds in suspension. This substance, whatever may be its nature, is slightly soluble in boiling water and alcohol, has neither taste nor smell, and is entirely destroyed by nitric acid. Exposed to heat, it yields carbonate of ammonia, and an empyreumatic oil.

The urine may likewise be of a *black* color, from the presence of melanic acid. When this substance is very abundant, the fluid has sometimes the appearance of black ink, or may be made such by the addition of an alkali. More frequently, a pink color is observed, which is supposed by Dr. Prout, to be owing to the presence of purpuric acid. Raciborski has often noticed this tint in rheumatic affections of the joints, of which, however, it is far from being diagnostic; and he has also witnessed it, though much less frequently, in catarrhal complaints of the chest.

The urine, under certain circumstances, deposits amorphous sediments, which Dr. Prout has divided into several classes, the difference of color forming the basis of the division. They all consist essentially of the lithate of ammonia, tinged with the coloring principle of the urine, or the purpurates of ammonia and soda. The yellow sediment is characteristic of health; the pink, of hectic; the lateritious, of inflammatory fever. To this statement, however, there are numerous exceptions.

Lastly, the urine may contain hairs. Of this singular occurrence, highly interesting cases have been published by Magendie, Brodie, and some other writers. The hairs, which are occasionally quite numerous, are seldom more than five or six lines in length, and they generally appear in combination with an excessive secretion of earthy matters. Whence these hairs are derived, we have no means of ascertaining. The subjects of most of the cases that have been reported, were old men of intemperate habits.

SECTION V.

Of the Prostate Gland.

THE prostate gland, situated at the inferior part of the neck of the urinary bladder, is a small conical body, of a firm consistence, yet easily compressed, and of a grayish color, bordering upon red.   Its weight, in the adult human subject, although liable to considerable variation, is generally found, according to my own examinations, not to exceed five drachms.   In length it is ordinarily about twenty-one lines, by eighteen in breadth, and nine in thickness. Larger behind than in front, it consists of two lateral halves, which are separated posteriorly by a deep notch, in the upper part of which, at the origin of the urethra, lies the small pyramidal tubercle, which Sir Everard Home has described as the third lobe of the prostate, but which, in the generality of cases, seems to be merely a portion of the body of the gland, in a state of hypertrophy.   Enveloped by a strong capsule, the organ is composed of a dense, fibrous substance, of a white grayish tint ; in the interior of which, are a large number of mucous follicles, which pour their contents, by means of ten or a dozen ducts, upon the inner surface of the prostatic portion of the urethra, at each side of the caput galli-naginis.

The prostate is liable to be affected with inflammation, suppuration, ulceration, hypertrophy, enlargement of its ducts, tubercular depositions, and earthy concretions.

Acute inflammation of the prostate is rather a rare disease, especially in the young.   Its anatomical characters are increased vascularity, and, as a natural consequence, deep redness, with tumefaction, serous infiltration, and preternatural lacerability.   The disease is generally induced by an extension of irritation from the neighboring parts, as the urethra, perinæum, or rectum, and is always marked by great distress in the neck of the bladder, difficult micturition, dull, aching pain in the pelvic cavity, and numbness in the groin and thighs.   The urine is hot and scanty, and sometimes, especially when there is much swelling of the prostate, there is complete obstruction to its evacuation.

Suppuration is commonly the result of acute inflammation,

though occasionally it supervenes on the chronic form of the disease. The matter, which is ordinarily of a thick creamy consistence, and of a pale straw color, is sometimes diffused through the substance of the gland; but more frequently it is collected into little abscesses, which have a natural tendency to burst into the urethra, the bladder, or the rectum. In some instances, the fluid finds an outlet through the perinæum. Occasionally the abscesses attain a very considerable size, containing from one to three ounces of pus. Suppuration of the prostate is seldom seen before the age of twenty; but, from this period on, it is by no means infrequent. Its existence may be suspected by a variety of symptoms; but the only certain sign is the sudden discharge of pus with the urine.

When the inflammation becomes chronic, it sometimes terminates in *ulceration.* The erosions generally exist on the vesical surface of the gland; and as they are constantly in contact with the urine, they often give rise to the most intense suffering. Their edges are usually hard and irregular, and their depth is frequently such as to render it difficult to pass the catheter. When these ulcers are extensive, they are liable to bleed, the hemorrhage being generally small, but sometimes copious and alarming.

Chronic inflammation is much more common than the acute, of which it is occasionally the result. The affection is very frequent in the decline of life, and in persons who are suffering from calculous disorders, or disease of the rectum. The most ordinary effect of this species of irritation, in relation to the proper structure of the gland, is *hypertrophy.* The enlargement is sometimes very great, exceeding many times the natural size; and it is commonly much more conspicuous on one side of the organ than on the other. Often it seems to be entirely confined to the third lobe, which projects upwards into the cavity of the bladder, like a big nipple. The enlargement is sometimes unattended with alteration of texture; in most cases, however, it is remarkably hard and firm, presenting, when cut into, a dense, gristly substance, of a whitish-brown color, with membranous bands extending through it in different directions. This constitutes the *scirrhous* prostate of authors. The vessels in the neighborhood of the gland are often very much enlarged, and even quite varicose.

This hypertrophous state of the prostate is always attended

with difficult micturition, resulting from the mechanical obstruction which it produces at the mouth of the urethra. The urine has to be drawn off with the catheter, and even this often fails in entirely emptying the bladder, the fluid which lies behind the enlarged gland, in the bâs-fond of the organ, escaping the instrument. When the disease is obstinate, as, in fact, it usually is, the patient is not only tortured with retention of urine, but he suffers from disease of the rectum, which, in consequence of the frequent straining efforts which he is obliged to make, is everted at the anus; the penis is often in a state of partial priapism; at night, there are involuntary seminal emissions; severe pains dart along the groin and urethra; there is a dull, aching sensation in the perinæum; and, in obstinate cases, œdema of the scrotum and inferior extremities. The bladder, in most instances of this kind, is excessively irritable; it becomes small and contracted, and, from the great exertion which it is constantly obliged to make to expel its contents, its middle tunic is often very much thickened, the muscular fibres being rendered as distinct as the fleshy columns of the heart. The mucous secretion is thick and viscid, and not unfrequently mixed with blood, or even purulent matter. The kidneys are also liable to become affected, and the patient sometimes falls a victim to the disease which is thus lighted up in them.

A very rare affection of this gland is sometimes met with, which, until recently, seems to have entirely escaped the attention of the pathological anatomist. I allude to the *dilatation* of the excretory ducts of the prostate, forming small pouches which may arrest the beak of the catheter, or become depots of earthy concretions, or urinary calculi. The sacs are seldom numerous, and they vary in size between a cherry and a marble: sometimes they attain a magnitude capable of holding several ounces; and cases occur, in which the whole of one lobe, or even the entire organ, is converted into a thin, fibrous capsule, the proper substance of the gland being almost wasted. This lesion most commonly occurs in old persons, in connection with urinary calculi and chronic enlargement of the prostate.

The prostate is occasionally the seat of *tubercles*. Of this disease, I have never seen but one example, in a young man who died in the Cincinnati Hospital, of psoas abscess. There were six or eight small masses, of a pale yellowish color, and of a soft, curdy consistence, scattered through different

parts of the gland, which was at the same time considerably reduced in size.   The deposition of tubercular matter here is commonly associated with pulmonary phthisis : it seldom occurs under the age of forty-five or fifty, and appears to have a decided predilection, so to speak, for the follicular structure of the gland.

I have never met with *earthy concretions* in the prostate ; but cases of this description have been frequently noticed by others.   Their composition is invariably phosphate of lime, with a little animal matter.   In their size, they vary between a mustard-seed and a hazelnut ; they are of a rounded figure ; their surface is smooth and polished ; and their color of a yellowish-brown.   These bodies often exist in considerable numbers, being either embedded in the substance of the gland, or situated in the dilated ducts.   They rarely cause much uneasiness, and thence their presence is not always suspected during life.   Occasionally they create retention of urine ; and, in some instances, their existence has been detected by the sound, or by the finger introduced into the rectum.

CHAPTER XIII.

Of the Male Organs of Generation.

SECTION I.

Of the Testicle.

THE testicle, suspended in the scrotum by the spermatic cord, is of an ovoïdal figure, and surrounded by two envelopes; the one of a fibrous, the other of a serous structure; the former giving it firmness, the latter, usually termed the vaginal tunic, enabling it to execute its various movements. In the adult, it is generally, according to my own measurements, about twenty-two lines in length, by eighteen in breadth, and seven in thickness. Its medium weight, I have found, in a considerable number of subjects, to be about five drachms, — the minimum being three and a half, and the maximum six and a half. The weight of the epididymis generally ranges from two to three scruples. In its consistence, it bears a strong resemblance to the ball of the eye; externally, it is of a white grayish color, owing to its fibrous covering; and, when cut into, it is found to consist of a soft, yellowish, pulpy substance, arranged into small pyramidal

masses, composed each of a coiled string of seminiferous tubes.

The diseases of the testicle are numerous and important, and they may be conveniently considered with reference to its serous investment, and its proper parenchymatous texture.

I. The principal lesions of this membrane are, acute and chronic inflammation, suppuration, hydrocele, induration, hæmatocele, fungous growths, cartilaginous and osseous transformations.

Acute inflammation of the vaginal tunic exhibits the same phenomena precisely as the serous textures in other situations. There is more or less redness, with effusion of serum, fibrin, pus, or blood; and not unfrequently the contiguous surfaces of the membrane coalesce by the adhesive process. The water that is poured out by the vessels is either absorbed or remains until it is drawn off by a surgical operation.

Suppuration of this membrane is very rare, except as a consequence of hydrocele and its treatment. The matter is generally of a yellowish straw color, and, when allowed to stand, separates into two parts, one of them thin and watery, the other thick and purulent.

Chronic inflammation of the vaginal tunic is of frequent occurrence in the inhabitants of warm climates, and in persons who are subject to diseases of the urethra and prostate gland. It is characterized by opacity and thickening of the inner surface of the membrane, and by the effusion of different kinds of fluids, especially such as are of a serous nature.

Naturally, the vaginal tunic is lubricated by a thin vapor. In inflammation this vapor becomes condensed, and thus leads to the formation of what is named *hydrocele*. The quantity of fluid poured out in this affection does not usually exceed six or eight ounces; but, in some instances, it amounts to several quarts. In the case of the celebrated Gibbon, Mr. Cline drew off not less than a gallon and a half. The water is generally quite limpid, especially in young subjects, and somewhat saline to the taste: sometimes it is of a deep yellow tint, and contains white, flaky particles, soft and greasy, like adipocire, and composed of cholesterine; * more rarely it is of a red color, from the admixture of red globules. It

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* " Dr. Bostock has suggested, with apparent probability, that these small, flaky particles are not the direct result of secretion, but the product of a chemical change taking place in the effused fluid, similar to that by which adipocire is formed from flesh when subjected to long maceration in water."

is coagulable by heat, alcohol, corrosive sublimate, and dilute acid, — facts which show that it closely resembles the serum of the blood. When the disease is of long standing, and dependent on organic lesion of the testicle, the accumulated fluid is often purulent. In a case in which I operated several years ago, I drew off nearly two quarts of pus and serum, of a very fetid smell.

In recent hydroceles, the vaginal tunic is commonly unaltered; in old ones, it is apt to become opaque, hard, and thickened. Occasionally the inner surface has a rough, pitted aspect, caused by the effusion of coagulating lymph; and instances sometimes occur, though rarely, where it is partially ossified, or studded with small cartilaginous growths, similar to what take place in the movable joints. Infants sometimes labor under this complaint, from the vaginal tunic continuing to communicate with the cavity of the abdomen, and allowing the water effused there to descend into it. This, I need scarcely say, is called *congenital hydrocele.*

Most hydroceles have a pyriform, conical, or globular shape; sometimes they exhibit a sort of hour-glass contraction, and in a few instances the water has been found in distinct sacs. This species of the disease is commonly of slow growth, and often remains stationary for years.

Hydrocele occurs at all periods of life, in infancy, in adolescence, and in old age. The disease is generally unattended by pain, except where the accumulation is large, when it is apt to incommode by its weight. The tumor is hard but compressible, and, when examined by candle-light in a dark room, is usually quite translucent. What is remarkable, and worthy of particular notice, is, that the testicle lies almost always at the posterior part of the tumor, opposite the inferior third of the swelling.

Hæmatocele, as its name imports, is a collection of blood in the vaginal sac, caused by mechanical violence, or inflammatory irritation; in the latter case it is ordinarily connected with hydrocele. The tumor is pyriform, dark, compressible, and filled with thick, grumous blood, often of the color of coffee-grounds. The vaginal tunic is somteimes preternaturally hardened, and its inner surface roughened with lymph. This affection, which is seldom painful or attended with constitutional disturbance, may be distinguished from hydrocele by its dark color, its obscure fluctuation, its weight, and by the fact that it is usually the result of external injury. Some-

times the clots that are thus formed become organized, the vessels which they contain being susceptible of artificial injection.

Encephaloïd, though occasionally found in the vaginal sac, is extremely rare. I have never met with it, and Sir Astley Cooper has seen it only once. The morbid mass has a white brain-like aspect, and possesses all the characters of fungus hæmatodes. It is commonly connected with hydrocele and thickening of the serous tunic. No particular pain seems to attend the developement of this disease.

Sometimes the vaginal tunic acquires a cartilaginous hardness ; and portions of it, as before stated, have been found in an ossified state. These transformations, which are not infrequent attendants on old hydroceles, ordinarily occur in small patches, of no determined shape ; but sometimes they grow from the free surface of the membrane in the form of little spicules, the attachment of which is affected by very slender footstalks.

In dissecting persons that have labored for a long time under hydrocele, or other chronic affections of the serous covering of the testicle, we occasionally find small *earthy concretions*, either contained in distinct sacs, or floating about in the serum. Their number, though sometimes considerable, seldom exceeds two or three ; their size varies from that of a shot to that of a pea ; and not unfrequently they have a peculiar pearly lustre. Sometimes such bodies are partly osseous and partly cartilaginous ; and now and then they are remarkably hard and gritty, like grains of sand. Their composition is carbonate and phosphate of lime, with about thirty-eight parts of animal matter in the hundred. The celebrated John Wesley, who was afflicted with hydrocele in his old age, is said to have had a small concretion of this drawn off by his physician.

II. The testicle is liable to inflammation, purulent deposits, scirrhus, encephaloïd, tubercles, hydatids, and osseous degeneration.

The anatomical characters of *acute orchitis* are, increased vascularity, and thickening of the tubular structure, followed, when the disease runs high, by deep redness and softening. The organ swells, becoming hard and rounded, and the vaginal sac is either distended with watery fluid, or lymph is poured out, by which the two contiguous surfaces of the membrane are permanently glued together. The epididymis

is usually involved in the affection, and in many cases the irritation extends along the spermatic cord, rendering it tumid and painful.

This disease, although it generally terminates by resolution, sometimes proceeds to suppuration, or it leaves the organ in a state of chronic enlargement, or, finally, it may give rise to hydrocele. The most common causes of acute orchitis are, local violence, suppression of the gonorrhœal discharge, mumps, stimulating injections, and vicissitudes of temperature. Great tenderness and swelling of the part, inflammatory fever, nausea, and vomiting, with irritability of the bladder, and dull, aching pain along the course of the spermatic cord, constitute the characteristic symptoms of the disease.

When suppuration is about to set in, all the symptoms become suddenly aggravated ; rigors now come on, attended often with slight delirium ; and the part is so painful that the patient can scarcely tolerate the weight of the bed-clothes. The pus, being generally mixed with seminal fluid, is seldom of a healthy character ; and, as it is confined by the albuginous coat, it is always a long while in working its way to the surface. The abscess often breaks at several places, thus leaving unhealthy sores which it is difficult to heal, and which not uncommonly lead to a total disorganization of the tubular structure. Suppuration of the testicle is most common in scrofulous subjects.

Chronic inflammation of the testicle seems to be of rather frequent occurrence, especially in warm latitudes. It usually begins in a hardness and swelling of the epididymis, from whence it gradually extends to the body of the gland, the seminiferous ducts of which are dilated, indurated, and of a dark grayish color. At first, the organ enlarged perhaps many times beyond its ordinary bulk, retains its natural smoothness, but by and by it becomes knobby and irregular. This form of the disease is often accompanied with effusion of serum into the vaginal sac, by the deposition of purulent matter in the parenchymatous structure, and by enlargement and thickening of the spermatic cord. In obstinate cases, the gland is sometimes of a hard, compact consistence, grates under the knife when cut, and is of a dark, reddish color, not unlike half-boiled flesh. Cells are often found in its interior, containing different kinds of fluids. The disease occasionally affects both testicles. There is seldom much constitutional

derangement, and the organ is usually free from pain, manifesting little or no tenderness on pressure.

When the testicle is *scirrhous*, the disease may be recognized by the great hardness of the gland, by the tardiness of its progress, by tenderness on pressure, and by pain darting along the spermatic cord to the loins. It seldom appears before the age of thirty-five or forty, though in a few instances I have noticed it at a much earlier period. In many cases it can be traced directly to the effects of injury, syphilis, or gonorrhœa.

Encephaloïd is a malignant growth of the testicle, commencing with swelling and induration of the body of the organ, generally slow in its progress, but sometimes so rapid as quickly to attain a very great size. When thus rapid, the disease soon reaches the epididymis, and the gland, instead of being globular, as it was in the first instance, is rendered pyriform, and so much resembles hydrocele as to be readily mistaken for it. The deception is increased frequently by the elastic nature of the tumor, by the effusion of water into the vaginal sac, and by the absence of pain and tenderness on pressure. As the disease advances, the testicle loses its smoothness and regularity, its surface becoming rough and knobby ; the swelling is soft, doughy, and irritable ; the spermatic cord enlarges, its vessels being often hard and varicose ; the inguinal ganglions of the affected side are tumid and tender ; the patient complains of occasional pain in the tumor, darting into the groin and lumbar region ; the countenance is wan and sallow ; and all the phenomena, both local and general, indicate the destructive nature of the malady. Ulceration sometimes occurs, attended by a discharge of bloody, serous fluid, and by the formation of fungous granulations, remarkably sensitive, and so tender as to bleed on the slightest touch.

If, in the first stage of the disease, the tumor be amputated, and carefully inspected, it will be found to consist of a soft, grayish, pulpy mass, looking very much like the cerebral tissue. Frequently the tumor contains serous cysts, coagulated blood, chocolate-colored matter, or a dark creamy substance, more or less offensive to the smell. The tubular structure of the gland is generally entirely destroyed ; the albuginous coat is very much thickened and indurated, or broken up, and confounded with the diseased structure ; and a considerable quantity of watery fluid, usually mixed with

blood, is almost always found in the vaginal sac. This horrible malady commonly occurs in connection with tubercles of the lungs, liver, or spleen, and always manifests a disposition to reappear, after the removal of the testicle, in the lymphatic ganglions of the groin, pelvis, or lumbar region.

Excepting the bones, eye, and mammary gland, the testicle seems to be more liable to this disease than any structure in the body. It is generally met with before the middle period of life, and may often be referred directly to blows, bruises, and other external injuries.

Tubercles are sometimes seen in the testicle, occurring either in its interior, on its surface, or in the epididymis : they are commonly of a pale yellowish color, spherical, and about the size of a pea. Occasionally the scrofulous matter is infiltrated into the tubercular structure ; and cases are observed in which the whole gland is converted into a curdy, friable, cheese-like substance. The disease begins without local uneasiness ; but, as it sometimes ends in ulceration, a very unpleasant sore may be thus created, which is of a pink color, fungous, irregular on the surface, and often highly sensitive. The deposition seldom takes place in both glands at the same time : it generally begins at the epididymis of one of them, and extends from thence to the body of the organ, which, as just stated, it sometimes entirely occupies. The matter is usually poured into the cellular element of the organ ; but, in some cases, there is reason to believe that it is deposited directly into the excretory tubes.

It is very rarely that the testicle contains *hydatids*. When present, they are commonly small, and their tendency is gradually to destroy the tubular structure, in which they are located. These remarks are equally applicable to the serous cysts, which are occasionally found in this gland. Both these affections are unattended by pain, and they are seldom witnessed before the age of twenty-five or thirty. The cysts vary in size from. the head of a large pin to that of a small grape ; they are extremely delicate, highly vascular, gregarious, and contain a thin, transparent, straw-colored fluid, analogous to the serum of the blood. Occasionally their coats are much indurated, and their contents thick and glairy, like the white of an egg. With these growths is usually associated enlargement of the testicle, sometimes of great extent.

Nodules of *cartilage* are not of uncommon occurrence in the testicle, existing either alone, or, as is more commonly

the case, with other lesions. Of this disease I have never seen an instance; nor have I met with the osseous degeneration, spoken of by Baillie, Cooper, and other writers. Such deposits, whether seated in the substance of the gland, or in its envelopes, are probably always the effects of protracted orchitis: they do not seem to be accompanied by any particular symptoms, and they never admit of relief from treatment.

Hypertrophy of the testicle, without any appreciable change of structure, is a very uncommon circumstance. Baron Larrey has witnessed some cases of it, and several have been recently reported by other writers. The gland may attain the magnitude of a large fist. The general health is usually good; but the penis is incapable of erection, and the tumor incommodes by its weight. More commonly the hypertrophy is connected with induration, and various other deviations from the normal state.

Atrophy of this organ seems to arise from chronic irritation, leading to absorption of the tubular structure. It may result, however, from a great variety of causes, such as an abuse of venery, indulgence in masturbation, mechanical injury, obliteration of the spermatic arteries, and immoderate and long-continued use of iodine, opium, and other narcotics. In some instances it has been known to supervene upon injury or organic disease of the cerebellum; and, in the French soldiers, in Buonaparte's first campaign in Egypt, it was often produced, as was supposed by Larrey, by the employment of a species of brandy, manufactured from the date and laurel-berry. The wasting was generally very gradual, commencing with a loss of sensibility of the organ, which became softened, and at length reduced to the size of a small bean. Contemporaneously with this structural lesion was an altered state of the voice, with cessation of the growth of the beard, and complete loss of sexual powers.

Another very frequent cause of this lesion is mechanical pressure exerted upon the testicle by varicose tumors of the spermatic veins. Of this, several cases have come under my own observation, and others have been communicated to me by my medical friends. The absorption which is thus induced often proceeds with great rapidity, until the gland is reduced to a soft, pulpy mass, scarcely equal in volume to a Lima bean.

Atrophy of the testicles occasionally exists as a congenital defect. I am acquainted with two young men, natives of the

State of Ohio, in whom these organs are scarcely as large as a hazelnut. One of them has never experienced the slightest sexual desire ; the other has been married upwards of eight years, but no offspring has followed the connection. Complete inaction, such as is observed in monks, is often attended with atrophy and impotence.

SECTION II.

Of the Spermatic Cord.

THE spermatic cord, composed of the deferential duct, of blood-vessels, nerves, and absorbents, all invested by a thin, fibrous sheath, is liable to encysted hydrocele, varicocele, and neuralgia.

Encysted hydrocele may be seated in the free portion of the cord, or it may occupy the part which lies in the inguinal canal. In the former situation, the nature of the swelling may be readily distinguished by its globular figure, by its firmness, transparency, and diminutive size ; in the latter, the diagnosis is often obscure, and the surgeon is liable to confound the disease with inguinal hernia. The fluid of a hydrocele of this kind is generally very thin and limpid, and the cyst consists of two layers, the external being formed by the spermatic fascia, the internal, which is almost always thickened, by the remains of the peritonæum. Let us be understood on this subject. In the descent of the testicle, the cord is loosely invested by a prolongation of the serous membrane of the abdomen ; this, after a time, contracts close adhesions around the cord, and in this way the communication between the peritonæum and the testicle is gradually destroyed. Occasionally, however, it happens that the union is in some places incomplete, and, a space being thus left, a slight secretion goes on, and an encysted hydrocele, as such an accumulation is called, is the consequence. The tumor is commonly small, rarely exceeding the volume of a pullet's egg.

Varicocele consists in an enlargement of the spermatic veins, as they stretch from the testicle, where they originate, to the groin. The vessels have a singularly knotty and tor-

tuous arrangement ; their coats are much thickened, and not unfrequently they feel like a cluster of worms. The tumor, which is irregular, compressible, and of a conical or globular shape, occurs much oftener on the left side than on the right, and is seldom attended with much uneasiness. In a few cases, there is pain in the loins and in the course of the cord ; but in the generality of instances the enlargement, however great, causes little suffering, save what results from its weight. Pathologists have endeavored to assign a reason for the greater frequency of this affection on the left side than on the right, by supposing that it is connected with the more dependent situation of the left testicle, and the greater length of the left spermatic vein, which, instead of ending in the inferior cava, like the right, terminates in the left renal, nearly at a right angle with the stream of blood from the kidney. This explanation, suggested originally, I believe, by Morgagni, is certainly plausible, and perhaps sufficiently near the truth. Be the cause, however, what it may, the fact is undeniable that the disease is generally found on the left side. In upwards of one hundred cases examined by M. Breschet, of Paris, only one occurred on the right side.

