portion is composed of areolar tissue like that which forms the parametrium, of which it is a continuation. It is often called the paravaginal tissue. Waldeyer proposes for it the term *paracolpium*, which is etymologically more correct.

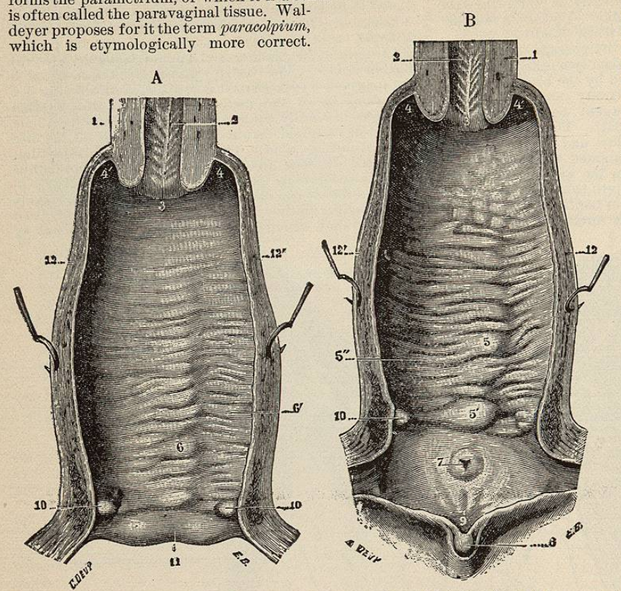

FIG. 4234.—Section of the Vagina through its Lateral Borders. (Testut.) *A*, Posterior segment showing posterior wall; *B*, anterior segment showing anterior wall; 1, cervix uteri; 2, cervical canal with arbores vitæ; 3, external orifice; 4, 4', lateral culs-de-sac of the vagina; 5, anterior column, with 5', the vaginal tubercle, and 5'', the transverse folds of the anterior wall; 6, posterior column, with 6', transverse folds of the posterior wall; 7, meatus urinarius; 8, clitoris; 9, vestibule; 10, 10, carunculæ myrtiformes; 11, fossa navicularis; 12, 12', sections of the lateral walls of the vagina.

It contains abundant plexuses of veins surrounding the vaginal, cervico-vaginal, and vesico-vaginal arteries. Sometimes the loop of the uterine artery itself descends to this level, lying about 15 mm. outside the vaginal wall. The ureters are at first about 15 cm. from the lateral cul-de-sac. As they pass forward they approach the wall and finally almost touch it anteriorly. The ganglion of Lee lies against the upper lateral portion, and remnants of the Wolffian duct, known as the ducts of Gärtner, are occasionally found there. The fibres of the levator ani cross obliquely, adherent only by loose areolar tissue. By its contraction the muscle closes the vaginal passage. The tissues below this crossing belong to what is known as the urogenital diaphragm, which is composed of the two layers of the triangular ligament, here distinguished as the ischio-vaginal and the ischio-vulvar sheets, and the muscles which lie between them, viz., the transversus perinei profundus and the constrictor urethræ. Below the diaphragm and impinging upon the vulva are found the vulvo-vaginal glands and the bulbocavernosus muscle surrounding the bulbs of the vestibule, hereafter to be described.

Interior Configuration.—In the young person who has not borne children the interior of the vagina is by no means smooth (Fig. 4234). At its lower part it is crossed by transverse folds or rugæ, which thin away laterally but medially thicken to form a longitudinal elevation on both the anterior and the posterior wall. These are known as the *columns* of the vagina (*columnæ rugarum*). Both the columns and the rugæ are better developed below and on the anterior wall than above and behind. The anterior column follows quite closely the course of the urethra, and on that account is sometimes called the *carina urethralis*. It usually terminates below in a well-marked elevation, the *vaginal tubercle*, situated just behind the meatus urinarius. The column and the tubercle afford an excellent guide to the meatus in catheterization of the urethra. These elevations become gradually less marked toward the fornix and wholly disappear in the upper part of the vagina. In the fœtus of eight or nine months the rugæ are found throughout the entire extent of the canal, and resemble in appearance the valvulæ conniventes of the small intestine. After considerable distention of the vagina they tend to disappear, and only traces of them can be found in multiparæ. They appear to be less frequent among some of the lower human races and are absent in apes.

