enlarged uterus. The longitudinal dimensions of the thorax are lessened by the upward displacement of the diaphragm, and this necessarily leads to some embarrassment of the respiration, which is, however, compensated, to a great extent, by an increase in breadth of the base of the thoracic cavity.

Changes in the Liver.—The liver has been observed to show certain changes in pregnancy. Numerous small yellow spots are seen scattered through its substance, varying in size from a pin's head to a millet-seed, and these are produced by fatty deposits in the hepatic cells, which De Sinéty believes to be associated mainly with lactation, and to disappear when that is concluded.

Changes in the Urine.—Certain changes, which are of very constant occurrence, in the urine of pregnant women have attracted much attention, and have been considered by many writers to be pathognomonic. They consist in the presence of a peculiar deposit, formed when the urine has been allowed to stand for some time, which has received the name of *kiestein*. Its presence was known to the ancients, and it was particularly mentioned by Savonarola in the fifteenth century, but it has more especially been studied within the last thirty years by Eguisier, Golding Bird, and others. If the urine of a pregnant woman be allowed to stand in a cylindrical vessel, exposed to light and air, but protected from dust, in a period varying from two to seven days, a peculiar flocculent sediment, like fine cotton-wool, makes its appearance in the centre of the fluid, and soon afterward rises to the surface and forms a pellicle, which has been compared to the fat of cold mutton-broth. In the course of a few days the scum breaks up and falls to the bottom of the vessel. On microscopic examination it is found to be composed of fat particles, with crystals of ammoniaco-magnesium phosphates and phosphate of lime, and a large quantity of vibriones. These appearances are generally to be detected after the second month of pregnancy, and up to the seventh or eighth month, after which they are rarely produced. Regnauld explains their absence during the latter months of gestation by the presence in the urine, at that time, of free lactic acid, which increases its acidity, and prevents the decomposition of the urea into carbonate of ammonia. He believes that kiestein is produced by the action of free carbonate of ammonia on the phosphate of lime contained in the urine, and that this reaction is prevented by the excess of acid.

Golding Bird believed kiestein to be analogous to casein, to the presence of which he referred it, and he states that he has found it in twenty-seven out of thirty cases. Braxton Hicks so far corroborates this view, and states that the deposit of kiestein can be much more abundantly produced if one or two teaspoonfuls of rennet be added to the urine, since that substance has the property of coagulating casein. Much less importance, however, is now attached to the presence of kiestein than formerly, since a precisely similar substance is sometimes found in the urine of the non-pregnant, especially in anæmic women, and even in the urine of men. Parkes states that it is not of uniform composition, that it is produced by the decomposition of urea, and consists of the free phosphates, bladder mucus, infusoria, and vaginal discharges. Neugebauer and Vogel give a similar account of it, and hold that it is of no diagnostic value. That it is of interest as indicating the changes going on in connection with pregnancy, is certain; but inasmuch as it is not of invariable occurrence, and may even exist quite independently of gestation, it is obviously quite undeserving of the extreme importance that has been attached to it.

Toward the end of pregnancy sugar may sometimes be detected in the urine, and after delivery and during lactation it exists in considerable abundance; thus, out of thirty-five cases tested in the Simpson Memorial Hospital in Edinburgh during the puerperium, it was found in all, the amount varying from 1 to 8 per cent.[1] Kaltenbach has shown that this temporary glycosuria is due to the presence of milk-sugar in the urine, and that it ceases with the disappearance of milk from the breasts.[2] This physiological glycosuria must be carefully distinguished from true diabetes, which is a grave complication of pregnancy.

Albumin is often present during the latter stages of pregnancy, and it may be transitory and of comparatively little moment, although its presence must always be a cause of some anxiety. Leyden believes that it is most often met with in the second half of a *first* pregnancy, and it may become chronic, leading to granular atrophy of the kidneys.[3] In some cases it seems to be the result of catarrhal conditions of the bladder, in others it is probably caused by undue arterial tension consequent on pregnancy.

CHAPTER IV.

SIGNS AND SYMPTOMS OF PREGNANCY.