Although vericocele may show itself at any period of life, yet it is undoubtedly most common in young subjects, within the first ten years from the time of puberty. In twenty-seven cases of this affection, recorded by M. Landouzy, a recent French writer,* seven occurred between the ages of nine and fifteen ; seventeen between fifteen and twenty-five ; and three between twenty-five and thirty-five.

Neuralgia sometimes occurs in the spermatic cord, extending to the epididymis and body of the testicle. The affection, seated probably in the nervous plexus, around the spermatic vessels, is of the nature of tic douloureux, being characterized by unnatural sensibility of the affected parts, with excessive tenderness on pressure, and pain in the groins, sometimes darting into the back and thighs. The testicle is but little swelled ; the cord is not perceptibly altered ; and, if the parts composing it be removed from the body, and carefully inspected, no lesion whatever is to be observed in them, excepting, in some rare cases, a slight thickening of the nerves.

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* Essai sur la Varicocele, Journal des Connaissances Médico-chirurgicale, Jan. et Mars, 1838.

SECTION III.

Of the Seminal Vesicles.

LITTLE is known respecting the lesions of the seminal vesicles. That they are liable to derangement, is sufficiently obvious ; but that their diseases are few and of rare occurrence, is equally certain. Hitherto, these reservoirs have been almost entirely overlooked in our examinations ; and to this omission, perhaps, more than to any thing else, is to be ascribed the meagreness of our information. Their average length is about two inches and a half, their breadth six lines, and their thickness four lines.

Inflammation of the seminal vesicles rarely exists as a primary disease ; most generally it is propagated to them from the urethra, bladder, prostate gland, or testicles. In a few instances, pus has been detected in them ; and, on one occasion, I found the left in a fetid, gangrenous condition. The individual was fifty-eight years of age, and died of inflammation of the prostate, accompanied with complete retention of urine for nearly a week. The right vesicle was of a dark color, from the loaded state of its vessels ; and its cavity was filled with a thick, muco-purulent fluid, mixed with a small quantity of semen.

Tubercular matter is much more rarely deposited in the seminal vesicles than in the testicles, uterus, or Fallopian tubes. Baillie saw one of these reservoirs entirely distended with this substance ; and a case occurred to me, not long ago, in which both were filled with it. The individual was a young man, twenty-seven years of age, in whom similar deposits existed in some of the other organs. The vesicles were remarkably pale, and reduced to less than one half their ordinary volume. Small earthy concretions, of the same nature as those of the prostate, have occasionally been found in these bodies ; and, in several instances, they have been observed to be very hard and scirrhous.

None of the changes here described seem to have any particular signs that mark their existence during life. In the case above mentioned, in which one of these organs was gangrenous, there was violent pain in the region of the prostate gland, with retention of urine, and, towards the close of

the illness, the most furious delirium; but no symptom
whatever that could be referred to the seminal vesicle.

The seminal vesicles are sometimes remarkably small, and
occasionally one of them is absent. In some instances, their
ducts are wanting, and in others, they are obliterated by in-
flammation, lymph, or tubercular matter, of which I have
seen several examples. Professor Blandin mentions * a case,
which he observed in the body of a mendicant, where both
the excretory tubes terminated in a sort of flexuous cul-de-sac,
which supplied the place of the seminal vesicle.

SECTION IV.

Of the Scrotum.

THE scrotum is liable to be affected with inflammation,
cancer, and other diseases. Of these, it is only necessary to
notice a few of the more important.

Cancer of the scrotum seldom occurs before the period of
puberty. It is most common in scrofulous persons, and
chimney-sweepers; and hence it has by some been named
the chimney-sweeper's cancer. The affection generally be-
gins at the base of the scrotum, in the form of a small, wart-
like excrescence, covered by a thin, scaly crust. After this
has continued for a time, the hardened cuticle sloughs off,
leaving a superficial, painful, ill-looking ulcer, with indurated
and everted edges. The surface of the sore has a red, ex-
coriated aspect, and discharges a thin, sanguinolent fluid,
often highly irritating and offensive. In this way, the ul-
cerative process gradually extends, until at length a large
surface of the scrotum, together with the vaginal tunic, and
the exterior of the testicle, is involved in the disease. In
this advanced stage, the cellular tissue around the sore is gen-
erally white and scirrhous; and the inguinal glands on one
or both sides are enlarged, injected, and, in some instances,
filled with scrofulous matter. At the commencement of the
disease, the part is merely affected with troublesome itching;

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* See his "Nouveaux Elemens d'Anatomie Descriptive," t. ii. p. 264. Paris,
1838.

but, after a while, the patient complains of darting pains, which often extend along the spermatic cord, and the scrotum is hot and tender on pressure.

The scrotum is sometimes transformed into a hard, fleshy mass, constituting what is termed *sarcomatous* enlargement. The enormous magnitude which this disease may attain is almost incredible. A surgeon of the West Indies, removed a tumor of this kind, from the scrotum of a negro, which weighed seventy pounds ; and Baron Larrey has detailed the particulars of another, which was supposed to weigh one hundred and twenty pounds. In the medical museum, at Montpelier, there is a diseased mass of this character, which was amputated by the learned Delpech, the weight of which, I am told, is one hundred and sixty pounds.

This disease is seldom observed in this country or in Europe ; but in some parts of Asia and Africa it is not of infrequent occurrence, especially in persons that are afflicted with elephantiasis. Externally, the morbid growth is rough and fissured, and its surface, particularly in old cases, is covered with yellowish, scaly crusts, the detachment of which leaves so many small, herpetic sores, emitting a thin, ichorous discharge. The skin is very thick and indurated ; the cellular tissue is firm and scirrhous, from the distention of its cavities with semi-concrete, albuminous matter ; and the blood-vessels of the part, instead of being large and varicose, as we find them in most other tumors, are remarkably small and contracted. The swelling is commonly indolent, and incommodes rather by its weight and bulk than by its pain. In its shape it is mostly pyriform, but sometimes ovoïdal, or globular. The testicle is not necessarily implicated in this disease, nor is the spermatic cord so much indurated and enlarged, as in some of the other disorders of the genital apparatus.

A peculiar *sloughing* disease occasionally occurs in the scrotum of young children. In a case which I recently saw with Dr. Woodward, in an infant two weeks old, a slough, about an inch in diameter, suddenly formed over the right testicle, leaving the vaginal tunic perfectly denuded, and producing an angry-looking sore, with hard, glossy edges, reposing upon black-colored cellular tissue. The spermatic cord was indurated, tumid, and remarkably tender on pressure. The constitution did not seem to suffer much. In the course of twenty-four hours after these symptoms were

discovered, the vaginal sac became distended ; and, on punc-
turing it, a considerable quantity of sero-purulent fluid, of a
yellowish color, followed the lancet. A small portion of the
membrane now sloughed, leaving the gland quite bare ; but,
by touching the part with lunar caustic, and applying the
yeast poultice, granulations gradually sprouted up, and the
infant got well.

We sometimes find cysts in the scrotum filled with fatty
matter, teeth, hair, or osseous fragments, or all these sub-
stances in a state of combination. In a case of this description,
observed by St. Donat, a French surgeon, the tumor con-
tained, amongst other pieces, two distinct frontal bones, the
orbits of which were regularly hollowed out for the recep-
tion of two small, rudimentary eyes. In another example,
the particulars of which have been published by Dr. Die-
trich, professor of midwifery in the University of Glogau,
the débris which was found in the testicle was composed
of a pelvis and a lower extremity. A still more extraordinary
instance was observed by Dr. Ekl.* In this case, the scrotal
tumor was formed by the ribs, the spinal column, the orbits,
and thigh-bones of a fœtus. We have already alluded, in
another section, to the singular case reported by Dr. André,
of Pétronne, in which he discovered hair and teeth in the
testicle of a boy, seven years of age. These formations,
which, on the whole, are extremely rare, bear the closest
analogy to those of the ovary ; and they can only be ac-
counted for on the theory of monstrosity by inclusion.

There is another affection of the scrotum, which, although
of very infrequent occurrence, may be briefly noticed in con-
cluding this article. I allude to the deposition of earthy
matter. This may take place in the form, either of sand-like
granules, or in that of calculous masses, from the volume of
a pea up to that of an almond. Their number, although
generally small, sometimes amounts to several dozens ; they
are of a dull whitish color, and of a cretaceous consistence,
or even of the density and solidity of bone. Their chemical
composition has not been ascertained ; but, judging from what
we know in reference to these bodies in other situations, it
is not improbable that they consist mainly of phosphate and

* See the interesting treatise of Dr. Ollivier, of Angers, entitled " Mémoire
sur la Monstrositie par Inclusion," in which this and other cases are de-
tailed.

carbonate of lime, cemented together by a small quantity of animal matter.

Hitherto these concretions have been found exclusively in subjects past the middle period of life, in association with hypertrophy.   Their formation is generally very tardy, and the irritation which they produce sometimes leads to ulceration. In the interesting case observed by my friend, Professor Mott, of New York, the scrotum was nearly fifteen times the normal bulk, the patient was very far advanced in life, and the disease, which was removed by a surgical operation, had existed for upwards of twenty years.*

SECTION V.

Of the Penis.

THE penis consists of several parts, differing from each other in their structure and functions, and liable, therefore, to dissimilar lesions.   The cavernous bodies, as they are termed, are rarely affected, whereas the urethra and the spongy texture around it are extremely liable to disease.   Of the lesions of these different component elements, I shall notice only the more important, and I shall commence with those of the excretory duct.

Acute inflammation of the urethra, generally the result of impure connection, is marked by the same anatomical characters as acute inflammation of the mucous textures generally ; that is to say, there is more or less redness, with opacity, and thickening of the lining membrane.   In three or four days after the infection, sometimes not under a week or even a fortnight, there is an increased discharge of mucus, followed in a short time by purulent matter, of a thick, ropy consistence, and of a pale straw color.   The quantity evacuated in the twenty-four hours varies from one to several drachms, and, in violent cases, it is not unfrequently extremely acrimonious, of a greenish cast, or tinged with blood. The morbid action is usually limited to the extremity of the

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* Philadelphia Journal of the Medical and Physical Sciences, vol. v. p. 335, new series, 1827.

urethra, occupying the first two or three inches, — probably from this portion being most abundantly supplied with mucous follicles, and from the poison expending its virulence principally in this situation. Now and then, however, the disease pervades the entire tube, from one end to the other.

The *symptoms* of acute urethritis consist in a peculiar scalding sensation in voiding the urine, the calls to which are much more frequent than usual, and in a general turgescence of the virile organ, with redness and swelling of the external orifice, the edges of which are often tender and excoriated from neglect of ablution. The pain is always increased during erection, and the discharges of urine, which commonly flows in a small narrow stream, from the diminished caliber of the tube, caused by the turgid state of the lining membrane and the infiltration of the surrounding structures, especially the submucous. When the inflammation is violent it is apt to extend to the neck of the bladder, the testicle, and spongy body of the penis, giving rise to effusion of lymph and the formation of abscesses. In ordinary cases, however, there is seldom if ever any breach of continuity.

When the disease assumes the *chronic* form, the discharge becomes more thin and limpid, bearing a greater resemblance to the white of egg than to real purulent matter. The quantity, also, is much less than in acute urethritis, and there is seldom much pain, scalding, or itching during micturition. The passage, however, usually remains somewhat contracted, from relaxation of the mucous lining, and the urine, in consequence, is always discharged in a narrow, tortuous stream. When the disease, now called *gleet*, is protracted, it often gives rise to stricture, by which the canal is permanently obstructed.

A very frequent effect of gonorrhœa is the extension of the inflammation to the spongy structure of the penis, and the consequent effusion of lymph into its cells. This complaint, constituting what surgeons are in the habit of calling *chordee*, is characterized by abnormal erections, which are always most distressing during night, when the patient becomes warm in bed. The organ is curved downwards, from the spongy structure not admitting of so complete distention as the cavernous ; and sometimes the cells are permanently obliterated, causing deformity of the penis, and imperfect erections. The effusion generally takes place about the middle of the organ, occupying occasionally a large extent of surface.

In some cases, the deposition is affected at several points, though this is unusual.

Organic *stricture* of the urethra (Fig. 76) is the result of inflammatory action, causing an effusion of lymph into the submucous cellular tissue and upon the free surface of the lining membrane. After some time, varying from a few days to several weeks, the effused fluid becomes organized, and thus forms a permanent obstruction, in front of which the passage is generally contracted, whilst behind it is dilated.

Fig. 76.*
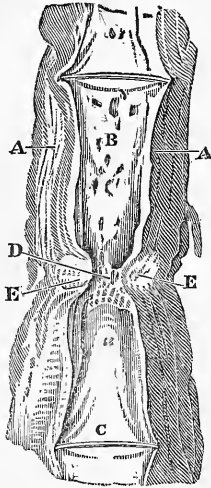
Fig. 77.†
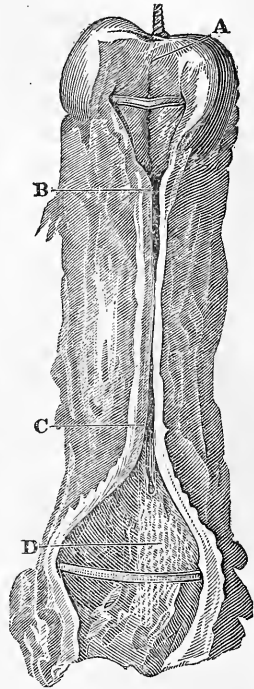
The urethra is sometimes narrowed by a circular ring, not thicker than a thread, but more commonly the stricture occupies a considerable extent of surface, from a line or two to an inch or more. (Fig. 77.) Nor does it always surround the whole tube; in many cases, perhaps in most, it forms merely a segment of a circle. The bridle stricture, (Fig. 78,) as it is called, consists of a dense band of organized lymph, stretched from one side of the urethra to the other. In old cases, the contracted part is sometimes very elastic, firm, almost of the consistence of cartilage, from repeated attacks of inflammation. The most common seat of the disease is at the membranous portion, about seven inches from the external orifice; the one next in point of frequency is at the junction of the posterior with the

* *a a*, corpus spongiosum; *b c*, urethra; *d*, stricture; *e*, indurated ring beneath the mucous membrane.

† *a d*, urethra; *b c*, stricture.

anterior two thirds of the
tube ; and, lastly, at the
part immediately behind
the neck of the penis.

Organic stricture is gen-
erally attended with pain
in the loins, chronic
swelling of the testicle,
irritability of the bladder,
itching about the anus
and perinæum, and dis-
charge of thin, gleety mat-
ter from the urethra. The
stream of urine is small,
forked, spiral, or dribbling,
the bladder is emptied
with difficulty, and mic-
turition is usually accom-
panied with pain.

Besides the lesion now

Fig. 78.*

described, some writers believe in the existence of a tempo-
rary stricture, caused by *spasmodic* action of the urethra.
The circumstances which are supposed to afford evidence
of spasmodic stricture, are, according to Mr. Syme, the
sudden invasion and disappearance of the complaint, its con-
nection with mental agitation, and the difficulty which the
surgeon experiences in introducing the catheter. Some
anatomists have imagined that this disease is caused by
the contraction of the muscular fibres, which enter, as they
allege, into the composition of the urethra; but as no such
fibres have ever been satisfactorily demonstrated, the most
plausible idea, it seems to me, is that which ascribes it to
the turgescence of the lining membrane, or to the erectile
texture which immediately invests its outer surface ; and this
opinion is strongly corroborated by the fact that the disorder
in question is almost entirely confined to persons of an irri-
table, nervous temperament.

A very distressing consequence of stricture is *abscess*, fol-
lowed by fistula in the perinæum, the rectum, or along the
course of the urethra. The canal, as was before stated, is

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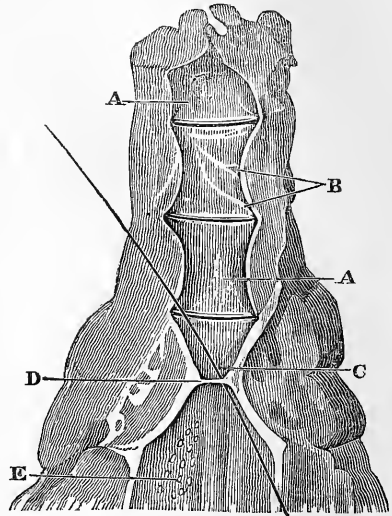
* *a a*, urethra; *b c*, mucous membrane; *d*, stricture; *e*, orifices of seminal
ducts.

generally very much dilated behind the constricted part, forming a sort of pouch for the lodgement of the urine. Occasionally calculi are retained here, and give rise to very disagreeable symptoms. The suppuration is often very slow in its progress, and as the matter accumulates in the submucous texture, the lining membrane of the canal yields at one or more points, followed by the escape of the contents of the bladder into the surrounding cellular substance, where they always produce considerable sloughing. Extensive infiltration is sometimes prevented by the cellular tissue immediately around the abscess, being so much condensed by the deposition of fibrin, as to present an effectual barrier to the diffusion of the fluid. The fistulous openings that are thus formed gradually diminish in size, and become incrusted by a layer of lymph, which, in cases of long standing, sometimes degenerates into fibro-cartilage. The passage in front of the perforation being no longer needed for conveying urine, now contracts, and, unless there be means used to dilate it, it is finally entirely obliterated. The number of these apertures is often considerable, the perinæum being literally burrowed by them.

Malformations of the urethra are far from being uncommon, and as the subject is one of much interest in reference to surgery and legal medicine, it requires brief consideration in this place. For practical purposes, they may be arranged under the following heads : first, where the canal opens on the upper or lower surface of the penis ; secondly, where it terminates in the perinæum ; and, thirdly, where it opens in front of the abdomen, just above the pubes. In *epispadius*, as the first of these malformations is styled, the preternatural orifice usually exists about an inch and a half behind the extremity of the penis ; whilst, in *hypospadias*, it may be situated at any point between the gland and the scrotum, though its ordinary seat is opposite the neck of the organ, or just behind it. When the opening is in the perinæum, the under surface of the penis is sometimes deeply grooved, the fissure extending down over the scrotum, and giving rise to an appearance of hermaphrodism, especially if, as occasionally happens, the testicles are retained in the abdomen, and the penis is very diminutive.

When the opening is placed far back, the individual who is the subject of the malformation is generally impotent. To this rule, however, striking exceptions sometimes occur.

I am acquainted with a colored man, a patient of mine, who, although the urethra terminates at the scrotum, at least four inches from the ordinary point, is yet the father of five children; and similar examples are to be found in every work on forensic medicine.

Morbid erection of the penis is sometimes produced by inflammation, followed by an effusion of lymph into the cells of cavernous bodies. I have never inspected a case of this kind after death, but observed one several years ago in a young mechanic, which lasted for nearly four weeks, in spite of the most rigid antiphlogistic measures. It came on soon after ordinary intercourse, and was attended with excessive pain, together with much constitutional disturbance. For several months after the violence of the disease had abated, the organ remained small, flaccid, and incapable of complete erection. Sometimes the priapism is caused by an effusion of pure blood; as in the interesting case related by Mr. Callaway, of London, and in which the individual continued permanently impotent.

The *pectiniform* septum of the penis is liable to be transformed into cartilage. I have never seen an example of this disease, but an instance once occurred to Dr. George McClellan, of Philadelphia, in which he was obliged, on account of the existing deformity, to perform a surgical operation. The individual was between fifty and sixty years of age; the disease had been coming on gradually; and the organ was curved towards the perinæum to such a degree as to interfere materially with sexual intercourse. The operation was entirely successful. Such a lesion, as the reader may readily conceive, might be a cause of impotence.

The fibrous sheath of the cavernous body of the penis is sometimes similarly affected. Boyer, Grainger, and Sir Astley Cooper have noticed examples of this kind.* The lesion usually occurs in persons who have freely indulged in sexual intercourse.

The penis is liable to be affected with *carcinoma*. The disease usually begins in one of the mucous follicles on the head of the organ, in the form of a little wart, from which it gradually spreads to the other parts, until the greater portion of it is destroyed. The ulcer, though deeply seated, is at first quite narrow; but by and by it becomes broader and

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* London Cyclopædia of Anatomy and Physiology, p. 266.

broader, and at last throws out a cauliflower-like fungus.
There is now a profuse discharge of thin, sanious, and offen-
sive matter, the inguinal glands rapidly enlarge from the
sympathetic irritation, and the patient is harassed with severe
lancinating pains darting up towards the abdomen, his con-
stitution being at the same time completely undermined by
the local disease.   Cancer of the penis is most common in
old men that have frequently suffered from syphilis; but it
may also occur in young persons, as the consequence of ex-
ternal injury.

It will scarcely be necessary, in a work of this kind, to
say any thing concerning the different ulcers that are found
on the penis, excepting such as are of a specific character.
Amongst these, the most common are herpetic, psoriasic, and
syphilitic, — each of which is worthy of brief notice.

Syphilitic ulcers, generally known by the name of *chancres*,
although they may occur on any part of the body, invade the
mucous texture always in preference to the cutaneous.   In-
deed, before the latter can be involved, it must be deprived
of epidermis; for, so long as this preserves its integrity, it is
impossible for the venereal virus to produce its specific effect.
Their most usual seat is the inner surface of the prepuce,
together with the neck of the penis, the orifice of the
urethra, and the sides of the frænum.   These ulcers vary
extremely, both in size and number, being sometimes quite
small, and at other times forming large sores.   In the plu-
rality of cases, there are not more than two or three; but
occasionally there are as many as six or eight, appearing
either simultaneously, or following each other in pretty rapid
succession.

It is now well ascertained that all chancres of the mucous
membrane of the genital organs, both in the male and female,
are originally of a pustular form.   The only exception to
this law is where the virus is applied to an abraded surface,
which modifies the appearance of the sore, converting it at
once into a running ulcer.   It is highly probable, I think,
that the matter is deposited, in the first instance, into the
mucous follicles, where it excites a specific inflammation,
eventuating in the secretion of a fluid, which is capable, in
its turn, of creating a similar disease.   What corroborates this
opinion is the fact, just adverted to, that the chancre always
begins in the form of a pustule, and that it is most apt to

be developed in those situations which abound in muciparous glands.

The initial step of the disease is a small, reddish, indurated speck, the summit of which is speedily converted into a spherical vesicle, filled with a thin, colorless serosity. Its size scarcely equals that of a mustard-seed ; and its parietes, being formed by the mucous epithelium, are so excessively delicate as to break upon the slightest touch. Hence it is frequently ruptured before an opportunity is afforded of inspecting it, which is the reason, doubtless, why it so long escaped the notice of pathologists. On bursting, the vesicle leaves a small circular ulcer, with hard, jagged, and abrupt edges, as if they had been cut vertically. The surface of the sore is gray, yellowish, or ash-colored, and the parts immediately around it are indurated, thickened, and of a deep, florid hue, being formed into a distinct, circumscribed tumor. The discharge is at first of a foul, sanious, irritating character ; but, by degrees, it assumes all the properties of laudable pus. The induration commences about the fifth day ; and, as was first remarked by John de Vigo, and afterwards by John Hunter, forms one of the most constant characters of chancre. It is about this period that the system begins to be in danger of contamination from the absorption of the virus.

A chancre appearing on the cutaneous surface, generally begins in the form of a pimple, which is surrounded by a red areola, and contains a thin, serous fluid, which, on the fifth or six day, becomes purulent. The part about this period presents the aspect of a pustule, not unlike that of small-pox ; and the structures on which it rests are somewhat indurated and œdematous, from the effusion of coagulating lymph. In a few days more, the matter becomes thick, the pustule shrinks, and scabs begin to form, which, on falling off, expose deep, rounded ulcers, encircled each by a prominent, violet-colored ring. The scabs, which are thick, and often of a truncated, conical shape, are soon succeeded by others ; and thus the disease proceeds until the part either gets well, or yields to the devastating influence.

Syphilitic ulcers are very apt to spread, and even to terminate in gangrene. The slough is small, circumscribed, and black at first, but afterwards, more or less extensive and ragged. The entire chancre is sometimes thus lifted from its

place, leaving the surrounding tissues in an inflamed and infiltrated condition, with a sore that can be easily healed. More generally, however, the ulcers assume a phagendenic character, and throw off fresh sloughs until the whole penis is involved in the ruinous mischief.

Many chancres, after having persisted for a variable time, gradually exhaust themselves, and finally cease spontaneously, the event being announced by the secretion of laudable pus, and the developement of healthy granulations. In whatever manner the reparation be effected, whether by art or the efforts of nature, there almost always remains a hard, gristly tumor, which is more or less tender on pressure, very slow in disappearing, and extremely prone to new attacks of ulceration. Indeed, so common is this, that chancre may be considered, in the language of an ingenious writer, as a genuine phœnix, which springs from its own ashes, and furnishes the food for its own nourishment. So long as the disease is confined to the penis, it is strictly a local affection; but it has a tendency, sooner or later, to work its way into the system; the first evidence of which, is generally a swelling of one of the lymphatic ganglions of the groin, known by the name of bubo.