The adherence of the upper part of the anterior wall to the trigone of the bladder is marked by a smooth, triangular area over which the rugæ and columns are entirely effaced. This is known as the *vaginal triangle*, or triangle of Pawlick (*area trigonalis vaginæ*, Fig. 4235). It is situated 25 or 30 mm. below the external orifice of the uterus. Its two superior angles mark the points where the ureters enter the bladder, and are of importance as guides in the catheterization of those conduits.

In virgins the orifice of the vagina is normally partially closed by a fold developed from its posterior wall, called the *hymen* (*hymen femininus*), from the Greek ὑμήν, a membrane, not from the Latin deity who presided over marriage. Much discussion has arisen as to the morphological character of this fold. As it appears to be developed from the Müllerian duct it would seem that it must belong to the vagina. The duct is formed from a solid cord of cells by the degeneration of the centrally situated portions. At the lower end some portions of the cord persist and form the hymen (Fig. 4236).

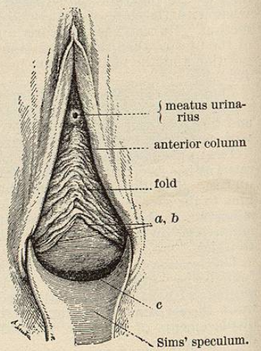

FIG. 4235.—Triangle of Pawlick. The posterior vaginal wall of a multipara strongly retracted with a Sims' speculum to show on the anterior wall the triangle of Pawlick (*a*, *b*, *c*). (Rieffel.)

As might be expected from its peculiar origin, the hymen varies much in its extent and shape. Some of the earlier anatomists denied its existence, and even Velsalius considered it rare. It is indeed occasionally absent altogether. Its usual form is that of an unbroken, semilunar fold of sufficient size to occlude the greater portion of the vaginal orifice, leaving an opening large enough to permit the evacuation of the menstrual flow (Fig. 4237, *A*). Frequently it surrounds the orifice in a ring-like manner (*hymen annularis*), the opening being either medially or laterally situated. This opening may, however, take the form of a slit, having two lips laterally situated (*hymen bilobatus*, *seu bilabiatus* Fig. 4237, *C*). There may be two openings (*hymen biperforatus*, Fig. 4237, *D*), several openings (*hymen cribriformis*, Fig. 4237, *E*), or none at all (*hymen imperforatus*). This latter form requires surgical interference to effect the proper menstrual evacuation. The edges of the hymen may be variously cut (*hymen fimbriatus*, Fig. 4237, *B*), simulating the ruptures seen after defloration. The membrane may be unusually thick (*hymen carnosus*), even resembling cartilage and able to resist rupture.

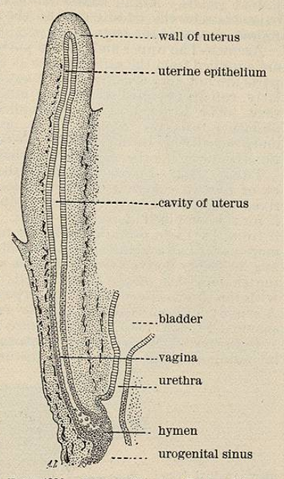

FIG. 4236.—From a Human Fœtus 10 cm. Long. Longitudinal section passing through the genital cord. (Tourneux.)