In attempting to ascertain the presence or absence of pregnancy, the practitioner has before him a problem which is often beset with great difficulties, and on the proper solution of which the moral character of his patient, as well as his own professional reputation, may depend. The patient and her friends can hardly be expected to appreciate the fact that it is often far from easy to give a positive opinion on the point; and it is always advisable to use much caution in the examination, and not to commit ourselves to a positive opinion, except on the most certain grounds. This is all the more important because it is just in those cases in which our opinion is most frequently asked that the statements of the patient are of least value, as she is either

[1] Edin. Med. Journ., vol. 1881–82, p. 116.
[2] Zeit. f. Geburt. u. Gyn., 1879, Bd. iv. p. 161, "Die Lactosurie der Wöchnerinnen."
[3] Deutsche med. Wochenschr., 1886, No. 9.

anxious to conceal the existence of pregnancy, or, if desirous of an affirmative diagnosis, unconsciously colors her statements so as to bias the judgment of the examiner.

Classification.—Constant attempts have been made to classify the signs of pregnancy; thus some divide them into the *natural* and *sensible* signs, others into the *presumptive*, the *probable*, and the *certain*. The latter classification, which is that adopted by Montgomery in his classical work on the *Signs and Symptoms of Pregnancy*, is no doubt the better of the two, if any be required. The simplest way of studying the subject, however, is the one, now generally adopted, of considering the signs of pregnancy in the order in which they occur, and attaching to each an estimate of its diagnostic value.

Signs of a Fruitful Conception.—From the earliest ages authors have thought that the occurrence of conception might be ascertained by certain obscure signs, such as a peculiar appearance of the eyes, swelling of the neck, or by unusual sensations connected with a fruitful intercourse. All of these, it need hardly be said, are far too uncertain to be of the slightest value. The last is a symptom on which many married women profess themselves able to depend, and one to which Cazeaux is inclined to attach some importance.

The first appreciable indication of pregnancy on which any dependence can be placed is the cessation of the customary menstrual discharge, and it is of great importance, as forming the only reliable guide for calculating the probable period of delivery. In women who have been previously perfectly regular, in whom there is no morbid cause which is likely to have produced suppression, the non-appearance of the catamenia may be taken as strong presumptive evidence of the existence of pregnancy; but it can never be more than this, unless verified and strengthened by other signs, inasmuch as there are many conditions besides pregnancy which may lead to its non-appearance. Thus exposure to cold, mental emotion, general debility, especially when connected with incipient phthisis, may all have this effect. Mental impressions are peculiarly liable to mislead in this respect. It is far from uncommon in newly-married women to find that menstruation ceases for one or more periods, either from the general disturbance of the system connected with the married life, or from a desire on the part of the patient to find herself pregnant. Also in unmarried women who have subjected themselves to the risk of impregnation, mental emotion and alarm often produce the same result.

A further source of uncertainty exists in the fact that in certain cases menstruation may go on for one or more periods after conception, or even during the whole pregnancy. The latter occurrence is certainly of extreme rarity, but one or two instances are recorded by Perfect, Churchill, and other writers of authority, and therefore its possibility must be admitted. The former is much less uncommon, and instances of it have probably come under the observation of most practitioners. The explanation is now well understood. During the early months of gestation, when the ovum is not yet sufficiently advanced in growth to fill the whole uterine cavity, there is a considerable space between the decidua reflexa which surrounds it and the decidua vera lining the uterine cavity. It is from this free surface of the decidua vera that the periodical discharge comes, and there is not only ample surface for it to come from, but a free channel for its escape through the os uteri. After the third month the decidua reflexa and the decidua vera blend together, and the space between them disappears. Menstruation after this time is, therefore, much more difficult to account for. It is probable that, in many supposed cases, occasional losses of blood from other sources, such as placenta prævia, an abraded cervix uteri, or a small polypus, have been mistaken for true menstruation. If the discharge really occurs periodically after the third month, it can only come from the canal of the cervix. The occurrence, however, is so rare, that if a woman is menstruating regularly and normally who believes herself to be more than four months advanced in pregnancy, we are justified *ipso facto* in negativing her supposition. In an unmarried woman all statements as to regularity of menstruation are absolutely valueless, for in such cases nothing is more common than for the patient to make false statements for the express purpose of deception.