Chancre can alone produce chancre. That this is the fact, appears to be conclusively established by the recent researches of Dr. Ricord,* of Paris. This distinguished physician repeatedly inoculated persons with the muco-purulent matter of simple gonorrhœa, without succeeding in a single instance in producing chancre. He has also ascertained that it is during the ulcerative stage that the sore yields its specific secretion : after this has passed, it loses its character, its nature changes, and its poisonous property is destroyed. Dilution with other substances renders its operation not only uncertain, but at times completely inert. The part to which it is applied must likewise be free from acute inflammation, from purulent fluid, and from unctuous matter.

The time intervening between the application of the virus and the developement of the chancre is very uncertain. Occasionally the disease follows in the course of twenty hours; at other times — and this is most generally the case — several days elapse ; and, in some instances, it does not make its

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* Edinburgh Medical and Surgical Journal, vol. x. L. ix. p. 479.

appearance under a few months. The nature of the part affected seems to exert some influence upon the production of chancre. Thus, the prepuce is more easily diseased than the gland, and the latter than the skin of the penis and of the scrotum.

Herpetic ulcers are only observed in adults, generally on the inner surface of the prepuce, though also sometimes on the skin. They manifest themselves by inflamed spots, of a bright red color, varying in size from that of a millet-seed to that of a split pea. Small vesicles soon succeed, of a globular shape, remarkably transparent, agglomerated, and containing at first a serous, and subsequently a puriform fluid. On the internal surface, these vesicles lead to the developement of thin, flat scales, which fall off about the fifth day, leaving a corresponding number of round, yellowish excoriations : on the external surface, rough, irregular scabs form. This disease is very apt to recur. It is usually attended with some itching, rarely with real pain. Friction and want of cleanliness are the principal exciting causes. By running together, these ulcers occasionally form one unbroken sore, occupying nearly the whole of the prepuce. From experiments made by Mr. Evans, of England, it appears that the matter secreted by these ulcers is not contagious.

The *psoriasic* ulcer is most frequently met with in persons who have the fore-skin unnaturally long, moist, and tender. It is an obstinate and painful disease, characterized by deep cracks, or fissures, on the edges of the prepuce, which becomes gradually thickened, hardened, and so corrugated as to occasion phymosis. The number of ulcers is sometimes quite considerable : they are very tender and unseemly ; apt to bleed when injured ; extremely difficult to heal ; and, if large, attended with a very copious, puriform discharge. Small, brownish-looking scales occasionally form on these sores.

A not uncommon consequence of gonorrhœa and syphilis is the developement of *warty excrescences*, principally around the neck of the gland, and by the side of the frænum. The number of these growths is usually inconsiderable, though occasionally there are as many as six or a dozen. Their volume varies extremely, being sometimes quite small, and at other times constituting large tumors. They have generally narrow necks, with thick, rough bodies ; are of a firm, fibrous

consistence, and of a pale grayish color, with various shades of red. When injured, they are very painful, and apt to bleed. On being extirpated, they often reappear.

It is unnecessary here to say any thing, particularly in reference to *phymosis* and *paraphymosis*, two congenital malformations, consisting, the one in an inability to retract the prepuce, the other in an inability to pull it forward. Both these states may be the result of accident, and are often met with in association with gonorrhœa and syphilis.

CHAPTER XIV.

Of the Female Organs of Generation.

SECTION I.

Of the Uterus.

I. *The Uterus.* — Situation and Shape. — Observations on its Weight and Volume. — Is composed of a peculiar Substance. — Liable to Malformations. — Retroversion. — Prolapsion and Inversion. — Is apt to suffer from Inflammation, both of its Lining Membrane, its serous Covering, and its proper Tissue. — Remarks on Uterine Phlebitis. — Softening. — Induration. — Fibrous Tumors. — Different Species of Polypes. — Calcareous Concretions. — Transformation of the Uterine Tissue into Cartilage and Bone. — Malignant Diseases. — Encephaloïd and Scirrhus. — The Corroding Ulcer and Cauliflower Excrescence of Clarke. — Tubercular Deposits. — Hemorrhage. — Accumulation of Air. — Obstructions of the Mouth of the Womb. — Hydatids. — Uterine Moles. II. *The Ovaries.* — Normal Characters. — Their Disorders are numerous and important. — Serous Cysts and Hydatids. — Scirrhus. — Occasionally contain Teeth, Hair, and Fragments of Bone. — Hemorrhage. — Remarks on the Corpora Lutea. III. *The Fallopian Tubes.* — How organized. — Are seldom affected with Disease. IV. *The Vagina and Vulva.* — Liable to the same sort of Maladies as the other Mucous Structures. — Polypes of the Vagina. — Enlargement of its Mucous Follicles. — Vices of Formation. — The Great Labia. — Clitoris. — Nymphæ, and Orifice of the Urethra. V. *The Mammary Gland.* — Structure, Volume, and Color. — Is often the seat of Acute and Chronic Inflammation. — Its Diseases, in many respects, resemble those of the Testicle and Ovary. VI. *Placenta.* — Structure. — Inflammation. — Suppuration. — Softening. — Cartilaginous Degeneration. — Ossification. — Hypertrophy. — Sanguineous Effusions. — Umbilical Cord.

THE sexual system of the female consists of the uterus, Fallopian tubes, ovaries, the vagina, vulva, and mammary glands. Previously to the age of puberty, the uterine organs are extremely small, and as they do not exert any particular influence on the constitution, they are not at all prone to disease. When they have attained their full developement, however, their importance is deeply felt by the system at large, and they then become subject to a great variety of morbid alterations, both of a functional and organic character, which either impair the general health of the female, or terminate in destructive mischief.

In women who have borne children, the womb is always larger, and its substance more firm and dense ; its lips, also, are more ragged and irregular, and sometimes, though rarely,

the orifice of the organ is obliterated. Morgagni refers to a
case where the closure was effected by the growth of an ad-
ventitious membrane, and similar examples have since been
recorded by other writers. Occasionally, though rarely, the
uterus and the vagina have been known to form one solid
mass, without any cavity or opening in either.

Situated obliquely within the pelvic cavity, the uterus is
in contact, above, with the folds of the small intestines, in
front, with the urinary bladder, and behind, with the rectum.
Inferiorly, it is intimately connected with the vagina, forming
an angle with it of about forty-five degrees. In its shape, it
is pyriform, the broader part being above, and the narrower,
which is called the neck, below. It is closely invested by
two folds of the peritonæum, and is kept in its position prin-
cipally through the agency of the round ligaments, which are
attached, on the one hand, to its upper and lateral aspect, and,
on the other, to the cellular substance of the groin and pubes.

The weight and dimensions of the uterus vary very much
in different individuals, as well as at the different periods of
life. In six specimens, taken from young virgins, soon after
the establishment of the menstrual function, I found the ave-
rage weight to be one ounce and a half, the minimum one
ounce, and the maximum one ounce and three quarters : the
medium length was two inches seven lines ; the breadth, from
one Fallopian tube to the other, eighteen lines ; and the thick-
ness ten lines and a half. Of the neck, the length was fourteen
lines, the breadth eleven, and the thickness eight. The lips,
which varied in thickness from three to four lines, were per-
fectly smooth and rounded, and enclosed a circular orifice
scarcely a quarter of an inch in diameter. In two of the
specimens the aperture presented the appearance of a trans-
verse slit. The horizontal diameter of the inferior extremity
was eight, the antero-posterior, seven lines. The medium
thickness of the parietes was five lines at the body, and four
at the neck. The length of what is termed the fundus of
the organ rarely exceeds the fourth of an inch.

The cavity of the uterus, very small in proportion to the
thickness of the parietes of the organ, is marked off, though
very faintly, into two lateral halves by two slightly-raised
longitudinal lines, running along its anterior and posterior
surfaces. In shape it is somewhat triangular, being much
wider above than below, where it gradually assumes a cylin-
drical appearance, conforming thus to the external configura-

tion of the neck. A very smooth, delicate, mucous mem-
brane, evidently a prolongation of that of the vagina, but
considerably modified in its structure, is reflected into this
cavity, and furnishes it with a complete lining. It is of a
light pink color, except during menstruation, when it is gen-
erally of a florid complexion, and is so intimately adherent to
the proper substance of the viscus, that Morgagni, Azzogindi,
Chaussier, and many others, have been induced to deny its
existence, — an opinion, however, which is not only opposed
by analogy, but by numerous pathological facts. In the neck
of the womb the membrane is thrown into very delicate, ob-
lique folds, which are more conspicuous in virgins than in
females who have borne children, and which are arranged
into beautiful arborescent lines. Throughout its entire ex-
tent, but more particularly at the mouth and neck of the or-
gan, it is studded with mucous follicles, which are so minute,
in the healthy state, as to render it difficult to demonstrate
them, but which are always rendered prominent during ges-
tation and in certain diseases.

The proper substance of the uterus seems to be peculiar.
In appearance it is not unlike a half-tanned hide, and in con-
sistence it is so dense and firm that it is not easily cut with
the knife. Varying in thickness from four to six lines, it is
composed of strong, elastic fibres, of a yellowish buff color,
which intersect each other in every conceivable direction.
With respect to the proximate nature of this texture, writers
are still much divided in opinion ; for, whilst some assert that
it is essentially muscular, others are disposed to look upon it
as being altogether peculiar, and consequently unlike any
other substance in the body. Vesalius, the great restorer of
anatomy in the seventeenth century, describes these layers of
fleshy fibres, one of them as being arranged transversely, the
second perpendicularly, and the third obliquely. Malpighi
speaks of them as constituting a sort of net-work ; and
Ruysch maintains that they appear in particular parts of the
organ, especially at the base, in the form of orbicular mus-
cles. In the admirable plates of Dr. William Hunter, they
are represented as being transverse in the body of the uterus,
and concentric at the base. This subject has been investi-
gated, more recently, by Mr., now Sir Charles Bell, an ac-
count of which observations may be found in the fourth vol-
ume of the London Medical and Surgical Society. This
distinguished anatomist asserts that the muscular fibres of

the womb can be as easily demonstrated as those of any other organ ; and he supposes that their presence is absolutely necessary to enable us to explain the powerful contractions which take place during labor. It would seem, from his dissections, that the circular fibres prevail at the base, and the longitudinal in the body and neck. According to Madame Boivin, again, an eminent Parisian midwife, the substance of the womb consists of two fleshy cones, of which the outer is composed of longitudinal, the inner of circular fibres, a disposition similar to that which obtains in the intestinal canal.

In opposition to this view, concerning the muscularity of the uterus, might be arrayed the names of many of the most distinguished anatomists of the last and present centuries ; but to do this would far exceed the limits of the present treatise, and I shall therefore content myself with observing that, so far as a careful examination of this substance, both in the healthy, impregnated, and diseased state of the organ enables me to judge, I am compelled to believe that it is of a peculiar nature, altogether unlike any other texture in the body. Not only is this conclusion sanctioned by the results of numerous and well-conducted dissections, but, if analogy be allowed to have any weight in the argument, it is wholly on that side of the question which I have just taken. Indeed, it may be assumed as an established anatomical fact, that the structure under consideration does not possess a single characteristic attribute of the muscular tissue, with the exception of its contractile power ; and this, it is well known, is much greater, in proportion to the volume of the organ, than that of any other muscle in the whole body. Instead of being red and soft, it is pale and firm ; and, as it is a doctrine in physiology that the strength of a muscle is always in direct ratio to the depth of its color, it might justly be expected that the fibres of the uterus would be of a transcendently florid hue, which, however, is not the case. Additionally to all this, it may be remarked that no chemist, at least so far as I am acquainted with their writings, has hitherto succeeded in obtaining fibrin, the proximate element of muscular substance.

Nor do these fibres, as they are termed, observe any particular arrangement. With the exception of the neck of the uterus, where they are apparently circular, they run in all directions, crossing each other at various points, and thus forming a strong, dense, and resisting web.

This organ is very plentifully supplied with blood-vessels, absorbents, and nerves. The arteries are derived from the spermatic and hypogastric, the former being distributed chiefly to the base of the womb, the latter to the body and neck. Anastomosing freely with each other, they are remarkably tortuous, and thus accommodate themselves readily to the great changes which the organ experiences during pregnancy. The veins are exceedingly numerous, and still more serpentine than the arteries. During gestation they greatly augment in volume, and thus constitute what Haller has termed the uterine sinuses, some of which are sufficiently large to admit the point of the little finger. The absorbents are likewise extremely numerous, and, as in the other viscera, are arranged into two sets, — a superficial and deep-seated.

The nerves are furnished by the sacral and hypogastric plexuses. It is through the filaments of the latter that the uterus is connected with the great trisplanchnic system, and that so many of the other viscera, especially the stomach, so completely sympathize with it, both in its impregnated and diseased state. So fully were some of the ancient physicians and philosophers impressed with the peculiar properties of this organ, that, without being probably aware of this nervous connection, they regarded the womb as "an animal within an animal."

Before we proceed to speak of the diseases of this organ, it will not be amiss to make a few remarks concerning some of its more important *malformations*, — a subject which is not only interesting to the pathological anatomist, but likewise to the medical jurist, to the latter of whom, especially, a knowledge of them is indispensable. Various attempts have been made to classify these vices, but I am not certain that they have resulted in much good. A plain statement of facts is all that I shall aim at on the present occasion. The subjects that will be treated of are, first, entire absence of the uterus; secondly, deficient evolution; and, thirdly, increase of developement.

1. Authors have sometimes noticed an entire absence of the uterus. Examples of this description have been recorded by Columbus, Meyer, Klintosch, Bousquét, Engel, Boyer, Walther, Macfarlane, Dupuytren, and other writers. In Voigtet's Manual of Pathological Anatomy,* a work which

* Band iii. s. 452.

abounds in profound erudition, and which should be in the library of every intelligent physician, may be found a copious list of references to cases of this variety of malformation. In some of these examples, indeed in nearly all, this congenital vice was connected with absence of the ovaries and the Fallopian tubes. The vagina was also frequently wanting; and the external parts of generation were either completely deficient, or represented as it were in miniature. When the ovaries were present, the vulvo-vaginal structures were more perfect, the mammary glands more expanded, the females possessed more of the characteristic attributes of their sex.

2. There also, secondly, occur cases in which the womb is remarkably small, or in which it exists only in a rudimentary state. Professor Jules Cloquet, the distinguished anatomist, exhibited, some years ago, to the Medical Faculty of Paris the sexual organs of a young woman, twenty-two years of age, where the uterus was not larger than that of a child of twelve months. The vagina was also very small; but the ovaries and Fallopian tubes were, on the contrary, quite well developed.* Cases not unlike this are to be found in various periodicals, but, on the whole, they are rare.

3. There are other deviations from the normal standard deserving of brief notice in this place. Among these the most common are, where the uterus presents the appearance of being bilobed, or where it is prolonged superiorly into two shoulders or horns. In the first variety, (Fig. 79,) the organ is of an elongated cylindrical shape, and is divided, by a longitudinal septum, into two parallel canals, precisely alike in size and figure, and opening separately into a common vagina. In a few cases, however, the canals have each

Fig. 79.

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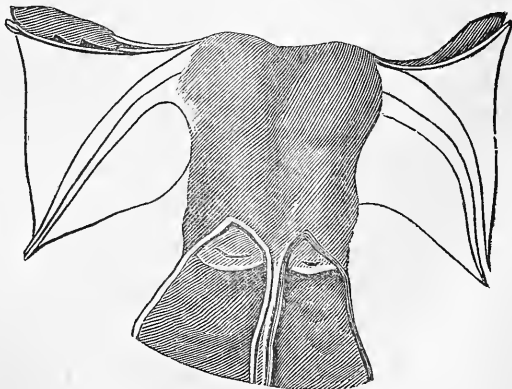
* Journal Generale de Medicine, t. lxx. p. 274.

an appropriate vagina.   In the bicorned uterus, (Fig. 80,) the
base and body of the organ are extended upwards into two
conical horns, from six to fifteen lines in length, and from

Fig. 80.
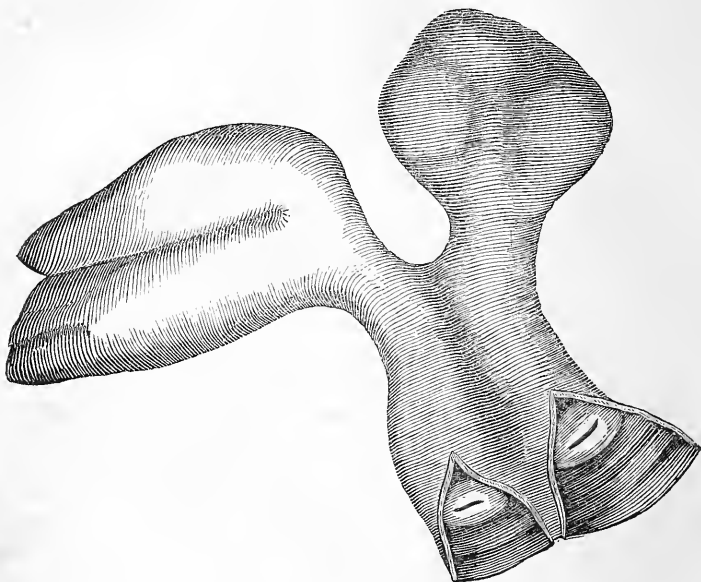
eight to twelve in breadth, the neck and mouth retaining
their natural conformation.   This variety, which is not un-
common in grown-up females, is of frequent occurrence in
monsters.   Finally, there is a third form of congenital vice,
the bipartite, (Fig. 81,) as it may be termed, which presents
a much greater departure from the natural condition than
either of the others : here the organ is really double, or it
consists of two distinct and separate portions, generally con-
nected by a thin, narrow isthmus of matter, and both open-
ing into the vagina, which may be either single or double, or
one into the vagina, and the other into the rectum.   Of this
mode of communication, an interesting example has been
recorded by Vallisnieri.   Occasionally the cavity of one of
the uteri is impervious.
    All these deviations from the normal formation are per-
fectly compatible with impregnation.   In some cases they

are associated with absence or deficient developement of the
ovaries and Fallopian tubes ; but, generally speaking, these

Fig. 81.
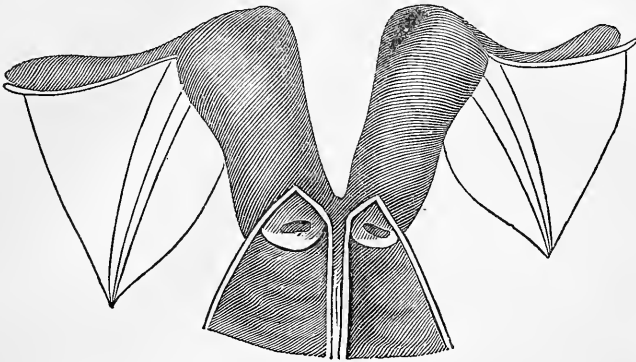
structures are present, as in the natural state.   In no instance,
so far at least as my knowledge extends, were there two
ovaries and two Fallopian tubes on each side, not even in the
bipartite variety, the nearest approach.

In women who have borne children, the womb is always
larger than in virgins, or than in those who are barren : its sub-
stance is also more dense and firm, its lips are more jagged
and irregular, and sometimes, though rarely, the orifice of the
organ is completely obliterated.   Morgagni refers to a case
where the closure was effected by the growths of an adven-
titious membrane ; and similar examples have since been
recorded by others.   The occlusion may also be produced by
inflammation, attended with an effusion of plastic lymph.
The orifices of the Fallopian tubes are also sometimes closed,
either congenitally or as the effect of disease.   In a few rare
instances the uterus and the vagina have been known to
constitute one solid mass, without any cavity or opening in
either ; and occasionally, again, though this is also very infre-
quent, the cavity of the former is divided, by a transverse
septum, into two chambers, one corresponding with its base,
the other with its neck.   This lesion is most common in
very old females, and is generally, if not invariably, the result
of inflammatory irritation, leading to adhesion of the isthmus
of the organ.

Of the various *malpositions* to which the uterus is liable,

not much need be said in a treatise on pathological anatomy. Those which we shall briefly notice on this occasion may be comprised under the heads of retroversion, anteversion, prolapsion, and inversion.

In *retroversion*, the orifice of the uterus is tilted up against the pubic symphysis, and the fundus is thrown downwards and backwards, so as to form a tumor between the vagina and the rectum. Thus the axis of the organ is totally reversed relatively to its natural situation within the pelvis. This species of displacement is most apt to occur between the third and fourth months of pregnancy; it may, however, take place at a much later period; and, in some instances, it has been noticed soon after delivery. Its progress, though occasionally gradual, is generally rapid.

Anteversion is a displacement precisely the reverse of the preceding, that is to say, the fundus of the womb is carried forwards on the urinary bladder, and the mouth backwards towards the rectum and the hollow of the sacrum. It rarely occurs during pregnancy, and is almost always associated with hypertrophy of the uterus. The anteversion is sometimes produced by morbid adhesions between this organ and the peritonæum, which have the effect of forcing it out of its normal position.

Notwithstanding the uterus has four ligaments which serve to maintain it in its natural position within the pelvis, it not unfrequently happens, both in its empty and gravid state, that it loses its hold, and falls down into the vagina, or even through the vulva. In the latter case, the organ forms a tumor between the thighs, with a small central aperture corresponding to the mouth of the womb, and the vagina is completely inverted, or pulled inside out. This prolapsion is always attended, especially when complete, with severe dragging pains, and a thick muco-purulent discharge.

Inversion of the uterus is that displacement where the viscus is turned inside out. It is generally attended with more or less prolapsion of the body of the organ, and seldom happens except during delivery of the after-birth, or the forcible removal of some tumor from its interior. Of this lesion there may be several degrees. In the first, the fundus falls down to the mouth of the womb, where, from some obstacle or other, it is arrested; in the second, it passes beyond this point for half or more of its length; and, in the third, the whole organ escapes at the inferior orifice. In the second

case, it is obvious that the body and fundus may be compressed, or strangulated, by the contraction of the neck.

The uterus is liable to *inflammation*, both in the married and in the single female, but much more frequently in the former than in the latter. The disease may attack any portion of the organ, the lining membrane, the parenchymatous substance, or, finally, the peritonæal covering; and, in some instances, though this is rare, all these structures may be involved simultaneously, together with the venous and absorbent trunks.

When the disease affects the *lining membrane*, all the phenomena will be present that are observed in inflammation of the mucous textures in other parts of the body. The redness, which is of a deep shade, is often spread over a large extent of surface, and in violent cases it is not uncommon to meet with small ecchymoses, followed by an escape of blood on pressure. The mucous follicles, especially those about the mouth of the uterus, are in a state of enlargement, and there is usually, in the course of a few days, a great increase of the natural secretion. In some instances, pus is deposited, and continues to be discharged for a considerable period, as in inflammation of the mucous membrane of the vagina.

Occasionally the lining membrane is affected with a sort of specific inflammation, eventuating in the effusion of coagulating lymph. It is very often seen in young females of a robust, irritable temperament, in whom it constitutes a frequent cause of dysmenorrhœa. The membranous concretion, which is seldom thick or firm, generally moulds itself to the inner surface of the uterus, and is sometimes expelled entire, though much more commonly in small pieces; in some cases it is probably absorbed. The period required for the extrusion, varies from a few hours to one or two weeks, and is almost always attended with considerable suffering. When the lymph extends into the Fallopian tubes, it leads to sterility, as it prevents any thing from passing along them.

The immediate cause of the production of this membrane has been a source of considerable dispute with pathologists. By Dr. Dewees it is supposed to depend upon debility of the uterus, giving rise to derangement of its secretory functions. That this is true does not admit of doubt, but it will be at once perceived that this theory does not account for the cause, but only for one of the symptoms of the complaint. Whoever has investigated the subject of dysmenorrhœa, must

acknowledge that it is an inflammatory affection, not of the proper structure of the uterus, but of its mucous lining. That this is the case, is sufficiently proved by the great suffering which is so often present. What do the severe pelvic pains, the sense of fulness in the region of the womb, the hot and feverish skin, the tense and accelerated pulse, indicate, but a congested and irritated state of this organ, amounting to inflammation? Analogy, also, affords us good grounds for this opinion. Lymph is never thrown out by parts, unless they are in a state of inflammation. The adventitious membrane of pleuritis, of croup, and of enteritis, is always dependent upon this cause, and upon none other. If, then, this be true here, why should it not be true also in regard to the uterus?

Inflammation of the body and serous covering of the uterus is most common in females during the first eight or ten days after parturition. It sometimes betrays an epidemic tendency, and rapidly passes into suppuration, softening, or even gangrene. The pus that is poured out in such cases may be situated in the parenchymatous structure, in the uterine cavity, the subserous cellular substance, between the folds of the broad ligaments, or, finally, in the venous or absorbent trunks. In most of the localities here referred to, it occurs in the form of small yellowish-looking globules; but cases are occasionally observed in which the fluid is collected into one or more abscesses, which are never very large, and which manifest a disposition, sooner or later, to burst into the vagina, the rectum, pelvis, or urinary bladder. The pus is generally blended with a good deal of lymph, and is sometimes highly offensive.