It is, however, usually ruptured at the first sexual approach. It then shows irregular jagged tears, some of which reach to the outer circumference. After healing, which is not long delayed, there are produced a number of rounded nodules (*lobi hymenales*) united by thickened edges. This form (*hymen defloratus*, Fig. 4238) may be distinguished from the fimbriate variety by the character of the lacerations, which in the deflorate form usually reach the circumference, in the fimbriate are less extensive and united by fine filaments.

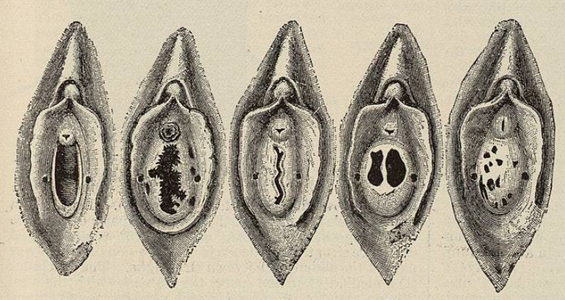

FIG. 4237.—Various Forms of the Hymen. (Testut.) *A*, Semilunar or falciform; *B*, fimbriated; *C*, bilabiate; *D*, biperforate; *E*, cribriform.

When labor ensues, the lobi hymenales are stretched and torn so that they afterward appear as a number of flattened, cicatrized elevations. In this state they are called the *carunculæ hymenales* or *myrtiformes* (Fig. 4240).

A hymen usually contains blood-vessels, and it is popularly supposed that its rupture is always accompanied by hemorrhage. Among the Eastern nations much reliance is placed on this "sign of virginity." The ancient Hebrews appear to have accepted it, as will be seen from Lev. xxii. 13–21. While slight hemorrhage is usual, and dangerous loss of blood has been known to occur, yet it often happens that the membrane is ruptured without such signs, and pregnancy not infrequently ensues with the hymen uninjured. (Fig. 4239.)

The great differences that occur in the hymen—it sometimes being torn by very slight violence, by the fingers or by some accidental circumstance, while at other times it remains intact after sexual approach and even after delivery—detract from its value as a matter of evidence in medico-legal cases. Haberda believes that it is often impossible to determine positively whether coitus has occurred. The carunculæ hymenales are more reliable, as they are found only in those who have borne children.

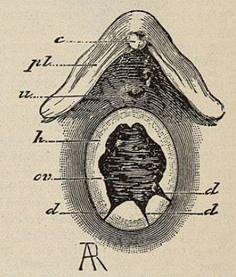

FIG. 4238.—Deflorate Hymen. Condition after first sexual approach. (Budin.) *c*, Clitoris; *pl*, nymphæ; *u*, meatus urinarius; *ov*, orifice of vagina; *h*, remains of hymen; *d*, *d*, *d*, tears.

Structure.—We may consider the vagina as possessing three coats: external, or adventitious; middle, or muscular; internal, or mucous.

The *external* coat can hardly be said to be an intimate part of the tube, but rather the packing of connective tissue that surrounds and connects it with other organs, it being the paravaginal tissue already adverted to. It contains smooth, muscular fibres, elastic fibres, deposits of fat and contorted, vascular plexuses that give it a loose, spongy character.

The *muscular* coat is composed of smooth fibres that cannot, in all parts, be definitely separated into layers. Externally they communicate with the muscular fibres found in the paravaginal tissue. Longitudinal bands lie along the anterior wall, connecting with the bladder above. The inner fibres are, for the most part, circular. They increase greatly in size and number during pregnancy. Above, the muscular tissue is continuous with that of the cervix; below, it is so much thickened that some authors describe a sphincter of smooth fibres. Luschka mentions longitudinal fibres that pass to the triangular ligament, constituting a *levator vaginæ*, said to elevate and dilate the vaginal orifice. A considerable amount of white fibrous and yellow elastic tissue is mingled with the muscular elements of this coat.