Conception may unquestionably occur when menstruation is normally absent. This is far from uncommon in women during lactation, when the function is in abeyance, and who therefore have no reliable data for calculating the true period of their delivery. Authentic cases are also recorded in which young girls have conceived before menstruation is established, and in which pregnancy has occurred after the change of life.

Taking all these facts into account, we can only look upon the cessation of menstruation as a fairly presumptive sign of pregnancy in women in whom there is no clear reason to account for it, but one which is undoubtedly of great value in assisting our diagnosis.

Shortly after conception various sympathetic disturbances of the system occur, and it is only very exceptionally that these are not established. They are generally most developed in women of highly nervous temperament; and they are, therefore, most marked in patients in the upper classes of society, in whom this class of organization is most common.

Morning Sickness.—Amongst the most frequent of these are various disorders of the gastro-intestinal canal. Nausea or vomiting is very common; and as it is generally felt on first rising from the recumbent position, it is commonly known amongst women as the "morning sickness." It sometimes commences almost immediately after conception, but more frequently not until the second month, and it rarely lasts after the fourth month. Generally there is nausea rather than actual vomiting. The woman feels sick and unable to eat her breakfast, and often brings up some glairy fluid. In other cases she actually vomits; and sometimes the sickness is so excessive as to resist all treatment, seriously to affect the patient's health, and even imperil her life. These grave forms of the affection will require separate consideration.

Very different opinions have been held as to the cause of morning

sickness. Dr. Henry Bennet believes that, when at all severe, it is always associated with congestion and inflammation of the cervix uteri. Dr. Graily Hewitt maintains that it depends entirely on flexion of the uterus producing irritation of the uterine nerves at the seat of the flexion, and consequent sympathetic vomiting. This theory, when broached at the Obstetrical Society, was received with little favor; it seems to me to be sufficiently disproved by the fact, which I believe to be certain, that more or less nausea is a normal and nearly constant phenomenon in pregnancy; for it is difficult to believe that nearly every pregnant woman has a flexed uterus. The generally received explanation is probably the correct one, viz., that nausea, as well as other forms of sympathetic disturbance, depend on the stretching of the uterine fibres, by the growing ovum, and consequent irritation of the uterine nerves. It is, therefore, one, and only one, of the numerous reflex phenomena naturally accompanying pregnancy. It is an old observation that when the sickness of pregnancy is entirely absent, other, and generally more distressing, sympathetic derangements are often met with, such as a tendency to syncope. Dr. Bedford[1] has laid especial stress on this point, and maintains that under such circumstances women are peculiarly apt to miscarry.

Other derangements of the digestive functions, depending on the same cause, are not uncommon, such as excessive or depraved appetite, the patient showing a craving for strange and even disgusting articles of diet. These cravings may be altogether irresistible, and are popularly known as "longings." Of a similar character is the disturbed condition of the bowels frequently observed, leading to constipation, diarrhœa, and excessive flatulence.

Certain glandular sympathies may be developed, one of the most common being an excessive secretion from the salivary glands. A tendency to syncope is not unfrequent, rarely proceeding to actual fainting, but rather to that sort of partial syncope, unattended with complete loss of consciousness, which the older authors used to call "leipothymia." This often occurs in women who show no such tendency at other times, and, when developed to any extent, it forms a very distressing accompaniment of pregnancy. Toothache is common, and is not rarely associated with actual caries of the teeth. When any of these phenomena are carried to excess it is more than probable that some morbid condition of the uterus exists, which increases the local irritation producing them.

Mental Peculiarities.—Mental phenomena are very general. An undue degree of despondency, utterly beyond the patient's control, is far from uncommon; or a change which renders the bright and good-tempered woman fractious and irritable; or even the more fortunate, but less common, change, by which a disagreeable disposition becomes altered for the better.