Inflammation of the uterine veins, although of very frequent ocurrence, does not seem to have attracted much notice until a very recent period. For our knowledge concerning it we are mainly indebted to Professor Meckel, of Germany, Dr. Lee, of England, and to Dance, Tonellé, and Cruveilhier, of France. From the researches of these and other anatomists, it appears that uterine phlebitis is an extremely common disease, and that it is a frequent cause of the fatal termination of what is vaguely termed puerperal fever. The lesion may originate in and be limited to the veins; but, in the great majority of cases, the parenchymatous structure participates in the inflammation, and assumes a dark livid aspect, at the same time that it loses its natural consistence.

Serum and pus may also be found in the subserous cellular tissue ; and the peritonæal investment is sometimes covered with thick patches of lymph. The veins themselves are always much enlarged, and their cavities are filled with pus, clots of blood, or plugs of adventitious membrane. The disease often extends along the venous trunks of the pelvis to those of the abdomen, or even to those of the inferior extremities ; and very frequently the absorbent vessels are similarly circumstanced, being greatly augmented in volume, and infiltrated with enormous quantities of purulent matter. The causes of uterine phlebitis are not always very evident. In some cases, it appears to result from violence done in the extraction of the placenta, and, in others, it may be traced to the effects of cold and moisture, irregularities of diet, or to some peculiar noxious condition of the atmosphere. As to the symptoms, we are equally in the dark, none having yet been pointed out that can be considered as pathognomonic. The lesion is said to be more frequent on the right side than on the left, and to be sometimes entirely limited to the veins in that situation.

Softening of the uterus is probably a very rare affection, at least I should think so from my own experience. The disease has hitherto been found chiefly in the persons of lying-in females. Amongst two hundred and twenty-two fatal cases of puerperal fever, observed by Dr. Tonellé, in the Maternity Hospital, at Paris, in 1829, there were fortynine in which the parenchymatous structure of the uterus was more or less softened, and of a dark livid color. In most cases, it is confined to the neck or inner surface of the viscus, seldom penetrating to or commencing in its exterior. Here, as elsewhere, the mollescence presents several stages, running insensibly into each other. In the first stage, the uterine substance is preternaturally flaccid, lacerable, and infiltrated with serosity ; in the second, it readily yields under pressure, and may be broken up into a soft, stringy texture, like that of the spleen ; in the third, when the disorganization is at its maximum, it is of a semi-fluid consistence, and scarcely retains any trace of its former character. The softened organ sometimes preserves its natural color, but more commonly it is remarkably pale, grayish, or even brownish. Occasionally, where the attending inflammation is violent, and runs its course very rapidly, the color is purple, slate, or

black, and occurs in patches, varying in diameter from a split pea to a twenty-five cent piece.

Frequently this disease continues for a considerable period, and yet the woman does not seem to be aware of its presence. That it is the result of inflammatory irritation, generally of an acute kind, appears sufficiently obvious, both from its anatomical characters, which have just been enumerated, the rapidity of its progress, and the symptoms which indicate its existence during life. Commonly these phenomena are extremely vague, and hence the diagnosis is always difficult. A sense of weight in the pelvis, a dull, aching pain in the hypogastric region, augmented by pressure, uterine hemorrhage, and febrile exacerbations, together with a remarkable prostration of the mental and physical energies, are the usual accompaniments of this singular lesion. This state of the uterus sometimes terminates fatally, either by rupturing the organ, or by bringing on gradual exhaustion; and, what is remarkable, we not unfrequently find it associated with mollescence of the other viscera, especially of the stomach and the heart.

It sometimes happens, though not often, that the substance of the womb is preternaturally hard. This change, which may exist with or without mollescence, is very different from scirrhus. It is characterized by unnatural paleness, and by a dense, firm, and almost incompressible state of the uterine tissue. There are no symptoms by which *induration* of the womb can be recognized during life. It seems to be the result of chronic irritation, going on, there is reason to believe, often for a long period, and is most commonly found in connection with scirrhus, encephaloïd, and polypes, in females who have ceased to menstruate.

Chronic inflammation of the uterus is often attended with an extraordinary developement of its mucous glands. The enlargement is most conspicuous about the mouth and lip of the womb, where the follicles are sometimes as big as a hemp-seed, a currant, or even a pea, dense, almost gristly, and of a white grayish color. The parts between them are generally tumid, red, morbidly sensitive, and disposed to bleed. In several cases, I have seen the enlarged glands transformed into considerable cysts, filled with a pale, tremulous substance, which could be easily removed by pressure. It is in this manner, perhaps, that the greater number of

diseases of the mouth of the uterus, whether benign or malignant, originate.

One of the most common appearances observed in the uterus is the developement of *fibrous tumors*, (Fig. 82,) occurring either in its substance, in its cavity, or on its outer surface beneath the serous covering. Their shape is usually spherical ; their diameter from the size of a hickorynut to that of a melon ; their structure firm, dense, opaque, (Fig. 83,) and of a light grayish color, tearing into strong, concentric fibres. Such excrescences have sometimes a rough, granulated texture, and not unfrequently they contain small cavities, filled with earthy matter, or various kinds of fluids, such as serum, jelly, blood, or pus. The calcareous matter, which in some instances almost encases these morbid growths, in the form of a thin, brittle shell, not unlike that of an egg, has been shown, by Dr. Bostock, to consist chiefly of the phosphate and carbonate of lime, together with a minute quantity of animal sub-
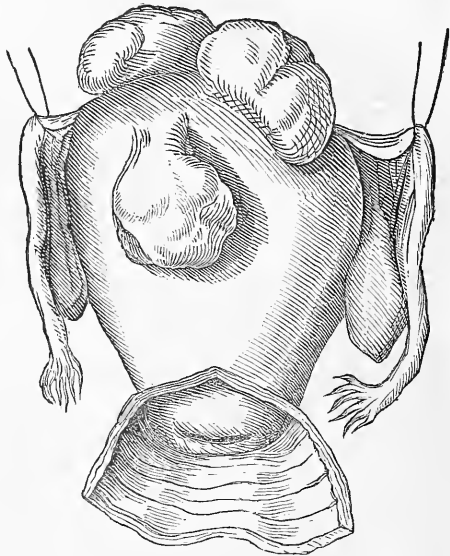
Fig. 82.

Fig. 83.
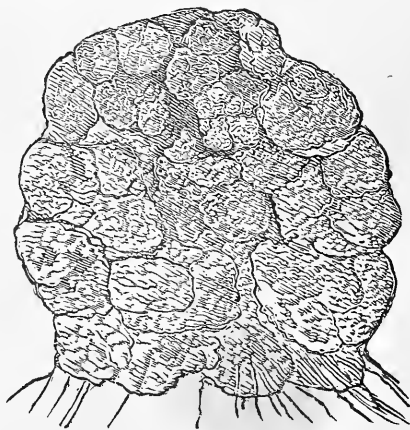
stance. It is generally of a pale grayish complexion, very soft, and porous, like pumice-stone; but examples are recorded where it had the hardness of ivory, and admitted of a fine polish.

Only one such tumor sometimes exists in the uterus; whilst, at other times there are as many as six, eight, ten, or a dozen. When large, they are usually irregularly lobulated, or divided by deep fissures; and blood-vessels, often of considerable magnitude, can be traced into their substance. They have no disposition to ulcerate, to become soft, or to degenerate into malignant disease; and, although they occur both in the married and the unmarried female, they seldom if ever make their appearance before the age of puberty.

When seated under the serous covering of the uterus, these tumors often hang by a very slender neck, and they then assume a pyriform shape. They possess very little sensibility; and, so long as they remain small, they produce no change in the form of the uterus, or local inconvenience; but, when they attain a large bulk, they often incommode, by their weight, and, by the pressure which they exert upon the bladder and the rectum, may seriously interfere with the expulsion of the urine and feces. When these bodies are embedded in the walls of the womb, or spring from its inner surface, the subjects of them are apt to be barren; or, if they conceive, the uterine tissue is unable to undergo the necessary expansion, and abortion is sooner or later the result. Sometimes these tumors are attached to the base of the womb, and, by rising into the abdomen, may be felt movable in that cavity, and thus simulate pregnancy. When situated in the uterine cavity, they are occasionally expelled during labor, and the woman either recovers, or dies of the profuse hemorrhage that ensues.

In the fourth volume of the American Medical Recorder are detailed two highly-interesting cases, by my learned and distinguished friend, Professor Francis, of New York, of fibrous tumors growing from the external surface of the uterus, of which I shall here give a brief abstract. In the first, the woman was thirty-two years of age; during the last six of which she was married, but never proved pregnant. The womb was of the natural size, and every where healthy, except at its base, where it gave attachment, by means of a

narrow foot-stalk, to an immense tumor, (Fig. 84,) which
weighed more than one hundred pounds, and filled the whole

of the abdom-
inal cavity, put-
ting the integu-
ments and mus-
cles greatly on
the stretch.   It
was of a pale red-
dish color, and of
a fibro-vascular
structure, look-
ing a good deal
like a mass of
flesh.   The sur-
face of this mor-
bid growth was
covered with se-
veral excrescen-
ces, the largest
of which weigh-
ed nearly two
pounds ; and in
its interior was

Fig. 84.
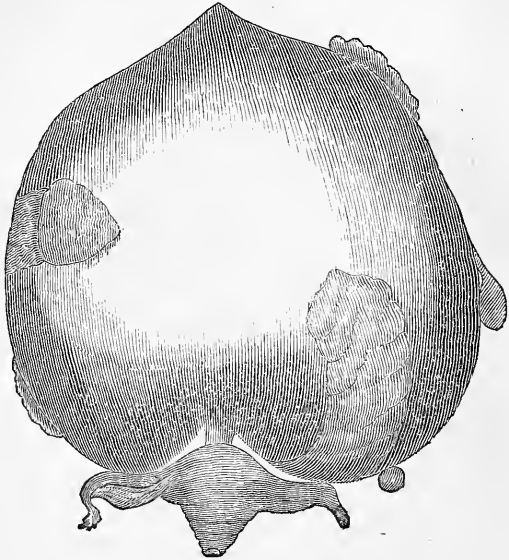
contained a large sac, which discharged three quarts of puru-
lent and highly offensive matter.   The disease had existed
for five years.   The annexed engraving will convey a better
idea of the nature and extent of these tumors than any
description, however elaborate.

In the other case, which occurred in a female, aged forty,
the uterus had attained the size it usually has at the sixth
month of pregnancy : its walls were one inch and a fourth in
thickness, and the substance itself was in many parts ossified.
Internally, at the fundus, was attached, by a short pedicle, a
round, bony tumor, about the size of a small orange ; and a
similar body occupied the uterine extremity of the Fallopian
tube : the corresponding ovary was hypertrophied, but other-
wise sound.   There were other appearances still more extra-
ordinary.   Near the neck of the womb were six large oblong
tubercles, adhering by small narrow foot-stalks, and branching
out in different directions, so as to fill the abdomen as high
up as the umbilicus : they were of a vascular texture, of a
pale reddish color, very firm, dense, resisting, and bore evi-

dent marks, in many places, of ossification. The weight of
the diseased uterus was upwards of thirty-two pounds.   The
patient died apoplectic.   Her principal ailments were, an
acrid discharge from the uterus, a sense of fulness and op-
pression in the pelvic region, cessation of the menses, and oc-
casional irritation of the stomach and bowels.

These fibrous growths, which are most common in old
women, are seldom met with before the age of thirty.   Bayle
estimated that they existed in one case out of every five after
the middle period of life.   This may be true of the French,
but certainly not in regard to the females of this country,
in whom these tumors, so far at least as my own observation
goes, are far from being frequent.   Old maids are said to be
particularly liable to them.

As intimately connected with the lesion first described, I
may advert here briefly to what are termed *polypous* tumors
of the uterus.   This is a subject which, notwithstanding the
great attention that has been bestowed upon it by the profes-
sion, is still involved in great obscurity, scarcely any two
writers agreeing upon the real nature of these morbid growths.
Without entering at all into the discussion of the matter,
which my limits will not permit, it appears to me that all
such tumors might be conveniently arranged into three
classes, according to their anatomical characters.   Adopting
this arrangement, I shall divide uterine polypes into fibrous,
vascular, and gelatinoïd ; and to each of these I shall devote
a few remarks.

The first variety bears a strong resemblance to the fibrous
tumor of the uterus, and is perhaps the most common of the
three.   Growths of this kind are of a fleshy consistence, firm,
yet compressible, smooth, elastic, of a pale grayish color, and
composed of dense filaments, which are so intimately inter-
woven with each other as to render it impossible to unravel
them.   In their shape, they are commonly globular ; some-
times pyriform ; and, in one instance, I found one that was
of the figure of a mushroom, the rounded foot-stalk being at-
tached to the neck of the uterus, the base projecting into the
vagina.   The fibrous polype has few vessels and nerves ; and
it is therefore little liable to bleed or to be attended with pain.
Tumors of this kind have often a very rough surface, and
they sometimes contain considerable cavities, filled with se-
rum, jelly, pus, or earthy matter.

The *vascular* polype is composed essentially of vessels and

cellular tissue, the fibrous element being either entirely wanting, or existing only in a very limited degree. This species is extremely rare, and seldom attains a large size ; it is of a red, florid color, of a soft spongy consistence, sensitive on pressure, erectile, and exceedingly prone to hemorrhage. In respect to shape, it presents the same diversities as the other species.

The *gelatinoïd* polype holds a sort of intermediate rank between the other two, being softer than the fibrous and harder than the vascular. This species is readily distinguished by the following characters : It is semi-transparent, of a peculiar grayish complexion, compressible, glistening on the surface, and attached by a delicate pedicle, which renders it pendulous. If it be carefully examined, after it is removed from the body, it will be found to exhibit a shreddy, tremulous structure, interspersed with a few vessels, which are generally too small to emit much blood. The gelatinoïd polype is sometimes quite large, but on the whole may be considered as infrequent. It seems to be much under the influence of atmospheric pressure, increasing in size when the weather is moist, and diminishing when it is dry.

Such are the distinctive characters of the three species of uterine polypes now described. To these it will be necessary to add a few remarks respecting certain features which they possess in common with each other.

Uterine polypes (Figs. 85, 86) are found of all sizes, from that of a bean up to that of a gourd. Their weight, in some cases, is immense. Dupuytren mentions that he saw one which weighed twenty-five pounds ; and another, described by Dr. De Clanby, weighed thirty-nine pounds, and

Fig. 85.
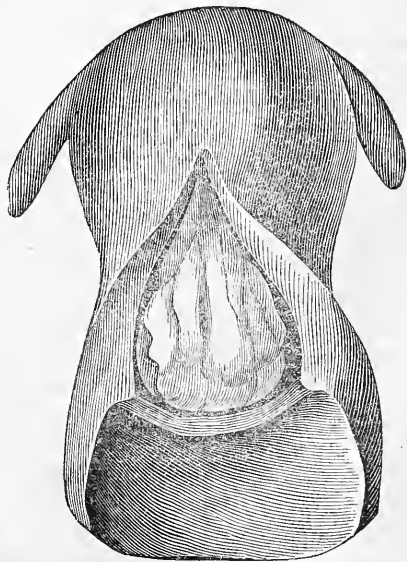
was nearly three feet in
its vertical circumference.
They occasionally extend far
down into the vagina, and
cases have been witnessed
in which they reached more
than ten inches below the
vulva. The shape of these
morbid growths is mostly
pear-like; and, although they
may originate in any portion
of the cavity of the uterus,
they are most frequently at-
tached to its neck. Many
of them have a narrow, slen-
der peduncle ; and, in such
as are of great size, it is not
uncommon to see deep fis-
sures, which give them
a lobulated arrangement.
Each of the three species

Fig. 86.

that we have described is invested by a thin mucous mem-
brane, which is more or less vascular, and merely a prolonga-
tion of that of the womb, immediately beneath which the
morbid growth is developed.

Uterine polypes often contain large cavities, filled with
substances that are not natural to them. Earthy concretions
have been found in their interior, and some have pretended
that they have detected tubercular matter. These tumors are
most common in aged females. A notion, but a very erro-
neous one, was formerly entertained that they occurred most
frequently in old maids. On this subject the observations of
Dupuytren are not only instructive, but decisive. Of fifty-eight
women affected with polypes, all were married except four,
who were single, and supposed not to have had sexual inter-
course. Nearly all of them had borne children.* Their
presence often occasions alarming hemorrhage ; and, when
they become ulcerated, they may give rise to a copious dis-
charge of irritating and offensive matter.

Calculous concretions sometimes occur in the uterus. Of
these formations many cases are described by the older
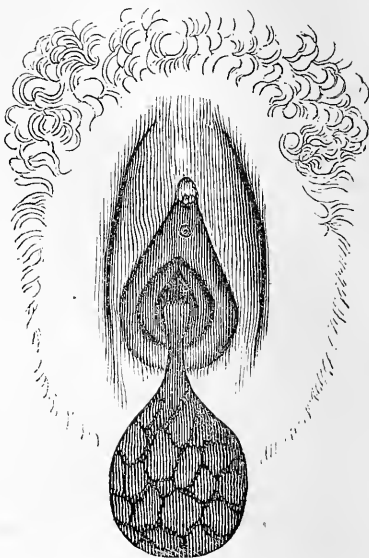
* Leçons Orales, t. iii. p. 485. Paris, 1833.

writers, and not a few by those of a more modern date. One of the most interesting examples, perhaps, on record, is that related by the celebrated Louis, in the Memoirs of the Royal Academy of Surgery of Paris.* It was observed in an old female, who was affected for a long time with difficulty in voiding her urine, and severe pain in the loins and perinæum. The uterus, which was in a state of scirrhosity, and of extraordinary size, contained a hard, compact, and irregularly-shaped concretion of a bony structure, which weighed five ounces and a half. Generally, however, these heterologous formations are much smaller, not exceeding the volume of a grape, a pigeon's egg, or of a walnut. Most of them are of a light grayish color, of an osteo-cretaceous character, and somewhat lamellated, with a rough unequal surface. It would seem, from the researches of the late Professor Turner, of London, that these bodies essentially consist of carbonate of lime, in union with a little animal matter.

Concretions of this sort are sometimes surrounded by a delicate membrane provided with minute vessels, and not unfrequently they contain small nodules of cartilage. Although their most usual situation is the cavity of the organ, yet they are occasionally developed in its substance, beneath its serous investment, or even in the uterine veins. Violent pain in the pelvic region, more or less uneasiness in the back and perinæum, and bearing down efforts similar to those of labor, are the principal symptoms marking the presence of these abnormal formations. When seated in the proper cavity of the womb, nature sometimes makes an attempt to expel them, which is almost always attended with considerable hemorrhage. At other times, though very rarely, their presence excites ulcerative absorption, leading to great local suffering and the formation of fistulous tracks between the uterus and the adjacent viscera. Calculous concretions are most commonly observed in advanced life ; but in a few instances they have been witnessed in young females, married as well as single, soon after the establishment of the menstrual function. Indeed, there is a case recorded in one of the early volumes of the German Ephemerides, in which a body of this kind is stated to have been developed in the uterus of a girl five years of age : it was of a pale yellowish color, and a little larger than a pigeon's egg.

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* T. ii. 4to. edit. 1769.

How these concretions are developed is still a litigated question. I have already described the formation of similar bodies in the plastic lymph of the serous membranes of the joints of the visceral cavities; and it is not improbable, I think, that those under consideration have an analogous origin. It is well known that the uterus is liable, at all periods of life, but especially in old females, to the effusion of fibrin, either into its cavity, into its substance, or into the submucous cellular tissue. In either case, the fluid, if it be permitted to remain, becomes organized, and converted ultimately into an adventitious structure of a fibrous, fibro-cartilaginous, cartilaginous, or osseous character. It is possible that they may also be produced by the presence of coagula, formed during uterine hemorrhage ; and it is probable, likewise, that in some rare instances the earthy matter is poured out without being preceded by any new growth, whether of an analogous or heterologous nature. This hypothesis derives support from the fact that these concretions are occasionally found entirely disconnected from the substance of the womb, lying perfectly loose in its cavity, or upon its outer surface.

The uterine tissue is sometimes partially *transformed* into cartilage, bone, or earthy matter. The foreign substance is generally seated in the proper texture of the organ, but occasionally it is lodged in the submucous cellular tissue, and appears to be encysted. Examples of this description are recorded by Baillie, Littson, Meckel, Bouvet, and other authors. Louis, in his excellent Essay on Calculous Concretions previously alluded to, quotes an instance in which the parietes of the uterus were so completely ossified as to require to be broken with a hammer : the organ was of enormous size, and contained a considerable quantity of thick purulent matter. In another case, referred to by the same distinguished writer, the internal surface of the womb was studded with numerous projections, of a yellowish color, and a firm rock-like consistence, bearing a striking resemblance to stalactites. "I have seen a uterus," says Dr. Hooper,* "the size of an adult head, irregular on its surface, and formed wholly of hard bony matter, surrounded by the expanded fibres of the organ, and in many parts covered only by the peritonæum." Such transformations are, however, extremely rare, and I have never seen a specimen. They occur almost

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* Morbid Anatomy of the Human Uterus, p. 14. London, 1832.

exclusively in females past the age of forty-five, and they appear to be produced by a perverted action of the uterine vessels, caused probably by chronic irritation. It would be interesting to ascertain, if this could be done, how far these deposits are connected with similar lesions of the arterial system.

The womb is often the subject of *malignant disease*, described by authors under the several denominations of scirrhus, fungus hæmatodes, cauliflower excrescence, corroding ulcer, and carcinoma. Scarcely any one of these appellations seems to me to be well chosen, as they have reference rather to certain states or appearances of the parts than to their true nature and constant anatomical characters. Not unfrequently all the conditions expressed by these terms are blended together, or even when they exist separately, they have invariably the same tendency, namely that of destroying the different textures of the uterus and the adjacent viscera.

Malignant disease, be its nature what it may, generally begins at the neck and lips of the organ, from which it gradually ascends to the other parts. So common is this mode of attack that it was once supposed to be invariable in its occurrence. Recent observations, however, made by some of the most able pathologists of Europe, prove that there are numerous exceptions to this rule, and that in many cases the disease, instead of showing itself first in the parts just mentioned, commences at the base or body of the organ, thence spreading downwards so as to manifest itself last in its inferior extremity.

The mouth of the womb in this affection usually becomes hard, thick, and irregular, and the lips are everted, and painful on pressure, bleeding not unfrequently on the slightest touch. One of the earliest symptoms is hemorrhage, not slight, but severe, and long-continued. Of twenty-one cases collected by M. Louis at the Charity Hospital in Paris, sixteen commenced in this manner; and of six observed in the ward of the same institution by the late lamented Dr. James Jackson, Jr. of Boston, five began in a similar manner. Both these writers lay great stress upon this phenomenon, considering it of more diagnostic value in the inceptive stage of the complaint than any other hitherto pointed out.* The pain accompanying this disease is variable, being at one time

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* Memoir of James Jackson, Jr. M. D. p. 116. Boston, 1835.

severe, at another so slight as almost to escape notice.* After
this state has continued for some time, ulceration takes place,
a thin, sanious fluid, abundant in quantity and highly irrita-
ting in quality, oozes from the vagina, and all the textures of
the affected part are completely destroyed.   The base and
body of the uterus, which are often much enlarged, also
change their appearance ; they become hard and firm, like
fibro-cartilage, and are intersected by dense, grayish filaments
running in a radiating direction.   In some instances, the
organ, when cut, has a raw flesh-colored aspect, like a slice
of fresh pork ; this is called the *lardaceous* degeneration of
the uterus.   In other cases, it has a *gelatinous* structure ;
and, in a third variety, as the softening and ulceration pro-
ceed, it assumes the color and consistence of *encephaloïd*.

The brain-like variety of the disease generally occurs in
the form of soft, lobulated masses, the interior of which
contains clots of fibrin, varying in color and consistence,
according to the length of time they have been deposited.
Their size seldom exceeds that of an orange, but sometimes
they are as large as a fœtal head, of an irregularly globular
figure, and of a dark brownish complexion, caused by the
secretion of melanotic matter.   In other cases, again, though
these are rare, the internal structure is of a deep red color,
and composed essentially of anastomosing vessels.

As the disease progresses, various morbid growths spring
from the ulcerated surface, and fill up the vagina.   These at
length fall off by sloughing, and are either speedily succeeded
by others, or they leave a deep excavated sore, with hard,
irregular edges.   In this stage of the complaint, there are
generally copious discharges from the vagina, consisting of a
thin, corroding sanies, serum, pus, or sero-purulent matter.
In many individuals such discharges are exceedingly fetid,
and at once serve to point out the true nature of the lesion.

Carcinoma of the uterus is most common about the decline
of the menses, in married females that have borne children.
Of twenty-two cases of this disease recently reported by Dr.
Ashwell, of London,† eight occurred between thirty and

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* " Authors generally describe this disease as attended with excessively severe
pains, &c.   This is sometimes true, but by no means so generally as has been
thought.   Of the six cases now in our wards — Charity Hospital — in three there
was no pain until a very advanced period ; and then it was inconsiderable ; and
in one, although the disease is quite advanced, there has as yet been no suffering."
Op. cit. p. 117.

† Guy's Hospital Reports, No. 4.   April, 1837.

forty ; six between forty and fifty ; six between fifty and
sixty ; and two between sixty and seventy.   All the women
were married, and, except two, had been mothers ; seven
were of light complexion and fifteen dark.