The mucous layer resembles the skin, being a stratified, pavement epithelium resting upon dermal papillæ. Its color is pinkish when inactive, red during menstrual or sexual excitement, and purplish red during pregnancy, when it is considerably congested. It is from 1 to 1.5 mm. thick, quite firm and attached to the subjacent, muscular layer without any intervening areolar tissue. During operations it is easily stripped off, but in that

case usually carries with it portions of the muscular layer. The papillary part contains many elastic fibres, some scattered lymphoid cells, and occasional closed follicles. The mucous membrane contains no glands, and the acid mucus found on the vaginal walls is either an exudation, or, perhaps, the secretion of the uterine glands altered by bacterial agencies. A number of species of bacteria are found on the membrane, some of which appear to be peculiar to this locality.

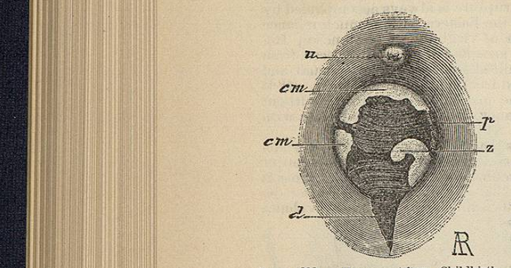

FIG. 4239. — Hymen After Childbirth. (Budin.) *u*, Meatus urinarius; *d*, tear; *cm*, carunculæ myrtiformes; *z*, detached floating tatter of the hymen; *p*, raw edge.

Arteries.—These are derived from several sources. Above, the cervico-vaginal branches of the uterine artery supply the fornix and upper third of the vagina; in the middle portion the vaginal artery proper, from the internal iliac, is distributed; while the lower part is supplied by a twig from the inferior hemorrhoidal, known as the inferior vaginal. The vaginal artery proper often arises in common with the uterine, the middle hemorrhoidal, or the inferior vesical. It is not unusual to find it represented by several branches. The arteries anastomose freely along the walls of the conduit and with the arteries of the neighboring organs. The arteries of opposite sides may unite to form median anterior and posterior vessels, running longitudinally, the so-called *azygos* arteries. Deficiency in one branch of supply is usually supplemented by an increase in the others. Arterioles reach all the layers of the vagina, being especially abundant in the papillæ of the mucous membrane.

Veins.—These are so numerous that they were considered by Kobelt as forming an erectile tissue, but they lack the special characters of that structure. They are particularly developed at the sides of the vagina, forming a large plexus that is continuous with the uterine plexus above, the vesical plexus in front, and the hemorrhoidal plexus behind. Hyrtl has shown that they also communicate with the portal system by anastomosis with the superior hemorrhoidal vein. They may thus discharge in three directions: below the levator into the perineal system, above it into the internal iliac and portal veins. Very few valves are found in these veins. They are surrounded by connective tissue and smooth muscular fibres, which cause them to remain open when cut. Hemorrhage from them is therefore difficult to stop and septic infection is easy.

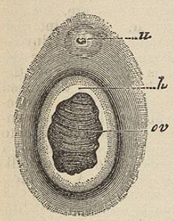

FIG. 4240. — Hymen Before Childbirth. (Budin.) *u*, Meatus urinarius; *h*, hymen whose edges are intact notwithstanding the sexual approaches.

Lymphatics.—Both the mucous membrane and the muscular coat contain a great number of lymphatics (Fig. 4241). The mucous coat has a fine-meshed plexus that communicates with that of the cervix above and that of the external genitals below. The muscular coat also has a plexus with much larger meshes. The two communicate freely. According to Poirier, they discharge by three groups of collecting vessels: a superior set that ends in glands that lie along the course of the internal iliac artery; a middle set that terminates in glands along the internal iliac; and an inferior set that passes along the sacrum to end in glands near the promontory. By anastomoses with other vessels these may communicate with the inguinal glands. Morau states that communications also exist between the middle set and the glands within the fibrous sheath of the rectum.