All these phenomena of exalted nervous susceptibility are but of slight diagnostic value. They may be taken as corroborating more certain signs, but nothing more; and they are chiefly interesting

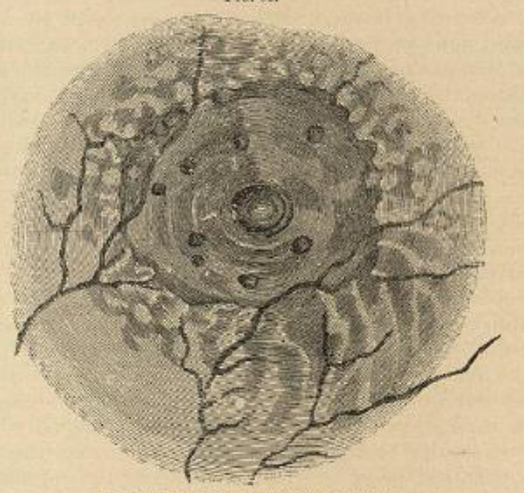
[1] Diseases of Women and Children, p. 551.

from their tendency to be carried to excess and to produce serious disorders.

Certain changes in the mammæ are of early occurrence, dependent, no doubt, on the intimate sympathetic relations at all times existing between them and the uterine organs, but chiefly required for the purpose of preparing for the important function of lactation, which, on the termination of pregnancy, they have to perform.

Generally about the second month of pregnancy the breasts become increased in size, and tender. As pregnancy advances they become much larger and firmer, the enlargement being caused by growth both of connective and glandular tissue, and blue veins may be seen coursing over them. The most characteristic changes are about the nipples and areolæ. The nipples become turgid, and are frequently covered

FIG. 80.



Appearance of the areola in pregnancy.

with minute branny scales, formed by the desiccation of sero-lactescent fluid oozing from them. The areolæ become greatly enlarged and darkened from the deposit of pigment (Fig. 80). The extent and degree of this discoloration vary much in different women. In fair women it may be so slight as to be hardly appreciable; while in dark women it is generally exceedingly characteristic, sometimes forming a nearly black circle extending over a great part of the breast. The areola becomes moist as well as dark in appearance, is somewhat swollen, and a number of small tubercles are developed upon it, forming a circle of projections round the nipple. These tubercles are described by Montgomery as being intimately connected with the lactiferous ducts, some of which may occasionally be traced into them and seem to open on their summits. As pregnancy advances they increase in size and number. During the latter months what has been called

"the secondary areola" is produced, and when well marked presents a very characteristic appearance. It consists of a number of minute discolored spots all round the outer margin of the areola where the pigmentation is fainter, and which are generally described as resembling spots from which the color has been discharged by a shower of water-drops. This change, like the darkening of the primary areola, is more marked in brunettes. At this period, especially in women whose skin is of fine texture, whitish silvery streaks are often seen on the breasts. They are produced by the stretching of the cutis vera, and are permanent.

By pressure on the breasts a small drop of serous-looking fluid can very generally be forced out from the nipple, often as early as the third month, and on microscopic examination milk and colostrum globules can be seen in it.

The diagnostic value of these mammary changes has been variously estimated. When well marked they are considered by Montgomery to be certain signs of pregnancy. To this statement, however, some important limitations must be made. In women who have never borne children they, no doubt, are so; for, although various uterine and ovarian diseases produce some darkening of the areola, they certainly never produce the well-marked changes above described. In multiparæ, however, the areolæ often remain permanently darkened, and in them these signs are much less reliable. In first pregnancies the presence of milk in the breasts may be considered an almost certain sign, and it is one which I have rarely failed to detect even from a comparatively early period. It is true that there are authenticated instances of non-pregnant women having an abundant secretion of milk established from mammary irritation. Thus Baudelocque presented to the Academy of Surgery of Paris a young girl, eight years of age, who had nursed her little brother for more than a month. Dr. Tanner states—I do not know on what authority—that "it is not uncommon in Western Africa for young girls who have never been pregnant to regularly employ themselves in nursing the children of others, the mammæ being excited to action by the application of the juice of one of the Euphorbiaceæ." Lacteal secretion has even been noticed in the male breast. But these exceptions to the general rule are so uncommon as merely to deserve mention as curiosities; and I have hardly ever been deceived in diagnosing a first pregnancy from the presence of even the minutest quantity of lacteal secretion in the breasts, although even then other corroborative signs should always be sought for. In multiparæ the presence of milk is by no means so valuable, for it is common for milk to remain in the mammæ long after the cessation of lactation, even for several years. Tyler Smith correctly says that "suppression of the milk in persons who are nursing and liable to impregnation is a more valuable sign of pregnancy than the converse condition." This is an observation I have frequently corroborated.