"There is a variety of malignant disease of the uterus,
which some have considered as essentially different from the
preceding, but which is a mere modification of the varieties
already described.   It has been called the *phagedænic* or
corroding ulcer (Fig. 87) of the womb.   Sometimes the
ulcer, which is of a deep
violet color, is quite su-
perficial, without much
thickening, induration,
or enlargement of the
part.   The ulcer begins,
like any other malig-
nant ulcer, on the surface
of the body, and gradu-
ally proceeds until the
greater portion of the
neck of the uterus has
been destroyed, or re-
moved by ulcerative ab-
sorption, and openings
are formed into the blad-
der and rectum.   The
portion of uterus which
remains after death is

Fig. 87.*
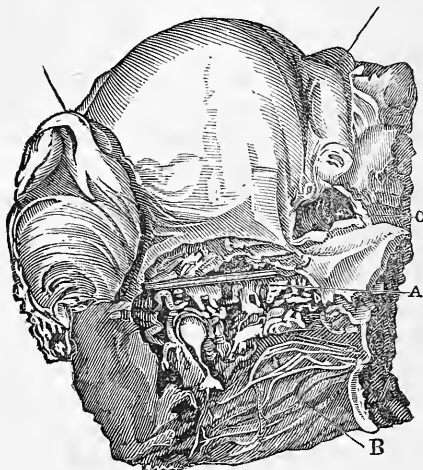
sometimes not much altered in appearance ; more frequently,
however, it becomes softened in texture, and assumes a yel-
low or reddish brown color." †   This affection, so destructive
in its consequences, rarely if ever occurs before the age of
forty, and commonly not until that of fifty or sixty.

Soft *fungous excrescences*, (Figs. 88, 89,) of a cauliflower
shape, also sometimes grow from the mouth of the uterus,
and undergo changes similar to those observed in other varie-
ties of malignant disease.   These morbid structures, first
accurately described, I believe, by the late Dr. John Clarke, of
London, have a rough, granulated surface, and in most cases
are of a bright flesh color : they are of a soft erectile texture,

* *a*, corroding ulcer ; *b*, vagina ; *c*, uterus.
† Cyclopædia of Practical Medicine, article *Uterus*, p. 344.

extremely vascular, and very liable to bleed when injured. In their size, they vary from that of a hen's egg to that of a large fist; their growth is often quite rapid, and, when the vagina is very dilatable, as in women who have borne many children, they sometimes protrude beyond the lips of the vulva. Excrescences of this sort do not appear to be endowed with much sensibility, and hence the patient seldom complains when pressure is made on them. They *invariably*

Fig. 88.*

spring from the mouth of the uterus, *never* from any other part; and it is pretty generally admitted now by all pathological anatomists that they have always a malignant tendency, destroying life either by constitutional irritation, or by the exhaustion

Fig. 89.

produced by the profuse sero-sanguinolent discharges. Dr. Dewees † states that he has never met with this disease, and I therefore conclude that it is extremely rare in this country. I have seen only one specimen of it, which is preserved in our college museum.

Tubercular matter, such as we find in the lungs, seldom occurs in the uterus, and perhaps never before the age of pu-

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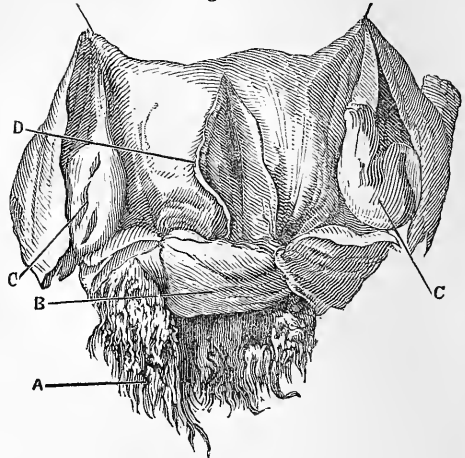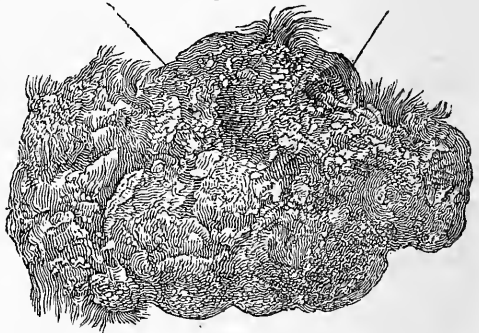
* *a*, excrescence; *b*, os uteri; *c c*, ovaries; *d*, body of the uterus.
† Treatise on the Diseases of Females, p. 296. Philadelphia, 1837.

berty. It is usually deposited upon the inner surface of the organ, which is sometimes entirely incrusted with it, forming a layer of half an inch or more in thickness. Bayle and Laennec make no mention of this disease; Andral, though he indicates its existence, offers no cases of it; Louis met with it only once; and Regnaud saw only three examples of it during a residence of six years in one of the largest Parisian hospitals. In one of his cases the malady was associated with tubercles of the lungs. The females had menstruated, and borne children. In some instances, though this, I believe, is very rare, the matter is deposited into the substance of the womb, or into the cellular texture between it and the peritonæum. In my own dissections I have never met with this disease.

Of *hemorrhage* from the uterus we shall speak only as it affects the organ in the unimpregnated state. Contemplating it under this restriction, the occurrence, it may be remarked, is most common in married females, about the cessation of the menstrual function, and is observed in every state of constitution, in the strong and plethoric, as well as in the feeble and relaxed. A great variety of causes have been enumerated as giving rise to uterine hemorrhage; but the most frequent by far is that peculiar state of the system which accompanies the disparition of the menses, together with ulceration of the mouth of the womb, or the presence of some adventitious growth. Disease of the ovary also powerfully predisposes to this lesion; and there are some females who are naturally, or from habit, so prone to it, that the most trifling exertion is sufficient to bring on an attack. The duration of the hemorrhage varies from a few days to several weeks. When dependent upon structural disease, or the presence of a polypous tumor, the blood often comes away suddenly, in a gush, which continues for a few hours, and then ceases.

The effused blood is generally of a dark red color, and comes away in coagulated masses, though occasionally, especially when the hemorrhage is sudden and profuse, it is of a fluid consistence, as well as of a lighter tint. With regard to the quantity of blood lost, it may vary from a few ounces to several quarts; and, although it is generally greatest when it proceeds from a ruptured vessel, it is often not less abundant when it has its source in exhalation of the mucous

membrane. On dissection, we find the surface of the womb either of a uniform red color, or mottled with blackish spots, soft and corrugated, with here and there a submucous ecchymosis. The whole organ is commonly somewhat relaxed, and, on cutting through its substance, small clots of blood are occasionally observed, resembling apoplectic effusions of the brain.

Large quantities of *water* have been known to accumulate in the cavity of the womb, — ten, fifteen, and even twenty quarts. The affection, however, is extremely rare, and is always connected with a closure of the mouth of the organ, caused by previous inflammation, malignant disease, or some morbid growth. The fluid is generally clear and limpid like the serum of the blood, which it also resembles in its chemical properties. In some cases, it is thick and turbid; and it has also been found of the color and consistence of coffee-grounds, from the admixture, probably, of sanguineous matter. The tumors thus formed often simulate pregnancy, are painful on pressure, and slightly fluctuate under the fingers. The disease, which, it may now be observed, is technically called *hygrometra*, is occasionally connected with utero-gestation, of which it forms one of the most distressing complications. Its true pathology is still involved in great obscurity. In all probability, it is dependent upon chronic inflammation of the lining membrane of the womb, — a conjecture deriving considerable plausibility from the facts already adverted to, that the disease is generally attended with obliteration of the orifice of the organ, and with more or less tenderness on pressure of the hypogastric region.

Air now and then collects within this viscus, constituting the disease which has been described by pathologists under the name of emphysema, physometra, and tympanites. How this is formed is still a litigated point. In many cases, it can be traced to the decomposition of effused fluids, such as blood, serum, or pus; and, in others, it is not unlikely that it is the product of a true secretion from the uterine vessels, brought about by some morbid condition, the precise nature of which is unknown. These accumulations may take place at any period of life, in the married and the single, in the young and the old. When considerable, they cause the womb to expand and rise up in the abdomen, as in pregnancy, with which it may be easily confounded. After

the flatus has existed for several months, the uterus commonly makes an effort to dislodge it, expelling it with a noise somewhat similar to what is occasioned in eructation.

The *mouth* of the uterus is sometimes preternaturally small, or so much contracted as scarcely to admit a small silver probe, or even a hog's bristle. This lesion is often congenital, but in other cases it is brought about by inflammatory irritation, in the same manner as stricture of the urethra. The late Dr. Mackintosh, of Edinburgh, thought that this condition of the uterine orifice was a frequent cause of dysmenorrhœa; and the cases which he has adduced, in illustration of the subject, tend very much, it must be confessed, to favor his conclusion. As yet no opportunity has presented itself to me for verifying the results of the Scotch pathologist, nor am I aware that this has been done by others.

We sometimes find *hydatids* in the uterus, though not so frequently, perhaps, as has been generally imagined by the profession. This subject, notwithstanding the great number of physicians who have written upon it, was first fully noticed by Madame Boivin, of Paris. In her celebrated Memoire " Sur l'Origine, la Nature et le Traitment de la Mole Vésiculaire ou Grossesse Hydatique," published in 1827, she developed the leading facts, and has left scarcely any thing else to future observers, than to verify and strengthen her inferences.

The number of uterine hydatids is often immense. In a specimen in my collection, notwithstanding a great many were lost during the delivery, there are at least ten thousand, of all sizes between an almond and a mustard-seed.* (Fig. 90.) In their shape, these bodies are either globular, pearlike, or conoïdal; and they are usually strung together by an intricate plexus of pedicles, which ramify in every direction, and are frequently not thicker than a common sewing-thread. The length of these stems varies from a few lines or less to several inches; they are of an irregularly, cylindrical figure, and from two to six are occasionally attached to the same vesicle; their strength is always very slight, so that they break with great ease; and many of them, though not all,

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* I am indebted for highly interesting specimens of these parasites, to my friends, Dr. Joshua Martin, of Xenia; Dr. M. Dunlap, of Greenfield; and Dr. Thompson, of Columbus, in the State of Ohio.

are distinctly tubulated, being inflatible, from the hydatids with which they are associated. The canal, however, does not generally extend through the whole length of the foot-stalk, but only a comparatively short distance, seldom more, indeed, than six lines or an inch.

The larger hydatids have generally smaller ones attached to different parts of their surface, — an arrangement not unlike what is observed in some tuberous roots. From five to ten, not bigger than a grain of barley, are often seen sprouting out in this way, their connection with the parent parasite being effected by means of a narrow, delicate stem, scarcely half a line in length. But, whatever may be their size or form,

Fig. 90.

they all adhere, immediately or indirectly, to one common stalk, exactly like a bunch of grapes, and which consists either of a portion of degenerated placenta, a fibrinous concretion, somewhat similar to an ordinary mole, a blighted ovum, or the remnants of the fœtal envelopes. These are, I conceive, highly important circumstances in the history of
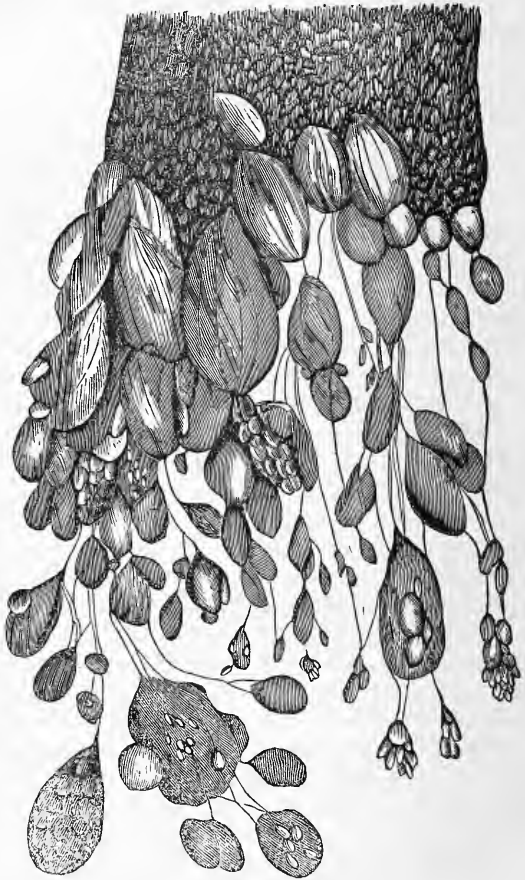
these singular productions, inasmuch as they fully confirm the opinion, so warmly advocated by mány writers, but so strenuously denied by others, that hydatids are never found except as the result of impregnation.

When carefully examined, each vesicle is found to have three distinct coverings, which may generally be separated without much difficulty with the knife, care being taken to hold the morbid growth under water : the external tunic is extremely delicate, almost like a film, and of a pale cineritious color, which becomes more perceptible when it is detached from the subjacent layer; it is easily lacerated, semi-transparent, and may be considered as a sort of deciduous membrane. The second lamella, on the contrary, is comparatively thick, firm, dense, and resisting; it has a whitish appearance, possesses the property, in some respects, of a fibrous texture, and serves at once to give shape and consistence to the vesicle which it assists in forming.   Within the two coverings now described lies the hydatid, properly so called, which is generally so weak as to break under the pressure of the atmosphere, and which appears to consist merely of a thin, lymph-like sac, filled with serous fluid.   In the recent state, this lamella is perfectly smooth and transparent; but, by immersion in alcohol, it speedily becomes opaque and corrugated.   In most cases the parasite lies loosely within its envelopes, but occasionally, especially when the vesicles are old or of large size, there is a pretty strong adhesion, by means of thread-like filaments, between them.   Its contents are clear and limpid, like the purest spring-water; slightly saline to the taste, and partially coagulable by heat, proof-spirit, and dilute acid.

We have already seen that the number of these bodies is sometimes extremely great.   By their agglomeration large masses are formed, the weight of which has been known to exceed ten pounds, though ordinarily it is considerably less. These masses are generally expelled piecemeal, and they are rarely if ever enveloped by distinct fœtal membranes, unless there are at the same time remnants of a blighted ovum.

The period of hydatid gestation, as might be supposed, is extremely variable.   The following table, compiled from Madame Boivin, and other writers, gives an accurate view of the duration of this disease in forty-four cases, including five that have been communicated to me by medical friends.

Duration of the Disease.		Number of Cases.
3 months,	. . . .	4
4 "	. . . .	3
5 "	. . . .	3
6 "	. . . .	5
7 "	. . . .	6
8 "	. . . .	7
9 "	. . . .	10
10 "	. . . .	3
11 "	. . . .	1
13 "	. . . .	1
14 "	. . . .	1
		44

From this table it appears that the number of hydatic births, if so they may be styled, is, within a fraction, twice as great after the sixth month as anterior to that period. Never, so far as my knowledge extends, does delivery occur before the expiration of the third month. The mean duration of this species of pregnancy, calculated from the above cases, is a little more than seven months, provided we receive as correct — which I am disposed to think we should not — the examples of Baudelocque, Vernois, and others, where the female is said to have carried the morbid product more than a year.

It has been supposed that hydatids of the uterus are most common in women about the decline of the menses; but this opinion is evidently grounded upon superficial observation. Of thirty-one cases, in which the age is satisfactorily stated, I find that twelve occurred between the twentieth and thirtieth year; eight between the thirtieth and fortieth; and eleven between the fortieth and fiftieth, or rather between the fortieth and forty-sixth, for beyond this period I am not acquainted with a single well-authenticated instance in which this degeneration was observed.

The developement of these parasites is generally, if not invariably, preceded by one or more normal gestations. In a case, the particulars of which were recently communicated to me by my friend, Dr. Dunlap, of Greenfield, in the State of Ohio, the woman, who was forty-six years old, and had always been in the enjoyment of excellent health, had given birth to eleven children. Occasionally these bodies form in several successive pregnancies; and, in a few rare instances, they have been observed in several members of the same family.

The expulsion of the hydatids is almost constantly attended with more or less hemorrhage. To this statement, indeed, there are few exceptions. A discharge of blood frequently takes place at a very early period of gestation, and recurs at variable but generally short intervals, until the time of parturition. The quantity of blood lost is often very great, so much so as seriously to undermine the vital powers, or even destroy the patient. Of this unhappy termination, instances are recorded by several writers, amongst others by Pechlin, Home, and Moth. The expulsion of these bodies, it may be observed, is always accompanied by labor pains.

The symptoms produced by the presence of uterine hydatids are such as are observed in ordinary pregnacy, — that is to say, with suppression of the menses there is morning sickness, faintness, and capricious appetite, with gradual increase of the abdomen. If the morbid mass be retained until the eighth or ninth month, the breasts occasionally enlarge and secrete milk, as in normal gestation. The only sure sign of the existence of these bodies is a discharge of sero-sanguinolent fluid from the vagina, which may set in at a very early period, and is particularly abundant in the morning when the patient rises from her bed, or whenever she subjects herself to any severe bodily exertion. The abdominal tumor is also more soft and flaccid than in ordinary pregnancy, it falls more easily from one side to the other, and no placental sound is heard on the application of the ste hoscope.

As to the causes of these morbid growths, they are still enveloped in complete mystery. It has been conjectured by many that they are occasionally an original production of the uterus; but there is no case on record, so far as I remember, which warrants such a conclusion. Indeed, when we reflect upon the fact already adverted to, that they always occur in association with mole-like concretions, the membranes of a blighted ovum or some remains of the fœtus itself, or, finally, with portions of the placenta in a state of degeneration, it must be conceded that they are invariably the result of impregnation. If this view be adopted, it follows, as a natural deduction, that the developement of the new being, after having sojourned for some time in the uterus, is arrested, and another action set up, under the influence of which the bodies in question are created. What the nature of this action is, we cannot of course determine any more than that which presides over ordinary generation.

Many anatomists have imagined that these parasitic forma-

tions are mere watery vesicles, not genuine acephalocysts, as is the case with hydatids in other organs. That this is occasionally true is not improbable ; but that they are really living animals, in the generality of instances, the concurrent testimony of the best writers on the subject abundantly proves. M. Hippolitus Cloquet has given them the name of racemose acephalocysts ; and various naturalists regard them as hydatoïd worms. Schroeger, a German author, considers them as varicosities of the lymphatic vessels of the placenta ; Ruysch, as dilatations of the extremities of the arteries. The latter opinion has recently been revived, and warmly advocated by Professor Cruveilhier. Such views, however, notwithstanding they possess some plausibility, are certainly altogether idle and unprofitable, as they have not a single fact to recommend them to our judgment.

The last subject which we proposed to discuss was that of *uterine moles.* Under this term authors have described different, and often very dissimilar products, which, after continuing for a variable period in the womb, are finally expelled with all the phenomena of ordinary labor. For the sake of perspicuity, so essential in all pathological inquiries, I shall at once proceed to divide uterine moles into two species, the fibrinous and the vascular. This arrangement, it will be perceived, altogether excludes uterine hydatids, which have been referred to this head by Madame Boivin, in the work before quoted, and which, from the many peculiarities they display, are worthy, I conceive, of separate consideration.

The *fibrinous mole* (Figs. 91, 92, 93) is a

Fig. 91.*

* Exterior of a fibrinous mole.

much more interesting
and intricate structure
than we might be led to
infer from the imperfect
descriptions of it, which
are to be found in authors.
In its shape it is always,
so far at least as reiter-
ated inspection has ena-
bled me to judge, more
or less conical, pyriform,
or gourd-like, — never, I
believe, perfectly globu-
lar. Occasionally, though
this is rare, it is some-
what lobulated or angu-
lar, either externally or
upon the inner surface,
or in both these situa-
tions at the same time.
Its size and weight vary
very much in individual
cases. In five specimens of this
species of mole which I exam-
ined with great care along with
Professor Parker, the mean
weight was found to be a little
more than one ounce, the maxi-
mum two ounces, the minimum
six drachms. The length in
the same cases varied from two
inches and a half to three inches
and a quarter; the width, from
one inch and a half to two inches
and a quarter; and the thick-
ness, from one inch and a half
to two inches. We are told by
some writers, amongst others
by Unezwolf, a German physi-
cian, of fibrinous moles that weighed nine pounds, and were

Fig. 92.*

a

b
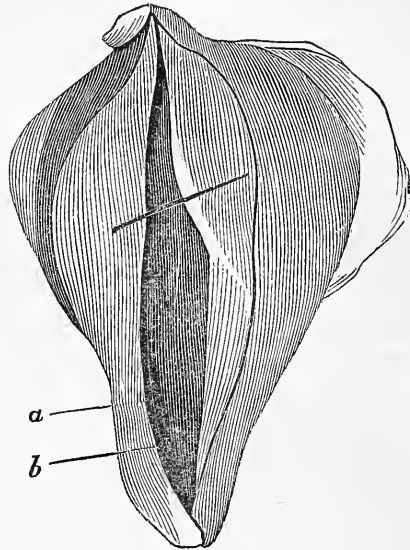
Fig. 93.†

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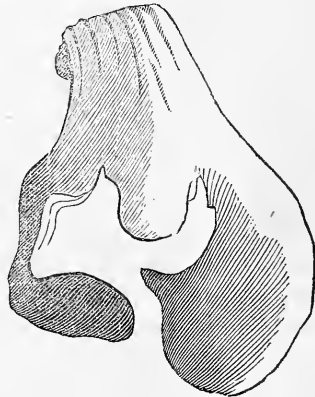
* Mole cut open, showing its structure: a, chorion; b, amnion.
† Mole with the cavity communicating externally.

as large nearly as an adult head ; but such examples must be exceedingly rare, and I have never met with them.

The fibrinous mole, in the recent state, has very much the appearance of a mass of blood, being of a modena color, not uniformly, but darker in some places than in others. It is of a firm, solid consistence, requires a good deal of force to cut it, and emits a dull, creaking sound under the knife, like fibro-cartilage. The degree of induration, however, is not the same in all cases, or even in all parts of the same specimen. When retained long, this species of mole sometimes partially degenerates into a hard, gristly substance, similar to certain transformations of the placenta.

Externally, the adventitious product is invested by a grayish, fragile lamella, generally not more than the fourth of a line in thickness. It evidently serves to connect the mole to the inner surface of the uterus, and possesses all the characters of the deciduous membrane. Not only does this lamella cover the exterior of this body, but it usually passes into the internal canal, which it thus lines throughout its whole extent. Hankoph * has recorded an instance where the mole was surrounded by an osseous covering, which was formed, doubtless, by a degeneration of the structure we have here described.

On making a longitudinal section of this morbid growth, an internal cavity is found, which is always remarkably small in proportion to the enclosing parietes. In most instances, it extends nearly from one extremity to the other, at the larger of which, much more frequently than at the smaller, it has an external opening. To this law, which may be regarded as a very important one, I have met with only a single exception in a considerable number of specimens. To attempt to describe the shape of the internal canal would be idle, so much does it vary in different cases. Irregularity is its distinguishing characteristic. Very frequently it presents itself in the form of a fissure ; sometimes it is cylindrical, and at other times it is angular. Equally irregular is the outlet of this canal ; whilst in some instances it is small and tolerably well-defined, in others — and these are by far the most common — it is large, grooved, or slit-like. Occasionally it closely resembles the mouth of the unimpregnated uterus.

But wherever may be the form and dimensions of the internal canal, or of its outlet, it is always lined with two short

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* In Haller, Disp. Med. t. iv. p. 715.

sacs, which, though intimately united, are perfectly separable by dissection, and which appear to correspond exactly to the natural envelopes of the fœtus. The outer layer is rough, flocculent, and loosely connected with the deciduous membrane, which, as was before stated, is always reflected into the mole when there is an open cavity ; the inner, on the contrary, is perfectly smooth and glossy, like the serous tissue in other parts of the body, and generally, though not always, contains a small quantity of transparent fluid, similar in every respect to the amniotic liquor.

The parietes of the cavity which we have just described are also exceedingly irregular, and they vary in different parts of their extent from the twelfth of an inch to six or eight lines in thickness. Examined in reference to their structure, they are found to be composed principally, if not wholly, of the fibrin and coloring matter of the blood, cemented together by plastic lymph. On making a section of the mole in the direction of its long axis, the outer portion is observed to have an imperfectly lamellated arrangement, and also to be somewhat more compact than the internal parts, which are of a much darker complexion, homogeneous, much more friable, and almost entirely made up of coagulated blood. In some instances, the walls are essentially fibrous, the fibres extending longitudinally from one extremity, or nearly so, to the other ; they lie in close, parallel lines, are very coarse, easily torn and separated from each other, and of a reddish-gray color, darker at some points than at others. These three varieties of structure are not unfrequently met with in the same tumor, the linear arrangement being seen at the apex, the lamellated at the external part of the body, and the uniform, homogeneous, or hematoïd towards the centre.