Nerves.—The upper and middle portions of the vagina are supplied from the same sources as the uterus. These parts are not very sensitive. The anterior wall, particularly, can be operated on without much pain to the patient. The lower portion is supplied with additional filaments from the internal pudic nerve, and is much more sensitive. Intra-epithelial plexuses and terminations occur as in other stratified epithelium.

THE VULVA.—*Etymology.*—From the vulgar Latin *vulva* or *volva*, a covering or wrap, hence the womb. Derived from *volvere*, to roll around or about. Celsus used it for the combined uterus and vagina. Spigelius derived it from the Latin *valva*, a double or folding door. The more usual Latin term for the external genitals was *cunnus*, probably derived from *cuneus*, a wedge, referring to the shape either of the mons veneris and labia as seen with the thighs closed, or of the expanded genital cleft. A synonym often used is *pudendum*, from *pudere*, to feel shame. French, *vulve;* Italian, *vulva;* German, *Scham.*

Definition.—The external genital organs of the female, including all those derived from the urogenital sinus and

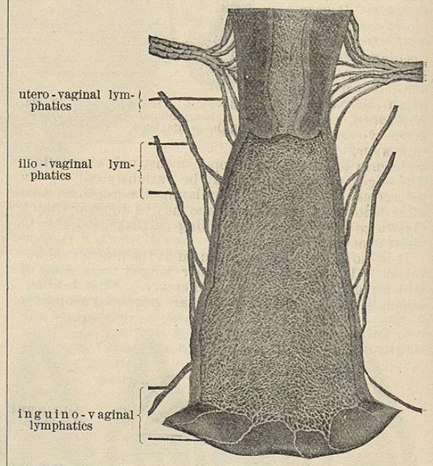

FIG. 4241.—Network of Lymphatics of the Vaginal Mucous Membrane. Efferent trunks of the vagina. (Poirier.)

found below the urogenital diaphragm. They are a series of related organs rather than the parts of a single one. Together they form an ovoid or wedge-shaped eminence situated on the surface of the body at the lower part of the abdomen, between the thighs. They include: (1) a median cleft-like space, the *vestibule*, with the vestibular glands; (2) the *labia* and *nymphæ*, tegumentary folds that limit this on either side; (3) the erectile apparatus, comprising the *clitoris* and *bulbs*. Some authors use the term merely to designate the genital opening with the labia.

General Arrangement.—But little of the external genitals is visible when a female is standing erect. Only a fleshy protuberance, covered with hair, the *mons pubis* or *mons veneris*, appears at the lower extremity of the abdomen, limited externally by the thighs and below passing into two fleshy folds, the *labia*, between which is seen

the half-effaced end of the *rima pudendi*, or genital cleft. In some cases the end of the clitoris may protrude at the upper end of the cleft, and, still more rarely, the edges of the nymphæ may be seen.

When the subject is placed in the dorsal position with widely parted thighs, flexed upon the abdomen, the genital cleft is stretched apart and forms a wedge-shaped fossa, rhomboidal in outline, limited on either side by the labia, extending in front to the mons pubis, behind to about 3 cm. in front of the anus (Figs. 4242, 4243). Within this space, running parallel to the labia majora, are seen two reddish folds, the *nymphæ*, which unite anteriorly by embracing a small penile appendage, the *clitoris*. The space between them is known as the *vestibule*. The vaginal orifice may be perceived posteriorly, and beneath the mucous membrane on either side of this are found masses of erectile tissue known as the *bulbs of the vestibule*.