As a diagnostic sign, therefore, the mammary appearances are of great importance in primiparæ, and when well marked they are seldom likely to deceive. They are specially important when we suspect

pregnancy in the unmarried, as we can easily make an excuse to look at the breast without explaining to the patient the reason; and a single glance, especially if the patient be dark-complexioned, may so far strengthen our suspicion as to justify a more thorough examination. In married multiparæ they are less to be depended upon.

In connection with this subject may be mentioned various irregular deposits of pigment which are frequently observed. The most common is a dark-brownish or yellowish line starting from the pubes and running up the centre of the abdomen, sometimes as far as the umbilicus only, at others forming an irregular ring around the umbilicus, and reaching to the epigastrium. It is, however, of very uncertain occurrence, being well marked in some women, while in others it is entirely absent.[1] Patches of darkened skin are often observed about the face, chiefly on the forehead, and this bronzing sometimes gives a very peculiar appearance. Joulin states that it only occurs on parts of the face exposed to the sun, and that it is therefore most frequently observed in women of the lower orders who are freely exposed to atmospheric influences. These pigmentary changes are of small diagnostic value, and may continue for a considerable time after delivery.

The progressive enlargement of the abdomen, and the size of the gravid uterus at various periods of pregnancy, as well as the method of examination by means of abdominal palpation, have already been described (pp. 129 and 137–140).

Fœtal Movements.—We will now consider the well-known phenomena produced by the movements of the fœtus *in utero*, which are so familiar to all pregnant women. These, no doubt, take place from the earliest period of fœtal life at which the muscular tissue of the fœtus is sufficiently developed to admit of contraction, but they are not felt by the mother until somewhere about the sixteenth week of utero-gestation, the precise period at which they are perceived varying considerably in different cases. The error of the law on this subject, which supposes the child not to be alive, or "quick," until the mother feels its movements, is well known, and has frequently been protested against by the medical profession. The so-called *quickening*—which certainly is felt very suddenly by some women—is believed to depend on the rising of the uterine tumor sufficiently high to permit of the impulse of the fœtus being transmitted to the maternal abdominal walls, through the sensory nerves of which its movements become appreciable. The sensation is generally described as being a feeble fluttering, which, when first felt, not unfrequently causes unpleasant nervous sensations. As the uterus enlarges, the movements become more and more distinct, and generally consist of a series of sharp blows or kicks, sometimes quite appreciable to the naked eye, and causing distinct projections of the abdominal walls. Their force and frequency will also vary during pregnancy according to circumstances. At times they are very frequent and distressing; at others, the fœtus

[1 The color-line is particularly well marked in the African race, and is very black in the full-blooded negro. In tumor cases, there is often a well-defined line over the *linea alba*, which is sometimes quite crooked, and of an orange hue.—Ed.]

seems to be comparatively quiet, and they may even not be felt for several days in succession, and thus unnecessary fears as to death of the fœtus often arise. The state of the mother's health has an undoubted influence upon them. They are said to increase in force after a prolonged abstinence from food, or in certain positions of the body. It is certain that causes interfering with the vitality of the fœtus often produce very irregular and tumultuous movements. They can be very readily felt by the accoucheur on palpating the abdomen, and sometimes, in the latter months, so distinctly as to leave no doubt as to the existence of pregnancy. They can also generally be induced by placing one hand on each side of the abdomen and applying gentle pressure, which will induce fœtal motion that can be easily appreciated.

As a diagnostic sign the existence of fœtal movements has always held a high place, but care should be taken in relying on it. It is certain that women are themselves very often in error, and fancy they feel the movements of a fœtus when none exists, being probably deceived by irregular contractions of the abdominal muscles, or by flatus within the bowels. They may even involuntarily produce such intra-abdominal movements as may readily deceive the practitioner. Of course, in advanced pregnancy, when the fœtal movements are so marked as to be seen as well as felt, a mistake is hardly possible, and they then constitute a certain sign. But in such cases there is an abundance of other indications and little room for doubt. In questionable cases, and at an early period of pregnancy, the fact that movements are not felt must not be taken as a proof of the non-existence of pregnancy, for they may be so feeble as not to be perceptible, or they may be absent for a considerable period.