The cellular tissue entering into the composition of this variety of mole is usually very small in quantity, and is often so intimately incorporated with the morbid mass, as to be perceptible only after protracted maceration. Its vessels, which are generally quite large, may be seen ramifying over its outer surface, running, for the most part, in the direction of its long axis. They enter the new product at various points, but none can be traced beyond the depth of a few lines : they are sometimes quite varicose, their parietes are remarkably brittle, and they have altogether much more of a venous than of an arterial character. The anastomoses which exist between these vascular trunks are commonly very im-

perfect, — a circumstance which, with the delicacy of their
structure, renders them exceedingly liable to congestion, rup-
ture, and hemorrhage.

The second species of mole may be called the *vascular*,
(Fig. 94,) in consideration of its structure, which, as the
term imports, is essentially
of that nature.   It is much
more rare than the preced-
ing, but in what proportion
it occurs we have no means
to determine.   In its shape,
the vascular mole is generally
globular, and, in its diameter,
it varies from one to four
inches.   Its weight, after the
discharge of its contents,
ranges from three drachms to
one ounce, according to its
dimensions, or the thickness
of its parietes.

Fig. 94.
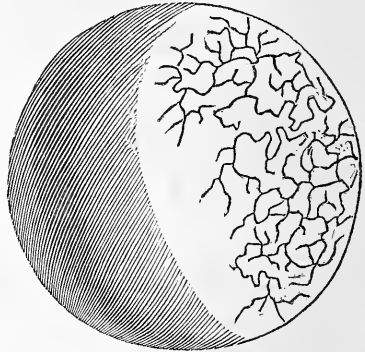
In regard to its structure, this variety of mole may be said
to bear a striking resemblance to the placenta.   Like it, it
appears to be essentially composed of blood-vessels, which
freely anastomose with each other, and are bound together by
delicate, cellular tissue, the whole forming a soft, spongy
substance, the thickness of which rarely exceeds the sixth of
an inch.   In some instances, numerous intersecting filaments
may be observed, which are either of a fibrous nature, or
obliterated arterial and venous ramifications.   Externally,
the mole is incrusted with a thin, coriaceous lamella, which
is much more delicate than in the fibrinous form : internally,
it is furnished with two distinct membranes ; the one answer-
ing to the chorion, the other to the amnion.   They are much
more perfectly developed than in the preceding variety, as
well as more easily separable from each other ; and the latter
always encloses a considerable quantity, occasionally as much
as three or four ounces, of watery fluid.

Such is a brief account of the two species of uterine moles.
The period during which they are retained in the womb is
of course liable to some variation, but in the generality of
cases it does not exceed three months.   In a few instances I
have known them to come away as early as the end of the
tenth week, and on one occasion as late as the middle term

of normal gestation. Their expulsion is invariably accompanied, as far as my experience goes, with more or less hemorrhage. The parturient efforts are usually very feeble, and often occupy from two to three days. The flow of blood may be so profuse as to endanger life. De Lamotte has recorded a case where it proved fatal.

The fibrinous mole has occasionally been observed in company with a healthy or diseased fœtus; and I have a specimen of the vascular variety, in the interior of which there is evidently the remains of an umbilical cord. Like hydatids, these products may occur in several successive pregnancies; and they have been noticed at all periods, from the age of puberty to the decline of the menses. Their developement is commonly attended with the phenomena of ordinary gestation.

It is supposed by many that these bodies are never formed except as the consequence of conception, — an opinion which is in perfect accordance with the result of my own observations. I speak now, of course, of what I consider to be the true genuine mole; that is to say, *an organized body of a certain or determinate form and structure, having an internal cavity, either closed or open, and lined by two distinct membranes of the character already ascribed to them.* Such a product, no matter whether it be fibrinous or vascular, I do not hesitate to say, on the authority of considerable experience, is never developed in the virgin uterus. I have never seen an example of what some have called a *spurious mole* — a dense, compact, and amorphous mass, composed essentially of clotted blood — but such a substance might form, there is reason to believe, in females during the period which intervenes between the establishment and the decline of the menses, without intercourse or the stimulus of conception, simply from the effusion and retention of a small quantity of sanguineous fluid.

Of the causes under the influence of which the true mole is developed, nothing is known with any degree of certainty. We may suppose, however, in the absence of positive facts, that the uterus, instead of providing for the growth and nourishment of the new being, as nature has designed it should, takes on inflammatory irritation, which is followed by the destruction of the germ, the effusion of blood, and the formation of an abnormal structure, which, as we have already seen, is sooner or later detached and expelled.

SECTION II.

Of the Ovaries.

THE ovaries are two small oblong bodies, lying in the upper part of the broad ligaments, behind and somewhat beneath the Fallopian tubes. Their color is of a light grayish, and their volume nearly equals that of a common almond. With regard to the weight of these organs, much diversity obtains in the different periods of life, as well in the single as in the married state. In eight young females, who died between the ages of seventeen and twenty-three, and in whom, from their previous health and moral habits, there was every reason to believe that the ovaries were perfectly natural, I found the mean weight to be one drachm and a quarter, the maximum one drachm two scruples and a half, and the minimum fifty-six grains. With regard to their dimensions, the mean length of the organs, measured in the same subjects, was seventeen lines, the breadth nine lines, and the thickness four lines and a half. In women who have borne children, the ovaries are generally about half a drachm heavier, and they are also broader and thicker, but seldom any larger. They are remarkably large in children : from the eighth to the twelfth year, they undergo little change in respect to their volume ; but, from this period on, they gradually augment in size, and at puberty they present the weight and dimensions here assigned to them.

Connected to the uterus by means of a thin, rounded, fibrous cord, scarcely an inch and a half in length, each ovary is invested by two tunics, which, although intimately united, differ from each other materially in their structure. Of these the outer is derived from the peritonæum, and is consequently of a serous nature ; the other is a dense grayish membrane, of a fibrous texture, perfectly similar to the corresponding substance in the male, and denominated the *albugineous coat.* This coat, which gives shape and consistence to the ovaries, sends numerous processes, finer than the most delicate threads, though their proper parenchymatous structure, which they thus intersect in every possible direction.

Concerning the precise nature of the parenchymatous structure of the ovaries, the present state of our knowledge is such

as not to enable us to communicate any positive information. All that is known, with any degree of certainty, is, that it is of a soft spongy consistence, highly vascular, succulent, and of a light rosaceous color. Their properties are particularly well-marked in females from the age of puberty until thirty-five, but they are much less conspicuous before and after these periods. Situated in this substance are the *ovarian vesicles*, or, as they are often termed, from the anatomist who first accurately · described them, the ovules of De Graaf. Their number is from five to fifteen; they are usually of a spherical shape, and in a specimen which I recently examined along with my friend Professor Parker, they varied in size from three quarters of a line to two lines and a half. The largest are almost always seated superficially, just beneath the coverings of the organ, which they often elevate, like so many little pearls. The structure of these vesicles is much more intricate, I apprehend, than is generally imagined by anatomists. From a considerable number of dissections, some of which were witnessed by the gentleman just named, I am convinced that each consists of two membranes lying in close juxtaposition but perfectly distinct from each other. What their precise nature is, I am unable to specify, but am disposed to believe that the outer is fibrous, the inner serous. The first is of a pale grayish color, much thinner than the other, and pretty firmly adherent to the surrounding parenchyma; the latter, on the contrary, is strong, thick, dense, and quite transparent in the normal state, but is rendered opaque on being immersed in alcohol and boiling water. This internal layer is sometimes arranged in the form of a double sac, by a sort of midriff or partition. Its office evidently is to secrete the humor which distends the Graafian vesicles, and which, as is shown by its ready coagulability on exposure to heat, proof-spirits, or any of the mineral acids, is of an albuminous nature, slightly viscid to the touch, perfectly pellucid, but inclining to yellow in the larger ovules.

The ovaries are supplied with blood by branches from the spermatic arteries, and their nerves are offsets from the renal plexus. Their absorbents, which are scanty and extremely delicate, empty into those of the kidney.

The ovaries are subject to inflammation, suppuration, softening, tubercles, melanosis, scirrhus, encephaloïd, fibrous growths, and serous cysts. Almost all these affections occur

after puberty, seldom before ; and they are much more common, as a general rule, in the married than in the single.

The anatomical characters of *acute ovaritis* are increased vascularity, softening, and sero-purulent effusion. In violent attacks, the organ is of a deep red color, much swelled and gorged with blood. On cutting into the parenchymatous structure, it will be found succulent, and to contain small globules of pus, or to be converted into a pulpy, disorganized mass. When the disease affects the albugineous and serous coverings, lymph is very apt to be poured out, sometimes in great quantities, by which the ovary is embedded, and firmly attached to the adjoining viscera. In such cases, I have known the gland to be permanently fixed to the sigmoïd flexure of the colon, the bladder, or body of the womb ; and, in five or six instances, I have seen the fimbriated extremity of the Fallopian tubes firmly glued to the ovary, either on one or both sides. Under the latter circumstance, the individual must of course be sterile.

Ovaritis, especially the puerperal variety, sometimes passes into *suppuration*. The matter is commonly of a thick cream-like consistence, such as occurs in phlegmonous abscess, and it may be either infiltrated into the parenchymatous structure of the organ, or collected at one or more points. The quantity of fluid, though usually small, is sometimes almost incredible. In a woman, aged thirty-five, whose case is recorded by Dr. Taylor, of Philadelphia, it amounted to sixteen quarts. The right ovary occupied the whole of the abdominal cavity, and was converted into a large vascular sac, weighing seventeen pounds after the removal of its contents. The disease, which was of about four years' standing, was imagined to be an encysted dropsy, and its real nature was only discovered after death. During the latter part of her life, the woman suffered under dyspnœa, severe cough, difficulty of lying, and œdema of the lower extremities. The abdomen was unusually large, and fluctuated feebly on pressure. The uterus was sound.* The matter thus formed may escape into the pelvic cavity, the rectum, vagina, or urinary bladder. In some cases it finds its way into the bowels ; and occasionally it has been known to travel along the course of the round ligament of the uterus, and work its way out at the inguinal ring.

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* North American Medical and Surgical Journal, vol. i. p. 443, 1836.

Softening of the ovary is a very uncommon affection. It generally results from active inflammation, and occasionally coexists with puerperal peritonitis. Under the influence of this disease, the organ becomes tumid, infiltrated with sero-purulent matter, extremely soft, and lacerable. In some instances, the entire structure of the ovary is reduced to a dark-colored vascular pulp, in which it is impossible to perceive the slightest trace of its natural organization. In other cases, again, the organ is of a dark complexion, hard and friable, like a half-rotten pear.

Tubercles of the ovary are rarely met with, being still more uncommon here than in the testicle. Thus far they have been observed chiefly in females of a scrofulous diathesis, after the decline of the menses. These bodies existed in one twentieth of the persons who died of pulmonary phthisis under the care of Dr. Louis. They do not give rise to any particular symptoms ; and, as they present the same characters as in the other organs, it is unnecessary to say any thing further concerning them in this place.

The ovaries are sometimes, although very rarely, affected with *melanosis*. A case reported by Professor Alison, of Edinburgh, admirably illustrates this disease. The ovaries, several times larger than their natural size, lay in front of the uterus, in the lateral iliac regions. Their outer surface had a dark, shining, lobulated appearance ; and, when cut into, their substance was found to be uniformly black, as if they had been steeped in China ink.

Scirrhus of the ovary is often found in connection with serous cysts, encephaloïd disease, and fibrous growths, but is rarely met with alone. The viscus is enlarged, often many times beyond the natural bulk, hardened in texture, and of a light yellowish color, with membranous filaments, of a dense, fibrous nature, intersecting it in different directions. This change of structure is similar to what takes place in the testicle ; it seldom evinces any disposition to ulcerate, and frequently continues a long period without affecting the general health.* The disease is most apt to come on some time after the cessation of the menses ; and, in its progress, the enlarged

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* In the case of a woman, forty-five years old, related by M. Vetter, a French writer, the right ovary was transformed into a tumor weighing fifty-six pounds. Its substance was homogeneous, grayish, and of a cartilaginous consistence, excepting at a few points, where it was softened, and of the character of the cerebral tissue. The disease was brought on by a blow, seventeen years before. (Bulletin des Sciences Medicales, Oct. 1825.)

and indurated viscus sometimes degenerates into a lardaceous, hydatic, cartilaginous, or bony state. Sharp, lancinating pains, referrible to the region of the ovary, with dysmenorrhœa, often attend this affection, and serve to distinguish it from other lesions.

More common perhaps than scirrhus is *encephaloïd*, which usually runs its course with frightful rapidity. It may occur at any period of life, soon after the appearance of the menses, and it seems, in some instances, to be called into activity by the process of impregnation. Generally the brain-like matter, which distinguishes this disease, is found in small, irregular masses, enclosed in a distinct cyst, of a fibrous, cartilaginous, or bony texture. These masses sometimes attain a very great magnitude. In the case of a young woman, narrated by Dr. Carswell, the ovary was as large as the gravid uterus at the full term. They are usually of different shades of color, being of a pale olive, brownish, or mahogany, in some places ; white, cream-like, or grayish in others. Branches of vessels may often be traced, in great numbers, into their structure ; and not unfrequently they contain large cysts, filled with serum, pus, or sanious fluid. In some cases, though this is rare, the ovary is transformed into a large lumpy sac, the interior of which presents an areolar arrangement, and is occupied by a glistening, semi-concrete, jelly-like substance, constituting the *gelatiniform cancer* of Cruveilhier.

Dr. Seymour, of London, has pointed out the connection which so often exists between this disease, scirrhus, and fungus hæmatodes in other parts of the body, especially the pylorus and the lymphatic glands.* Its existence, during life, may be suspected by the deteriorated health of the patient ; the wan and sallow countenance ; the progressive emaciation and debility ; by the unevenness and rapid growth of the tumor ; and by the occasional occurrence of sharp, lancinating pains in the pelvic region.

Fibrous tumors, similar in their texture to those of the uterus, occasionally grow from the substance of the ovary. They are said to be of common occurrence in European women, but are seldom seen in the females of this country. Varying in size between a hazelnut and an orange, they are of grayish color, firm consistence, and attached usually by a long, narrow foot-stalk. Occasionally these tumors

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* Diseases of the Ovaries, p. 61. See his work for plates.

coexist with scirrhus, encephaloïd, or serous cysts; and it is not uncommon to find in them small, irregular cavities, filled with a thick, dirty-looking fluid. Sometimes they are interspersed with cartilaginous, osseous, or earthy concretions.

There are probably no organs in the human body in which *serous cysts* are more frequently developed than in the ovaries. Assuming every variety of shape, they are most generally globular, ovoïdal, or pyriform, varying in size from the smallest nut to the magnitude of a large melon. Sometimes the whole ovary is converted into one enormous sac; at other times the cysts seem to be gregarious, or united into clusters, having no communication with each other. Occasionally the sac is multilocular, or divided into small compartments. The contents of these cysts vary in color and consistence in different cases. In some, the fluid is thin, pale, and ropy; in others, thick, and dark-colored, like coffee-grounds; in others, purulent, sero-purulent, sanious, meliceric, saponaceous, tar-like, greasy, or suety. The quantity of fluid is occasionally truly surprising. In the case of a woman, aged forty, recently reported by Dr. Hintze, of Baltimore, the cyst contained upwards of twenty-three gallons. It communicated with the inferior portion of the colon of the urinary bladder, was nearly spherical in shape, and of a thick, compact, fibrous structure. Thus an ovary which, in the normal state, scarcely weighs two drachms, will expand, under disease, to a magnitude capable of holding an immense amount of fluid. Externally, the sac is commonly smooth and polished; internally, it is rough and irregular, sending off frequently little septiform processes. In some instances it has a dense, cartilaginous feel; and occasionally it has been found partially ossified.* These sacs, it may now be observed, constitute what is termed *encysted*

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* A case of extraordinary enlargement and ossific transformation of the right ovary of a colored woman, sixty years of age, has been recently reported by Dr. Geddings, the able professor of pathological anatomy in the University of the State of South Carolina. The tumor, the weight of which was fifteen pounds, was nine inches in length by seven inches and a half in breadth. On being cut into, about eight ounces of curdy matter escaped. The rest of the mass was so hard and resisting that it could only be divided with a saw. From three to four fifths of its substance was composed of bony matter, part of which existed in the form of homogeneous, solid nodules, part in that of plates and spicules, cemented together by tough, fibrous tissue. The ossific transformation was not confined to the external envelope of the organ, but extended through its entire substance, and had supplanted every vestige of the natural structure. (Southern Medical and Surgical Journal, May, 1838.) Similar examples are related by Henning, (Medical Fragments, p. 345;) by Stork, (Ann. Med. ii. p. 245;) by Schlenker, (De Singularè Ovarii Sinistri Morbo, § 8;) and by Walter, (Observ. Anat. p. 44.)

dropsy of the ovary, and there is reason to believe that they often arise from a diseased state of the Graafian vesicles.

Hydatids are occasionally found in these cysts. My friend, Dr. McDonald, of Alabama, described to me a case not long ago, in which there were upwards of two hundred of these parasitic growths, of all sizes between a small pea and a large fist. Some of them adhered to the inner surface of the sac, by narrow, slender necks ; others were loose, and floated about in the effused fluid, the quantity of which was very great. The hydatids, which are generally, if not invariably, of the acephalocystic kind, sometimes amount to several thousands.

Fig. 95.

Teeth, bones, (Fig. 95,) cartilages, and hairs (Fig. 96) are sometimes discovered in ovarian cysts, wrapped up in a peculiar saponaceous, fatty, or suety matter. One of the most extraordinary examples of this kind perhaps on record is to be found in the " Breslau Collections " for 1722. The woman had been afflicted from her earliest youth, and died when she was thirty-eight years old : on inspection, the right ovary was found converted into a large sac, weighing fifty-four pounds. The tumor was of a soft, meliceric consistence, and scattered through its substance were several fragments of bone, together with a considerable quantity of hair, some of which was rolled up in tufts two feet long. Of the osseous pieces, which were eight in number, the largest was eight inches in length by two inches in thickness ; and several of them evidently ap-

Fig. 96.
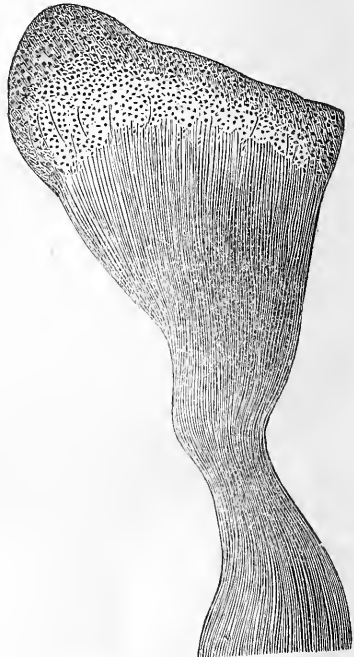
pertained to the jaws, as they were surrounded by incisor, canine, and molar teeth.   Cleghorn discovered in an ovarian tumor irregular pieces of bone, hairs, and twenty-seven teeth ; and similar cases are described by Bicker, Murray, Sœmmering, Baillie, Cruveilhier, and other writers.   The hairs are said by Meckel to be furnished with distinct bulbs ; and, in their color, they present every variety, like those of the head, to which they bear a great resemblance.   These singular productions do not seem to be confined to any particular period of life ; hitherto they have been observed with almost equal frequency in the married and in the virgin female, and, what is remarkable, instances are not wanting in which they have been found in different parts of the male, especially in the stomach and intestines.

Ruysch discovered teeth and hair in the stomach of a man ; Mr. Brodie, a jaw, with full-grown teeth, in the urinary bladder ; Gordon, hair, with a piece of bone, in the thorax.   In a case, the particulars of which are detailed in the third volume of the " Berlin Collections," the tumor, which was of an adipous nature, adhered to the diaphragm, and contained twenty-one fragments of bone, four teeth, and a tuft of hair ; and in another, recently reported to the Royal Academy of Medicine at Paris, by Dr. André, of Peronne, teeth and hair were found in the testicles of a boy, aged seven years.[*]

Concerning the mode of origin of these singular products, various opinions have been expressed by writers.   In the majority of cases, it is highly probable that they are the result of conception, the embryo being developed in the ovary instead of the uterus ; but this explanation cannot apply, certainly, to those instances in which these substances are found in the male sex, and in the young, immature female.

Their presence here can only be accounted for, as has been justly observed by Andral, on the theory of *monstrosity by inclusion*, so well described by Dr. Olivier, of France.

Tumors of the ovary, from whatever cause arising, are liable to be confounded with ascites, from which, however, they are easily distinguished by the following signs : 1. they are generally more tense, circumscribed, and protuberant ; 2. they are situated more to one side of the abdomen, especially in the early stage of their existence ; 3. they always lie in front of the intestines, never posterior to them ; 4. they are

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[*] Memoires de l'Academie Royale de Medicine, t. iii. p. 480.

less influenced by change of posture, and they do not fluctu-
ate so distinctly under the finger. In ascites the fluid gravi-
tates to the lowest part of the abdomen in the erect and to
the posterior part in the recumbent position; 5. ovarian tu-
mors always grow slowly, and are seldom attended with
much constitutional derangement; ascites, on the contrary,
often comes on rapidly, and the general health is invariably
impaired. Additional evidence is to be obtained from insti-
tuting a vaginal examination. In peritonæal effusions, the
neck of the uterus always occupies its accustomed place,
whereas in ovarian enlargements it is usually drawn up, so
as to be beyond the reach, in great measure, of the finger.
The organ is also, in some instances, dragged to one side. It
may be further stated, that, when the cyst is multilocular,
the surface of the tumor is commonly irregular, and yields a
sensation, on being percussed, as if it contained liquids of dif-
ferent degrees of consistence.

One of the ovaries is sometimes wanting, in which case it
almost always happens that the other is considerably enlarged,
full twice the natural size. I have met with several instances
of this kind, and others are referred to by Duges, Meckel,
and Hooper. Occasionally both organs remain in a sort of
rudimentary state, being scarcely as large as a bean, and of a
dense fibro-cartilaginous consistence. In such cases, of which
a number of examples have fallen under my observation,
there is frequently an entire absence of the vesicles of De
Graaf.

Atrophy of the ovary is frequently observed in old females,
after the cessation of the menses. The period for the exer-
cise of the reproductive function being passed, the organ is
no longer needed, and it accordingly, in many cases, greatly
decreases in volume, the interior structure is dry, dense, and
almost crisp, and the serous and fibrous envelopes are remark-
ably rough and puckered. Similar phenomena are sometimes
witnessed in women who are habitually barren.

The ovary is sometimes, though rarely, the seat of *hemor-
rhage*. This may occur in three distinct situations: 1. in
the parenchymatous structure; 2. in the ovules of De Graaf;
3. immediately beneath the fibrous envelope. The blood is
generally collected into irregularly rounded masses, varying
from the size of a currant to that of a garden pea. It is
either of a dark red color or almost black; coagulated, or
partly fluid and partly solid. Ovarian hemorrhage is most

common in young plethoric females, and usually occurs in combination with a highly congested state of the uterus, the Fallopian tubes, and broad ligaments.

As a very curious and interesting question connected with the morbid anatomy of the ovaries, it will be proper here to allude briefly to what is called the *luteal body*, more especially as the subject is one of considerable interest in a medico-legal point of view. In the ovaries of a woman who has recently been pregnant, we may observe, in addition to the ovules of De Graaf, a tender, friable, vascular structure, generally of a circular or oval shape, the dimensions of which vary according to the period which has elapsed between the conception and the examination. The first account of this body was given by Fallopius towards the latter part of the seventeenth century : it was afterwards more particularly described by Haller and his disciples ; and, in our own times, it has been particularly investigated by J. F. Meckel, Blundell, and Sir Everard Home. For the latest and most accurate additions, however, to our stock of knowledge relative to this topic, we are indebted to Professor Montgomery, of Dublin, the results of whose observations are comprised in a short article, replete with valuable information, in the London Cyclopædia of Practical Medicine.*

In reading the various accounts which have been published on this subject, one cannot help being forcibly struck with the contradictory statements presented by different authors. This confusion has been produced, in great measure, if I mistake not, by applying the term "luteal body" at one time to a separate structure, and at another to the cicatrice caused by the rupture of the ovarian membranes. The truth is, these are not, as many have supposed, identical parts, but parts that are perfectly distinct from each other, — a circumstance which must be constantly borne in mind if we wish to avoid error. With this remark, intended to obviate future perplexity, we may proceed one step further, and inquire into the nature of the luteal body, and into the character of the resulting cicatrice.

The color of the luteal body varies according to the period at which it is examined. In the early stage of its existence, it is always more or less red ; by degrees, however, it assumes, as its name indicates, a dull yellow complexion, not unlike

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* See article *Signs of Pregnancy*, vol. iii. p. 496.

that of the buffy coat of the blood ; after parturition, again, and generally several months even before that event, it becomes gradually more and more pale, and at length loses its characteristic tinge altogether. In some instances, indeed, the yellow color, from which this body derives its name, is entirely absent.

The structure of this body is strikingly glandular, resembling a section of the human kidney.* In the early stage of its developement, it is quite vascular, being surrounded by a large plexus of arteries and veins, branches of which penetrate it in every direction, and can be easily filled with injecting matter. Its surfaces are somewhat convex, like those of the crystalline lens, and the superficial one not unfrequently projects beyond the natural level of the ovary, resting upon it like the segment of a smaller globe. As it grows older its vascularity decreases, but its density sensibly augments.