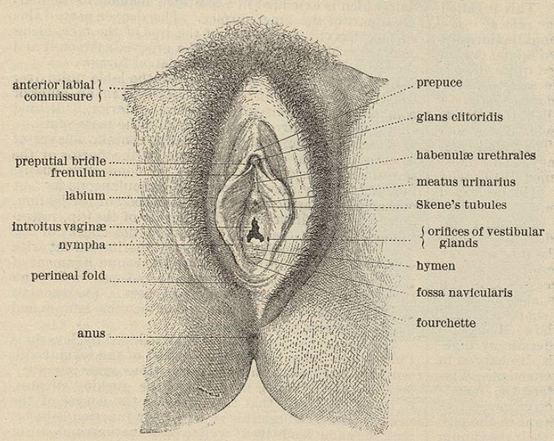

FIG. 4242.—External Genital Organs of a Virgin as seen after Separating the Labia and the Nymphæ. (Rieffel.)

The Vestibule.—This may be defined as the portion of the urogenital cleft that lies between the nymphæ, limited in front by the clitoris, behind by the fourchette when that exists. It is not always used in this sense. Schäfer limits it behind "by a transverse line at the level of the urethra"; Gray, following the example of most French anatomists, by the entrance to the vagina. If this limitation were imposed, it would hardly be proper to speak of the "bulbs of the vestibule" or of the "vestibular glands," both of which structures are situated at the sides of or behind the vaginal opening.

Like the vagina, its walls are in contact when not stretched apart. When the thighs are separated it appears as an almond-shaped space, looking downward and a little forward, its broad, rounded end being posterior. It presents a roof, two ends and sides, the latter being the inner surfaces of the nymphæ.

The roof, which has in front a smooth, uniform surface, pinkish in color, presents, about the junction of its anterior and middle thirds, the *meatus urinarius* or external opening of the urethra. This is seated on a rounded eminence, the *urethral papilla*, which is not usually smooth, but covered with rugosities or small vegetations which may hinder the introduction of the catheter. The orifice is usually an antero-posterior slit 5–6 mm. in length, but may be of various shapes, semilunar, triangular, or puckered. While it is the smallest and least dilatable portion of the urethral canal, it may, if proper precautions are used, be gradually enlarged to 20–25 mm., or even to a greater size, without inducing incontinence of urine. Thus the finger may be introduced for exploration of the bladder, or stones and foreign bodies extracted. In some instances of absence or closure of the vagina, it is said that attempts at copulation have resulted in the introduction of the penis into the urethra. The orifice is almost vertically under the pubic arch and 25 mm. from it. Its distance from the glans of the clitoris is usually somewhat less.

Running forward from the meatus to the clitoris, there may be seen in young subjects two fine whitish lines, called by Waldeyer the *habenulæ urethrales* (Fig. 4242). They represent the vestiges of the anterior part of the corpus spongiosum which, in the female, remains rudimentary. They were first noted by Pozzi (1884), who called them the "bride masculine."

On either side of the urethral orifice there may be noted the openings of two ducts for tubular glands situated on either side of the urethra and apparently homologous with the prostatic glands of the male. These ducts are often called Skene's tubules, as they were especially studied by Skene in 1880. They were, however, known to Morgagni and De Graaf.

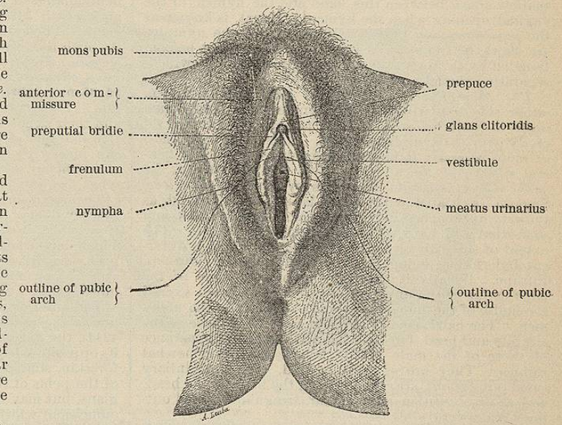

FIG. 4243.—External Genital Organs of a Multipara as seen after Slight Separation of the Labia. (Rieffel.)

Behind the urethral opening is found the introitus vaginæ, closed more or less in the virgin by the hymen,