In its form, the luteal body is almost always oval, in nine cases probably out of ten ; but, in some instances, I have found it circular, or rather presenting the appearance of a disk, slightly convex at the sides. Its size, like its color, is liable to considerable variety, according to the period at which it is inspected. In the early months of utero-gestation, the longer axis is stated by Professor Montgomery to be from four to five eighths of an inch, and the shorter from three to four eighths. Its thickness, according to the same authority, is generally less than its breadth. These measurements nearly coincide with those of the celebrated Rœderer, who says the luteal body is four lines long, three lines broad, and two lines thick. Surprised at the statements of these distinguished writers, and confidently believing that they were greatly exaggerated, Professor Parker and myself determined to put this matter to the test of observation. Unfortunately, however, the specimens which we could command were all taken from females who died either during labor or immediately after delivery, and offered us no opportunity for examining these bodies in the earlier stages of their formation. Yet, notwithstanding this, our investigations have fully convinced us that the assertions of Montgomery and Rœderer, as to the dimensions of the corpora lutea, are perfectly correct, and therefore in every respect entitled to our confidence and regard. That this conclusion is well grounded, the following facts will, I conceive, fully warrant.

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* Montgomery, op. cit. p. 497.

The first examination was made upon a female who died within a few hours after the delivery of her third child, at the full term of utero-gestation. On the anterior surface of the right ovary was a distinct luteal body, of an oblong shape, opaque, two lines in length, one line and three quarters in breadth, and scarcely half a line in thickness. It was of a pale yellowish color, opaque, homogeneous in its appearance, and of a fibro-cartilaginous consistence. Another luteal body was observed on the opposite organ, apparently more recent than the first, of a spherical form, two lines and a half in diameter, and encircled by a depressed, puckered cicatrice, four lines in length by three lines in breadth.

In the second case, that of a female who died soon after parturition, the luteal body, situated in the right ovary, was of a circular shape, two lines and a half in diameter, about the twelfth of an inch in thickness, and of a pale yellowish color, similar to the buffy coat of the blood. It was surrounded by a cicatrice nearly five lines across, which was evidently formed at the expense of the serous and fibrous envelopes, and the margins of which had a rough, tattered appearance. In other respects the surface both of this and of the left ovary was perfectly natural.

In the third examination, the luteal body was found to occupy the posterior surface of the left ovary. It was likewise of a circular shape, two lines in diameter, and of a pale grayish color, surrounded by a yellow areola about the fortieth part of an inch in width. To the knife it offered a good deal of resistance, and it was evidently of a fibro-cartilaginous nature. The right ovary exhibited nothing unusual, excepting that both surfaces were rough and puckered, from the presence, apparently, of several ancient cicatrices, the largest of which was nearly half an inch in diameter. In this case, also, death took place within the first twenty-four hours after delivery, at the full term of utero-gestation.

In the fourth case, the woman who was about thirty-five years of age, and the mother of two children, died from an attack of cholera, at the end of the seventh month of her pregnancy. The left ovary was of the usual size, and perfectly natural in regard to its exterior. On cutting into it, a soft, spongy structure was discovered, of an irregularly oval shape, five lines and a half in length by four in breadth, and of a reddish color. No cicatrice could be detected over or around this substance, of the precise nature of which it was

impossible to form any accurate idea. The right ovary con-
tained what was thought to be three distinct luteal bodies.
They were of a pale yellowish color, slightly mammillated
on the surface, or studded with numerous little prominences,
resembling the eggs of certain insects, and of a dense fibro-
cartilaginous consistence. The largest was three lines and a
half in length, one line and a fourth in thickness, and two
lines and three quarters in breadth. The other two were
somewhat smaller, but had the same color and consistence ;
and one of them, the most superficial of all, was surrounded
by a distinct cicatrice, and projected some distance beyond
the natural level of the organ. On looking at these bodies
with a magnifying-glass they exhibited a singularly convo-
luted appearance, like that of the human brain, and which is
so well described by Sir Everard Home, in a paper in the
London Philosophical Transactions.

If we couple the results of the preceding examinations with
the fact that the luteal body gradually diminishes in size as
utero-gestation advances towards completion, and at length
partially or wholly disappears, it will be perceived, as was be-
fore intimated, that they strikingly corroborate the measure-
ments of Montgomery and Rœderer ; in other words, they
clearly show that the structure in question is much larger
than is generally imagined, and very different also from the
cicatrice which accompanies and surrounds it.

The manner in which this body is formed admits of easy
explanation. The larger Graafian vesicles, it will be recol-
lected are always seated superficially, and are frequently from
two to four lines in diameter. Now let us suppose that un-
der the influence of its appropriate stimulus one of these little
sacs bursts, and we can readily imagine what will be the re-
sult. In the first place, there will undoubtedly be an escape
of its contents, whereby a cavity will be formed for the re-
ception of the yellow body. Not only, it will be perceived,
are the coats of the vesicle itself ruptured, but there is also a
laceration, or, perhaps, more properly speaking, an absorption
of the corresponding portion of the serous and fibrous en-
velopes of the ovary, caused by the pressure of the subjacent
ovule, distended as it must be to the very utmost under the grasp
of the fimbriated extremity of the Fallopian tube. The ovule
having passed from its original bed, the cavity which is thus
left is gradually if not immediately closed up with plastic
lymph, poured out by the irritated and inflamed membranes

of the ruptured vesicle, the inner of which, as was shown in a previous section, is of a serous nature, and therefore well qualified to yield the substance alluded to. Generally the lymph is not perfectly pure, but blended with it there is more or less blood ; and hence the reason why a recent luteal body is always of a redder color than one that is older. In a short time this new matter acquires solidity, its opacity diminishes, vessels shoot into it from the surrounding parts, and in this manner it becomes an organized structure, capable of withstanding, for a limited period, the action of the absorbent vessels of the ovary, but finally yielding to their influence. Such, in a few words, I conceive, is the mode of formation of the luteal body.

In regard to the accompanying cicatrice, which, as I have already endeavored to show, differs essentially from the yellow body itself, it is altogether dependent for its formation upon the general envelopes of the ovary. The serous and fibrous tunics of this organ being ruptured, the ulcerative absorption induced by the subjacent vesicle, a sort of ring is left, of an oval or circular shape, with ragged tattered edges of a grayish or whitish appearance, which surround the luteal body, and frequently project considerably beyond the level of its surface. By and by the ring contracts adhesions with the newly-deposited substance, the intervening opening diminishes in size, and the tattered edges finally approximate, leaving merely a radiated, linear, or stellated cicatrice, or rebuilding, if I may use the expression, the part so effectually as to render it impossible to determine where the rupture occurred.

Having thus pointed out, with as much fidelity as my reading and observation enable me, the difference between the luteal body and its accompanying cicatrice, let us proceed, finally, to inquire at what period, if at all, these structures disappear, and how far they may be regarded as affording evidence of previous conception. It has been thought by many that the luteal body is a permanent ineffaceable texture, and therefore always indicative of the number of pregnancies ; but this is unquestionably a mistake, both as respects the premises and the conclusion thence deduced. At what period after delivery its disparition is affected, is a circumstance which is not satisfactorily settled. Professor Montgomery, in the able paper already adverted to, distinctly states that he

has never been able to detect the existence of the luteal body
beyond the fifth month.   In the case of a young woman who
died at this period after giving birth to her first child, the
structure in question was scarcely any larger than a mustard-
seed, but the external cicatrice was still perfectly obvious,
and served to point out the escape of the ovule.   Judging
from my own observations, I should be inclined to look upon
the final disparition of this body as liable to much diversity,
depending upon the state of the ovary, the age of the female,
and a variety of other circumstances which must readily sug-
gest themselves to the mind of the reader.   In a case already
referred to, the fourth that was examined by Professor Parker
and myself, three distinct corpora lutea were observed, cor-
responding exactly with the number of offspring.   Only one
of these had a characteristic cicatrice ; it was of yellow buff
color, remarkably prominent, several lines in diameter, and
comparatively soft and friable.   The most ancient was quite
small, and would no doubt have shortly disappeared had the
woman lived.   This examination cannot be regarded, it is
true, as conclusive ; but, as far as it goes, it certainly cor-
roborates the view we have taken, that the luteal body occa-
sionally continues much longer than is imagined by Dr.
Montgomery, the cicatrice in the mean time becoming entirely
effaced.

The next topic to which I proposed to advert was, how far
the luteal body can be regarded as proof of previous impregna-
tion ? Concerning this question different opinions have been
expressed by different writers ; some contending that this sub-
stance is always a certain indication of this condition ; others,
that it affords, at best, very equivocal evidence.   Those who
espouse the latter side of the question allege that it can be of
no value in this respect, inasmuch as it is frequently produced,
both in the human subject and in animals, in consequence
merely of strong sexual excitement, without any incercourse
whatsoever.   Upon this subject, the researches of Montgom-
ery are, I conceive, perfectly conclusive.   " In addition to
the authorities here cited, we may be allowed," says this
distinguished writer, " to add the result of our own observa-
tions, which have been now continued through a period of
more than six years, during which time we never omitted a
single opportunity within our reach, for examining the bodies
of women of all ages, and under all the varying circumstances

of virginity, after intercourse, during gestation, and subsequent to delivery, at different periods from conception, — these opportunities having been afforded by more than one large hospital, as well as in private practice.　We have also dissected hundreds of the inferior animals with reference to this point, and have in our museum preparations of ovaries exhibiting the corpus luteum in different conditions in the human female, and also in cows, mares, sheep, sows, goats, bitches, cats, hares, and rabbits; and our firm conviction is of the truth of both of Haller's propositions, namely, that conception never happens without the production of a corpus luteum," and "that the corpus luteum is never found in virgin animals, but is the effect of impregnation."　In regard to the virgin corpus luteum, or that which results simply from lascivious excitement, it can be readily distinguished, according to Montgomery, from the genuine luteal body, by the following particulars: 1. There is no prominence of the ovary over it. 2. The external cicatrice is wanting. 3. There are often several of them in both organs, especially in females who die of tubercular phthisis.　4. It is not vascular, and cannot be injected.　5. Its texture, instead of being tender, friable, and regularly glandular, is inferior, consists merely of the remains of a coagulum, or of a fibro-cellular substance. 6. It has neither the central cavity, nor the radiated cicatrice which results from its closure.*

Finally, it should be observed that the accompanying cicatrice, like the yellow body itself, is gradually effaced, generally within the first year after delivery, sometimes, indeed, several months sooner, but at other times, not until considerably later.　Taken by itself, it affords no evidence of previous conception, inasmuch as it is impossible to distinguish it from a cicatrice produced by the discharge of an abscess, a tubercular excavation, or a sanguineous effusion.　The opinion, therefore, that the scars remain for life, and exactly indicate the number of births, is absurd and erroneous.

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* London Cyclopædia of Practical Medicine, vol. iii. p. 502.

SECTION III.

Of the Fallopian Tubes.

The Fallopian tubes are two slender, tortuous canals, about four inches and a half in length, which extend between the ovaries and the superior angles of the uterus, with both of which they are connected. Their caliber is extremely narrow in the inner half of their extent, being scarcely large enough to admit a common-sized bristle ; but, as they proceed to their destination, they gradually augment in diameter, and finally terminate in a wide, trumpet-shaped mouth. They serve as excretory ducts to the ovaries, and consist each of three tunics, — an external one, which is serous, an internal, which is mucous, and an intermediate, which seems to be similar in its structure to the spongy body of the urethra, and, like it, capable of temporary erection. The vessels of the Fallopian tubes are branches of the spermatic arteries, — the nerves of the hypogastric plexus.

Thus organized, the Fallopian tubes are liable, to attacks of acute and chronic *inflammation*, both in the virgin and in the gravid state. These diseases may be propagated to them from the uterus, or they may have an independent origin : they may be limited to one tube, or even to a part of that tube, or they may involve both ducts simultaneously. Inflammation is most apt to be present in dysmenorrhœa and puerperal peritonitis, when the tubes are extremely vascular, and of a deep red color ; and, in severe cases, they are closed up either partially or entirely with coagulating lymph, or distended with purulent matter. In a case mentioned by Professor Harrison, of the Cincinnati College, the left tube contained at least an ounce of thick, laudable pus, the right about three drachms : the mouth of the uterus was red and tumid, and the whole of its inner surface bathed with purulent matter. Occasionally, when the accumulation is very great, the tube bursts, and the matter escapes into the pelvic cavity ; at other times, it discharges its contents through the rectum, the small intestines, the urinary bladder, or the uterus.

In some instances, these tubes terminate in a cul-de-sac ; and cases are occasionally witnessed in which their fringes are destroyed by ulceration, or by adhesion to the ovaries or

adjacent organs. Their canals are also sometimes obstructed by inspissated mucus, lymph, and scrofulous matter. In a young girl of ill fame, examined by Professor Harrison, the Fallopian tubes, very greatly dilated, contained a thick, cheese-like deposit ; and to the outer surface of each were appended two small tumors, filled with a similar substance. All these lesions are so many causes of sterility.

Fibrous tumors sometimes grow from the Fallopian tubes ; sometimes in their interior. They are usually of a rounded shape, very hard, and exhibit the same appearances, when cut into, as fibrous tumors of the womb. Malignant disease occasionally invades these passages, commencing in them either as an original affection, or extending to them from the uterus or the ovaries. The true hydatid, I believe, has never been found here ; but very often small cysts, filled with a thin, limpid fluid, are seen hanging from the fimbriated extremities of these tubes, and this sometimes in women who have never borne children. Their size varies from that of a currant to that of a walnut, an orange, or even a small gourd.

Accumulations of *watery fluids* are sometimes seen in the Fallopian tubes. (Fig. 97.) The most usual quantity is from one to two ounces ; but occasionally it amounts to many pints. In such cases, the duct commonly assumes a pyriform shape, and greatly augments in thickness, — a condition which is absolutely necessary to prevent its rupture. De Haen relates an instance in which the tube weighed seven pounds, and the cavity contained nearly four gallons of fluid ; and a still more extraordinary one has been detailed by Madame Boivin.

When the ovum is retained in the Fallopian tube, as has been known to happen in some rare cases, it generally grows until the third, fourth, or fifth month of gestation, and then makes its escape. In some instances, the escape is preceded by ulceration ; but more commonly there is a rupture of the tube, its attenuated walls being incapable of further distention. Fatal hemorrhage almost always follows this accident. A very instructive case of this species of pregnancy is mentioned by the late Dr. Clarke, in the second volume of the London Medical and Chirurgical Transactions ; a second is detailed in a late number of the American Journal of the Medical Sciences ; and a third was recently communicated to me by my friend, Dr. Kennedy, of Easton, Pennsylvania.

In this case, the tube was ruptured in consequence of a blow
on the abdomen, and the woman gradually sunk under the
hemorrhage, having been pregnant about seven months.

Fig. 97.
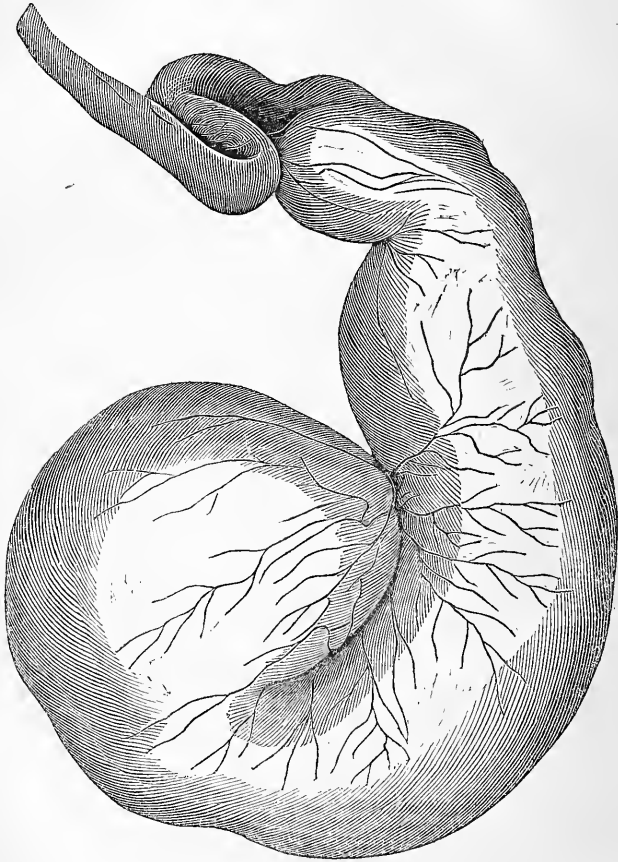
Of the symptoms of these various affections, it will not be
necessary to speak; I need only remark, concerning them,
that they are generally very obscure, and that they do not
afford any indications by which the lesions of the Fallopian
tubes can be distinguished from those of the rest of the
uterine system.

SECTION IV.

Of the Vagina and Vulva.

THE vagina is liable to ordinary and specific *inflammation.* The disease is marked by the usual anatomical characters, and is often attended with profuse discharges of purulent matter, of a very acrid nature, and mixed at times with blood.   In bad cases, abscesses are formed in the submucous cellular texture ; and instances have been witnessed where the parts were rapidly destroyed by gangrene.   A coating of adventitious membrane is sometimes observed, especially when the inflammation is connected with disease of the mouth and neck of the uterus.   Ulcers of the vagina are generally referable to the syphilitic, cancerous, or scrofulous poison, and do not differ from the same class of sores in other regions of the body.

Polypes are occasionally developed in the walls of the vagina ; but this is very rare, and hitherto I have not seen one instance.   Tumors of this description may attain a very considerable magnitude, so as not only to distend the whole tube, but project eight or ten inches down the thighs.   Baudier has published an account of a polypous growth of the vagina, the weight of which was ten pounds and a half ; and similar cases are narrated by Dupuytren and other authors.

A singular tumor is sometimes observed in this tube, which seems to consist in a morbid enlargement of the mucous follicles that are so abundantly found in this division of the mucous system.   I once saw a swelling of this kind immediately beneath the orifice of the urethra of a young lady, the mother of four children.   It was of a spherical shape, about the size of a walnut, and of a white, glossy appearance, with a rough, corrugated surface.   She told me that it was at times painful, and that she had first perceived it eight years ago, soon after her marriage.   I opened the tumor with a lancet, and let out a considerable quantity of a viscid, glairy fluid, like the white of eggs.   The fluid never reaccumulated.

Obstruction of the vagina is liable to occur from inflammation, and the consequent effusion of fibrin into the submucous cellular tissue.   In this way, not only the orifice, but the

greater part of the tube, may be much diminished in size, either uniformly, or, as more frequently happens, at particular points. The stricture, though generally partial, occasionally completely encircles the vagina, presenting the appearance as if it had been bound by a ligature. The affected part feels firm, thick, and rigid, not unlike the mouth of the uterus, for which it has sometimes been mistaken during labor. The obstruction may be seated at any part of the length of the tube, but in most cases it is found within the first two inches of the lower outlet. The outlet of the vagina, again, may be closed up by an imperforate hymen, or by a dense, pale, gristly substance.

The vagina is sometimes very *short*. Baillie states that he has seen it not more than half its natural length; and still more remarkable examples are mentioned by Dr. Dewees. In one of these the whole distance to which the finger could be passed did not exceed an inch and a half; and in the other, which seemed to be connected with an absence of the uterus, the tube terminated in a cul-de-sac. At other times the vagina is entirely wanting, greatly contracted, or converted into a solid, gristly mass; and cases have occasionally been noticed where, through accident or congenital deficiency, it communicated with the bladder and the rectum, at various distances from the anus. In a female mentioned by Sue, the rectum opened into the vagina, and the vagina into the bladder.

The vagina may be *double*. Of this I have never seen an instance, but cases of it are recorded by Haller, Eisenmann, Bartholin, Callisen, Meckel, and other writers. The septum sometimes extends the whole length of the tube, dividing it into two cylindrical canals, each of which may terminate inferiorly by a separate aperture. Callisen refers to two cases where the canals thus formed were closed each by a perfect hymen. In some instances, which, however, must be extremely rare, the frœnum is situated transversely, constituting a sort of diaphragm, which prevents the flow of the menstrual fluid.

We have already intimated that the great lips are subject to *bloody infiltration*. This lesion, which results from a rupture of some of the neighboring vessels, during or immediately after delivery, usually involves only one of these organs, seldom both at the same time. The tumor which is thus formed is generally of an irregularly oblong shape, with a dark livid surface, more or less compressible, and about the

size of a hen's egg.   Occasionally, however, it is much larger, equaling or surpassing the volume of a fœtal head, and containing from ten to twenty ounces of blood.   The effusion commonly takes place suddenly, or in a very short time, and, when copious, it almost always makes its escape spontaneously, by lacerating the superincumbent textures, or it remains, and speedily induces gangrene in them.   In the latter case, the blood is generally of a very black color, partly fluid and partly coagulated, and emits a highly offensive odor. The infiltrated tissues are sometimes frightfully lacerated, and converted into a dark, shreddy substance, without any trace whatever of their original characters.

The external lip may be the seat of different kinds of *ulcers ;* and they are likewise liable to gangrene, malignant disease, and bloody infiltration.   An eminent English physician, Mr. Kinderwood, many years ago described a fatal disease of the vulva of young children, which, commencing at one or more points of the mucous surface, rapidly spreads over the nymphæ, clitoris, and hymen.   Gangrenous spots appear in a very short time, and continue to enlarge until the parts are converted into dark-colored, fetid sloughs.   Great prostration of strength, accompanied by fever and severe pain, is the most prominent symptom of the complaint.

Dr. Parker and I recently removed a tumor of this sort from the entrance of the urethra of a young lady of eighteen. It was of a conical shape, nearly an inch and a half in length by three quarters of an inch in diameter, very sensitive, of a bright florid color, elastic, and compressible.   On maceration for a few days in water, it became perfectly white, and seemed to be composed essentially of blood-vessels, supported by soft cellulo-fibrous substance.

Warty excrescences are often seen within the vulva.   In some instances they extend into the vagina, and down the perinæum as far as the margin of the anus.   Their number may be very great.   In one case, that of a young girl of eighteen, I counted as many as sixty-five, of all sizes, from that of a mustard-seed to that of a raspberry.   Usually they are of a pale florid color, of a fibro-cartilaginous consistence, rough on the surface, pediculated, and somewhat painful on pressure.   Their origin in most cases is referable to gonorrhœa and syphilis.

The clitoris and nymphæ are sometimes hypertrophied to such a degree as to require excision.   In some countries these structures are naturally much larger than in America and

Europe.   In Persia and Turkey their developement is often
very great.

   The female urethra is rarely diseased.   The principal
lesions to which it is liable are, stricture, dilatation, and vas-
cular excrescences.   The *stricture* is usually situated at the
extremity of the tube, and may be so great as to produce
much difficulty in making water.   Sir Benjamin Brodie has
described a case where the urethra was so much contracted
that it scarcely admitted the finest probe : the stricture com-
menced at the extremity of the canal, and extended about
half an inch back.   In some congenital malformations, the
orifice of the urethra opens into the vagina at some distance
from the external aperture.   Occasionally, where the mouth
of the vagina was closed up by a dense membrane, the ure-
thra has been known to be dilated to such an extent as to
admit the male organ.

   Vascular excrescences sometimes spring from the female
urethra, or are seated around its orifice.   They are of a
bright scarlet color, exquisitely sensitive under pressure, and
of a soft, spongy, erectile structure, with a smooth, fissured,
or granulated surface.   The shape is generally pear-like, and
the size varies from a small pea to that of a horse-bean.
This disease has been observed in young girls under seven-
teen, but is most common in adults.   The causes which lead
to its production are unknown.

   In the female, the parts most commonly attacked with
chancre are, the edges of the pudendal lips, the nymphæ,
and the orifice of the vagina.   In some instances the disease
affects the perinæum, the interior of the vagina, and even
the mouth of the uterus.   The ulcers exhibit the same char-
acters as when seated on the penis ; generally, however, their
number is greater, and they are apt to produce more extensive
devastation.

SECTION V.

Of the Mammary Gland.

   THE mammary gland is situated in front of the great pec-
toral muscle, nearly equi-distant between the breast-bone and
the arm-pit, in the midst of a considerable quantity of adipous
substance.   In its size it varies very much in different indi-

viduals, as well as in the different periods of life. Until the age of puberty it is always remarkably small, and exists only, so to speak, in a rudimentary state ; but, from this time on, it rapidly augments in volume, and attains its maximum developement during pregnancy and lactation. When the period of child-bearing is past, the gland gradually diminishes in size, and is ultimately transformed into a soft, drab-colored substance, in which it is impossible frequently to distinguish any of the primitive tissues.

Divested of the fatty matter by which it is surrounded, the adult mammary gland is found to be of a circular shape, convex in front, but flattened posteriorly, from three to five inches in diameter, and from ten to fifteen lines in thickness. It is of a light pink color, and of a remarkably tough consistence, being cut with more difficulty than fibro-cartilage. Like the pancreas, which in many of its features it closely resembles, it is composed of an assemblage of lobes of different sizes, which are connected together by dense cellular substance, and which impart to the surface of the organ its rough and knotty aspect. These lobes are more abundant, as well as more intimately cemented together, at the centre than at the periphery of the gland, and they are always rendered very conspicuous when affected with inflammation. By dissection, each can be shown to consist of a series of smaller masses, which are themselves resolvable into granules not bigger than a poppy-seed. These little bodies, the number of which is very great, are very distinct during lactation, and are made up of oblong vesicles, which can only be seen by the aid of the microscope.

From the minute granules that compose the mammary gland, fine excretory tubes arise, which unite together and form the lactiferous ducts. Of these there are commonly from fifteen to twenty : they are tortuous, extensible, semitransparent, and composed each of two distinct tunics, the external of which is fibrous like that of the ureter ; the internal, mucous : they proceed in a radiated manner from the circumference towards the centre of the organ, and, as they approach the base of the nipple, they all become sensibly expanded, forming so many little sinuses, of a conical shape, the largest of which are more than the sixth of an inch in diameter. All these ducts are destitute of valves, which accounts for the facility with which they can be injected in the backward direction. It was formerly thought, by many

respectable anatomists, that these canals freely communicated with each other; but more recent investigation has disproved the opinion, it being clearly ascertained that each tube is connected with its proper branches only.

The part in which the lactiferous ducts terminate is called the *nipple*. This projects from the central portion of the anterior surface of the gland, in the form of a conical eminence, the volume of which is liable to great variation, being scarcely alike in any two subjects. Of a light rosy tint, it is firm, elastic, and susceptible of temporary erection, like the penis and the clitoris; externally it is rough, somewhat reticulated, and furnished with numerous papillæ; and, on making a section of it, it is found to be composed mainly of the extremities of the lactiferous ducts supported by bloodvessels and cellular substance. The skin, for a short distance around the base of the nipple, is extremely soft and delicate, of a rosy color in virgins, but of a dark brown in those who have borne children, and provided with several zones of sebaceous follicles.

The mammary gland receives a large supply of vessels, which are always very capacious during lactation. Its nerves are branches of the intercostals and of the brachial plexus. The lymphatics, which are numerous and arranged into two sets, are superficial and deep, terminate in the axillary ganglions, — a circumstance which explains the great facility with which these bodies become enlarged whenever there is any serious lesion in the mammary gland.

This body exists in the male, but only in a rudimentary state. Nevertheless, there have been instances in which it was quite large, and even secreted considerable quantities of milk. It has also been known in a few rare cases to be affected with carcinoma in the same sex.

Sometimes a supernumerary mamma is observed. Dr. Roberts, of Marseilles, recently reported a case where, in addition to the ordinary glands, a third one occupied the left groin, and served to suckle several children. Supernumerary nipples, capable of furnishing milk, are by no means uncommon, and must have been noticed by almost every practitioner.

The lesions of the breast may be arranged under the following heads: inflammation, scirrhus, encephaloïd, encysted tumors, tubercular deposition, hypertrophy, atrophy, earthy concretions, neuralgia, and apoplexy.

Acute inflammation of the mamma most commonly occurs
during lactation, being rarely observed at any other period.
It usually sets in within the first week or two after parturi-
tion, from the effects of cold, or from an obstruction in some
of the lactiferous tubes. The gland is tumid, hard, and en-
gorged with blood, all its vessels being deeply injected. At
first there is merely tenderness on pressure ; but, in the pro-
gress of the disease, the patient complains of severe pain,
generally of a sharp, pricking kind, which shoots along the
corresponding axilla, and sometimes even along the whole
of the upper extremity.

After this state of things has continued for a week or ten
days, the disease either stops, passes into the chronic form, or
leads to *suppuration.* When the latter event is about to hap-
pen, all the symptoms become suddenly aggravated ; there.
are deep-seated, throbbing pains, with excessive tenderness
on pressure ; the skin becomes red and injected ; and the pa-
tient suffers under great constitutional irritation, accompanied
by alternate chills and flashes of heat. The matter usually
collects in one or more abscesses, and is of a thick, cream-
like aspect, with a slight mixture occasionally of milk, serum,
or blood. The quantity of pus seldom exceeds five or six
ounces ; in some cases, however, I have known it to amount
to several quarts. The time required for the matter to work
its way to the surface, varies from ten to twenty days, accord-
ing to the depth at which it is situated, and the irritability of
the constitution. When several abscesses exist, they some-
times communicate together by fistulous tracts.

Chronic inflammation of the breast, although it may occur
at any period of life, is most common between the ages of
seventeen and thirty. Invading usually only one or two lob-
ules, it sometimes attacks the whole gland, the substance of
which has a peculiar doughy feel, like that of a fatty swell-
ing, and appears to consist of a number of nodules, from the
size of a currant to that of a filbert ; its color is generally a
pale yellow, sometimes pink ; and its consistence firm and
dense, almost fibro-cartilaginous. This disease often contin-
ues for years ; but, what is remarkable, it rarely manifests a
malignant tendency, or disposition to suppurate. On pressure,
the part is hard and painful, and there is commonly a gnaw-
ing uneasiness in it, which is almost always aggravated about
the catamenial period. The breast sometimes becomes great-
ly enlarged in this disease, and causes so much inconvenience

as to require removal. Hey mentions a case of this kind, where the organ weighed upwards of eleven pounds, and yet exhibited no structual lesion. I once saw the gland amputated, under the supposition that it was carcinomatous.

Scirrhus of the breast rarely appears under the age of thirty-five. It is most frequent about the period of the decline of the menses, and is witnessed quite as often in old maids as in women who have borne children. When inspected after death, the mamma is found to be inelastic, firm, dense, and crisp, like cartilage, which it also resembles in color: sometimes it is of a dry, fibrous texture, like the interior of an unripe pear, and of a light grayish tint, interspersed with yellowish lines, probably the remains of lactiferous ducts: more rarely the organ is soft and succulent, presenting a considerable number of small vessels, and yielding, upon pressure, a thin, opaque, serous fluid, occasionally blended with milk. These appearances frequently occur together, forming so many zones, gradually and insensibly running into each other. In some instances, again, the tumor contains one or more cavities, filled with purulent matter, or with a viscid, ropy fluid, not unlike the synovia of the joints.

The malady usually commences in a few lobules; but, as it progresses, the whole organ becomes converted into a firm, solid mass, with a rough, tuberculated surface. In a scirrhus breast in the museum of the Cincinnati College, removed by Professor Parker, from a widow, thirty years old, there are four or five tumors, the largest of which, hard and crisp, like cartilage, and of an oblong, spherical shape, scarcely equals the size of a pullet's egg. Before the gland was extirpated, it had an irregular, knobby feel, and could be freely moved in different directions. When the whole of the breast is not involved, the excepted part is generally somewhat changed in its color and consistence, being yellowish, firm, and coarsely granulated, so as to resemble the substance of the pancreas.

Beginning usually with slight swelling, the disease is soon followed by sharp, darting pains, accompanied by a peculiar tension and fulness of the mamma. After some time, a circumscribed lump is perceived, hard and irregular to the touch, and somewhat tender on pressure. The induration gradually augments; and, as the turgescence spreads, the whole gland becomes firm, and knobby: in this stage, the organ is still movable, but by degrees it contracts adhesions to the pectoral muscle, so that it can no longer be pushed

about with the hand.   In the mean time the nipple is painful and retracted; the skin is puckered and discolored; the superficial veins enlarge, and assume a deep bluish tinge, from the obstacle to the return of the blood; the patient loses her flesh; the appetite diminishes; and the strength rapidly declines.   Ulceration now sets in, leaving one or more circular sores, with hard, depressed, angry-looking edges, and a foul, sloughy base.   The discharge is thin, ichorous, offensive, and often so acrid as to corrode the healthy skin.   With this state of the disease, the constitution always deeply sympathizes; the woman is harassed with sharp, lancinating pains, darting into the axilla of the affected side, and down the arm; and the irritation now rapidly extends to the neighboring lymphatic ganglions, which either become white, firm, and tumid, or they are rendered preternaturally soft and vascular, having often a bloodshot appearance.

Scirrhus of the breast frequently remains indolent for a considerable length of time, when it rapidly assumes the characters that have just been described.   When removed, after an interval of several years, the disease is almost always sure to return, either in the cicatrix or in the contiguous lymphatic ganglions.

Encephaloïd, when occurring in the breast, exhibits the same anatomical characters as in other structures of the body. Although it occasionally exists as a primary lesion, it most commonly supervenes upon scirrhus, — the tumor in this case being partly fibro-cartilaginous and partly brain-like in its texture.   The swelling has a pulpy, doughy feel, is very apt to ulcerate, and usually coexists with encephaloïd in some one or other of the internal organs.

Cruveilhier has noticed a peculiar species of mammary cancer, to which he has applied the term *gelatiniform*.   Externally, it is of a light grayish color, dense, firm, and glistening; internally, it is more soft and succulent, yields some moisture on pressure, and· tears into hard, jelly-like strings.   Of this disease I have never seen an instance, and am inclined to regard it merely as a variety of encephaloïd.

Hydatids are sometimes found in the breast, constituting what surgeons call encysted tumors.   Varying in size between a currant and an orange, they generally invade the entire gland, the proper substance of which they often completely destroy.   As in other parts of the body, they occasionally occur in clusters, but more generally they are perfectly

distinct from each other, and of a globular figure. When these bags are of considerable size, it is not uncommon to find within them smaller hydatids, hanging by narrow foot-stalks, and having precisely the same configuration and structure. The contained fluid is either thin and limpid, like spring-water, or thick and glairy, like the white of egg. Sometimes there is an admixture of blood, pus, curdy matter, or particles of inspissated lymph. Hydatids usually occur in connection with carcinoma, and they occasionally attain the volume of a fœtal head, though generally, as before stated, they are much smaller. When they are large and numerous, the breast will sometimes weigh eight or ten pounds. Tumors of this kind have not always a malignant tendency ; oftentimes they cause little or no suffering, and if, after their contents are discharged, their sides be brought into contact, they will frequently unite by adhesive inflammation.

Tubercles are of rare occurrence in the breast. When existing in this organ, it is presumable that they would present the same appearances as in other parts of the body. They are seldom numerous, and they are most commonly found in connection with tubercles of the lungs, and the lymphatic ganglions.

Hypertrophy of the mamma is by no means uncommon, nor is it, as might be supposed, confined entirely to the female sex. In several instances I have seen both breasts of the male enlarged many times beyond their usual bulk ; and not a few cases are recorded where they have freely, and for a long time, secreted milk. In women, the swelling is commonly associated with amenorrhœa, but sometimes it occurs during pregnancy, and disappears soon after delivery. One of the most extraordinary examples of hypertrophy of the mamma, perhaps, to be found on record, has been recently reported by Dr. S. C. Houston, in the fourteenth volume of the American Journal of the Medical Sciences. The subject was a colored girl, aged sixteen, who died in the Philadelphia Almshouse, in April, 1834. The left breast, which began to enlarge much earlier than the right, weighed twenty pounds, and measured forty-two inches around the base, forming an oviform mass, which extended from the lower part of the neck to some distance beneath the umbilicus. The other breast, which was of the same shape as the left, was also enormously enlarged ; yet, notwithstanding this, it was perfectly sound, presenting not the slightest structural

lesion. Around both glands, the cellulo-adipous tissue was in a state of hypertrophy, and in neither could there be detected any trace of the nipple. The girl had menstruated, and enjoyed good health, until a few weeks before her death, which was occasioned by a contusion of the left mamma, terminating in gangrene. A laced jacket was worn, to sustain the weight of the enlarged organ.

Hey, in his Practical Observations on Surgery, alludes to several cases of a similar nature, in all of which the hypertrophy was connected with suppression of the menses ; in one of these, the breast weighed fifteen pounds, and so greatly incommoded by its bulk that it was obliged to be amputated. Dorsten, a German physician, attended a young lady in whom the enlargement was associated with retention of the milk. Both breasts were pendulous and painful, and the left was found to weigh sixty-four pounds. No decided structural change could be detected in the gland, except the mere hypertrophy of the integrant cellular texture.

Atrophy of the mamma is the natural effect of old age. When the menstrual function ceases, the gland begins to diminish in volume, and the wasting gradually progresses until at length the whole organ is reduced to a soft, flabby mass, of a dirty grayish tint, in which it is often difficult to detect any of the natural structure, except the lactiferous ducts, which are seldom completely effaced. Sometimes the gland shrinks early in life, particularly in married females who do not nurse their offspring. Temporary atrophy of this viscus results occasionally from the effects of neuralgia, either of the nerves of the face, the trunk, or of the extremities ; and, from the observations of Professor D'Outrepont, of Würtzburgh, the same change, it would appear, is often induced by the extract of hemlock, exhibited during lactation.

Calcareous concretions are occasionally met with in the breast, either in its substance or the lactiferous ducts : they are commonly small, not exceeding an ordinary pea, and hitherto they have been observed chiefly in connection with encephaloïd and scirrhus. Sir Astley Cooper supposes that these concretions are the result of a process similar to what takes place in the formation of natural bone ; that this is occasionally the case, seems to me not improbable, but I am far from believing that it is of uniform occurrence. I have seen these bodies only in two instances, in females far advanced in life. They were of a whitish color, irregularly spherical in shape, and of a hard, solid consistence, like dry mortar.

A still nearer affection than this is *melanosis*, which may occur either as an infiltration amongst the granules of the gland, or, as is more frequently the case, in the form of small spherical nodules, of a black, sooty color. Of this disease, I saw an interesting specimen, some years ago, in an old female who died of pulmonary phthisis, accompanied by scirrhus of the left mamma. The little tumors, which were five in number, were distinctly encysted, and contained a thin, ropy fluid, of the color and consistence of China ink.

Neuralgia of the breast may occur at any period after puberty, but is most common in young females from the age of fifteen to thirty. It is characterized by exquisite pain, darting through the part like electricity, and extending generally to the corresponding shoulder and axilla, sometimes down the elbow to the fingers. The suffering resembles that of tic-douloureux, observes often a regular periodicity, is very much increased prior to menstruation, and is sometimes so severe that the patient is unable to lie upon the affected side, or bear the weight of the bed-clothes. The disease, although it may last for years, has no malignant tendency : it is met with mostly in persons of a nervous, irritable temperament, and is frequently produced by external injury, such as a blow or contusion. The menstrual secretion is generally very deficient, and there is almost constantly leucorrhœa.*

The complaint, although it sometimes affects the whole gland, is most commonly confined to several of its lobules, which either retain their natural bulk and appearance, or they are converted into small, solid tumors, distinctly circumscribed, movable, and highly sensitive to the touch, the pain that is induced by handling them continuing in some cases for several hours. Occasionally these swellings seem to be seated in the connecting cellular tissue, rather than in the glandular structure ; and they seldom exceed the size of a marble, an almond, or a walnut ; they never suppurate, and sometimes spontaneously disappear. The nature of this disease is still involved in considerable obscurity, — a circumstance which is not at all surprising, when we reflect how little we know concerning neuralgia in general.

Closely allied to the lesion just described, is a morbid change which occasionally occurs in the breast of young

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* Sir A, Cooper, on Diseases of the Breast, p. 76. London, 1829.

girls soon after the period of puberty. It may be considered as a species of *apoplexy*, as it consists in an effusion of blood into the cellular tissue of the organ, resembling an ecchymosis produced by a blow or leech-bite. Generally there is only one such spot, but now and then there is as many as five or six: they come on a few days before the menstrual period, and disappear within the first week or two after; though, in some instances, they have been known to continue for more than a mouth. This disease, first pointed out, I believe, by Sir Astley Cooper, seems to depend upon some sympathetic action between the uterus and the breast, causing a great determination of blood to the latter, eventuating in the rupture of some of the smaller vessels. The affected parts, which are always of a dark, livid hue, are exquisitely tender on pressure, the pain sometimes shooting down to the ends of the fingers.

Erectile tumors are sometimes found about the mamma, and attaining occasionally a very large size. They are soft, exceedingly vascular, of a dark florid color, and liable to bleed on the slightest touch. Composed essentially of an interlacement of arterial and venous branches, they are most common in adult females, though in a few instances they have been noticed in the male.

The *lactiferous ducts*, like other excretory canals, are liable to be permanently closed by causes which interrupt the passage of the milk, such as external tumors, or accidental products contained in their interior. Of these the most common by far is the effusion of plastic lymph produced by inflammatory irritation. The extent to which the tube is obliterated varies in different cases, from a few lines to an inch or more. The lesion generally arises within the first month after delivery; and, as the breast is then engaged in secreting milk, the portion of the tube behind the constricted or obliterated part is apt to become dilated, forming a globular, ovoïdal, or pear-shaped tumor, the volume of which occasionally exceeds that of an orange. A swelling of this kind is almost always attended with a peculiar sense of distention, and distinctly fluctuates under the finger. On cutting into it, the contents are found to be of a whitish color, and of a thick, cream-like consistence, or of the nature of curdy whey, — the quantity ranging from a few drachms to several ounces.

SECTION VI.

Diseases of the Placenta.

THE placenta is a soft, spongy, vascular organ, serving as
a bond of connection between the mother and the fœtus.
When fully developed, its weight is about twelve ounces. It
is nearly circular in its form, from six to eight inches in diam-
eter, and about eighteen lines thick at the centre, from which
it gradually decreases towards the circumference. When
divided, it is found to be essentially composed of the ramifi-
cations of the umbilical vessels, which are distributed in all
directions, connected together by cellular substance, and in-
tersected by fibrous filaments, giving the whole the aspect of
a parenchymatous structure. Of the two surfaces of the
placenta, the fœtal is perfectly smooth and polished, being
invested by a reflection of the chorion and amnios; the ute-
rine presents a considerable number of lobules, technically
named cotyledons, and is covered by a soft, cellulo-fibrous
lamella, known under the name of the deciduous membrane.
In their shape, the lobules are irregularly rounded, and they
each receive an arterial and venous branch, which ramify
through its substance, but do not anastomose with the vessels
of the adjoining masses. Neither nerves nor absorbents have
been satisfactorily traced into the placenta, though the proba-
bility is that both exist there.

When we consider that the placenta is a species of organ-
ized pseudo-membrane, it is not surprising that, notwithstand-
ing its temporary existence, it should be liable to various mor-
bid alterations. Until recently this subject appears to have
attracted very little attention; Morgagni and some of the
older anatomists have, it is true, transmitted to us some in-
teresting cases of diseases of the placenta; but they are, for
the most part, so loosely drawn up as to render it extremely
difficult to deduce from them any thing like general princi-
ples. The most important facts of which we are at present
in possession have been furnished by Professor Cruveilhier,
of Paris, Monsieur Brachet, of Lyons, and Dr. Simpson, of
Edinburgh. The researches of these pathologists are of the
greatest value, not only to morbid anatomy, but to medical
jurisprudence, — a branch of science upon which they have

the closest bearing. The most common diseases of the placenta, and those which will be briefly noticed on this occasion, are inflammation, atrophy, cartilaginous degeneration, ossification, and sanguineous effusions.

Acute *inflammation* of the placenta is extremely rare ; at any rate, such must be our conclusion when we reflect upon the few cases of it that are to be found on record. The disease is generally limited in its extent, and appears to terminate in one of three ways, — either in the effusion of lymph, in suppuration, or, finally, in passing into the chronic form. In the first case, the affected part presents all the characters of a hepatized lung ; that is to say, it is dense, solid, easily crushed, and of a dark reddish color. When the lymph is poured out between the inner surface of the organ and the corresponding portion of the uterus, the two structures become so intimately incorporated, as to render it frequently impracticable, when the period arrives for their separation, to detach them from each other. In this way, there is reason to believe, usually arises what is called morbid adhesion of the placenta.

Suppuration of the placenta is extremely rare, and I have never met with an instance of it. The matter is commonly confined to one or more cotyledons, and is either diffused through their substance, or collected into one or more abscesses. In a case recorded by Brachet, not less than fourteen depots were found, varying in volume between that of a pea and a nut. The pus was of a thick consistence, without any particular odor, and looked a good deal like softened tubercular matter.*

Another lesion which is sometimes observed is *softening*. How far this is dependent upon inflammatory irritation is a point which has not been determined. I have noticed this condition in quite a number of cases, in several of which it was associated with the fibro-cartilaginous and osseous degenerations presently to be described. Occasionally the softening appears to affect the entire organ ; but, in the majority of instances, it is confined to particular sections of it, occupying one fourth, one third, or one half of its extent. The volume of the placenta is seldom altered in this lesion.

The most common disease of the after-birth is the *cartilaginous degeneration*. This generally occurs in small, cir-

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* Journal Generale de Médicine, 1828.

cumscribed masses, from two to four lines in thickness, of a
whitish milk-like color, and of an irregularly oval shape.
In their consistence, they vary from the softness of fibrous
texture to the density of articular cartilage. In some in-
stances, they are of a pale yellowish color, and partially trans-
formed into osseous matter. In other cases, though this is
not common, the masses are intersected by fibrous bands,
constituting that form of the disease to which the older anat-
omists have applied the term scirrhus. In a third series of
cases, the affected part has a remarkably granular appearance,
being composed of an infinity of small, spherical bodies, of
a reddish buff color, dense and firm in their consistence, and
scarcely exceeding the volume of a millet-seed. This degen-
eration is generally associated with atrophy, and, as might be
supposed, interferes more or less with the nutrition of the
fœtus.

Another rather frequent lesion of the placenta is *ossifica-
tion*. Of this I have observed several well-marked exam-
ples. The degeneration may occur under two varieties of
form. In one, the more frequent of the two, the ossifica-
tion is confined exclusively to the smaller arterial branches,
which assume an acicular arrangement, hundreds of them
sometimes existing in a space not exceeding half a square
inch. They are of a yellowish color, fragile, and particularly
conspicuous at the uterine surface of the organ. In this way
whole cotyledons are occasionally transformed. This species
of degeneration, which sometimes pervades the entire pla-
centa, is analogous to senile ossification of the arteries. The
larger arterial branches usually remain sound, and the bulk
of the organ is seldom materially diminished.

In the second variety, the foreign matter occurs in the
form of a layer, varying in thickness from the fourth of a
line to a quarter of an inch. In its diameter, it rarely ex-
ceeds a cotyledon, to the inner surface of which it closely
adheres, the deposition commencing apparently in its cellulo-
fibrous envelope. In some instances, these plates are partly
osseous, partly cartilaginous, and partly fibrous, according to
the length of time they have been in progress of forming;
their number is occasionally considerable; and, in a few rare
cases, they have been known to constitute a complete shell,
which was accurately moulded to the uterine surface of the
organ. A radiated arrangement is sometimes observable in
these plates, not unlike that of the parietal bone of the fœtus,

the osseous fibres extending from the centre to the circumference.

Like other organs of the body, whose existence is of a less temporary nature, the placenta is liable to *hypertrophy*. When this happens, the weight and bulk of the viscus are considerably augmented, sometimes enormously ; its color is abnormally pale ; the parenchymatous structure is infiltrated with serosity, pits on pressure, and is often uncommonly firm. This lesion, I presume, is rare ; and further observations are necessary before we shall be able to furnish a complete history of it.

The placenta, finally, is sometimes the seat of *sanguineous effusions*. Several such cases have occurred in my own practice, and not a few are recorded by authors. The blood is poured into the parenchymatous substance of the organ, near its uterine surface, in the form of irregular masses, varying in volume between a pea and a walnut. The number of depots is usually small, though in a few rare instances, every cotyledon has been affected. The fluid, at first of a dense modena color, and of a soft consistence, becomes gradually lighter and more dense, until finally it presents all the properties of an old apoplectic effusion of the brain. The surrounding textures are generally more or less altered, and many of the vessels are plugged up with fibrin. This lesion is occasionally connected with the fibro-cartilaginous degeneration.

Nearly all the lesions above described are either directly hostile to the persistence of the placenta, or they interfere, to a greater or less extent, with the nourishment of the fœtus. In the cartilaginous and osseous transformations, many of the vessels are either entirely obliterated, or their caliber is so much diminished as to admit of a very imperfect circulation. Hence, atrophy of the placenta, and emaciation of the new being. When the lesions are extensive, abortion is the consequence. Ossification of the placenta occurs occasionally in several successive pregnancies.

The placenta may adhere to any part of the uterus, but is usually found at the base. In twin cases, it is either double, bilobulated, or furnished with two cords. Occasionally it is attached to the head of the infant.*

The *umbilical cord* presents some anomalies worthy of brief notice. It is occasionally double, and cases are recorded

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* Nouv. Bibliotheque, Med. 1830.

where it was inserted into the head, chest, and extremities.
The length of the cord at birth is generally about twenty
inches ; but it may be much longer. In one instance I
found it four feet and a half, and in another, mentioned to me
by Dr. Catlin, of Massachusetts, it was nearly six feet. Its
veins are sometimes varicose ; it is occasionally twisted,
knotted, or tuberculated ; and, in a few rare instances, it has
presented black nodosities, or been partially filled with hydat-
ids. Blandin, Velpeau, and others, narrate cases where there
was but one artery and two veins, instead of two arteries and
one vein.

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