Braxton Hicks[1] has directed attention to the value, from a diagnostic point of view, of intermittent contractions of the uterus during pregnancy. After the uterus is sufficiently large to be felt by palpation, if the hand be placed over it, and it be grasped for a time without using any friction or pressure, it will be observed to distinctly harden in a manner that is quite characteristic. This intermittent contraction occurs every five or ten minutes, sometimes oftener, rarely at longer intervals. The fact that the uterus does contract in this way had been previously described, more especially by Tyler Smith, who ascribed it to peristaltic action. But it is certain that no one, before Dr. Hicks, had pointed out the fact that such contractions are constant and normal concomitants of pregnancy, continuing during the whole period of utero-gestation, and forming a ready and reliable means of distinguishing the uterine tumor from other abdominal enlargements. Since reading Dr. Hicks's paper I have paid considerable attention to this sign, which I have never failed to detect, even in the retroverted gravid uterus contained entirely in the pelvic cavity, and I am disposed entirely to agree with him as to its great value in diagnosis. If the hand be kept steadily on the uterus, its alternate hardening and relaxation can be appreciated with the greatest ease. The advantages

[1] Obst. Trans., 1872, vol. xiii. p. 216.

which this sign has over the fœtal movements are that it is constant, that it is not liable to be simulated by anything else, and that it is independent of the life of the child, being equally appreciable when the uterus contains a degenerated ovum or dead fœtus. The only condition likely to give rise to error is an enlargement of the uterus in consequence of contents other than the results of conception, such as retained menses, or a polypus. The history of such cases—which are, moreover, of extreme rarity—would easily prevent any mistake. As a corroborative sign of pregnancy, therefore, I should give these intermittent contractions a high place. [1]

The vaginal signs of pregnancy are of considerable importance in diagnosis. They are chiefly the changes which may be detected in the cervix, and the so-called *ballottement*, which depends on the mobility of the fœtus in the liquor amnii.

Softening of the Cervix.—The alterations in the density and apparent length of the cervix have been already described (p. 142). When pregnancy has advanced beyond the fifth month the peculiar velvety softness of the cervix is very characteristic, and affords a strong corroborative sign, but one which it would be unsafe to rely on by itself, inasmuch as very similar alterations may be produced by various causes. When, however, in a supposed case of pregnancy advanced beyond the period indicated, the cervix is found to be elongated, dense, and projecting into the vaginal canal, the non-existence of pregnancy may be safely inferred. Therefore the negative value of this sign is of more importance than the positive. In connection with this may be mentioned a sign of pregnancy to which attention has recently been drawn by Hegar.[2] It consists in a peculiar elasticity of the lower segments of the uterus, made out by vaginal or rectal examination. It may serve to differentiate the pregnant uterus from certain uterine enlargements due to tumor in cases in which the diagnosis is doubtful.

Ballottement, when distinctly made out, is a very valuable indication of pregnancy. It consists in the displacement, by the examining finger, of the fœtus, which floats up in the liquor amnii, and falls back again on the tip of the finger with a slight tap which is exceedingly characteristic.

In order to practise it most easily, the patient is placed on a couch or bed in a position midway between sitting and lying, by which the vertical diameter of the uterine cavity is brought into correspondence with that of the pelvis. Two fingers of the right hand are then passed high up into the vagina in front of the cervix. The uterus being now steadied from without by the left hand, the intra-vaginal fingers press the uterine wall suddenly upward, when, if pregnancy exist, the fœtus is displaced, and in a moment falls back again, imparting a distinct impulse to the fingers. When easily appreciable it may be considered as a certain sign, for although an anteflexed fundus, or a calculus in

[1] In a case where ectopic pregnancy had been long suspected in this city, the movements here noted decided the gestation to be uterine, and the woman delivered herself. She had a bifid uterus, with one half empty, and admitting a sound four and a half inches.—Ed.]

[2] Centralblatt für Gynäk., 1887, Bd. xi. S. 805.

the bladder, may give rise to somewhat similar sensations, the absence of other indications of pregnancy would really prevent error. Ballottement is practised between the fourth and seventh months. Before the former time the fœtus is too small, while at a later period it is relatively too large, and can no longer be easily made to rise upward in the surrounding liquor amnii. The absence of ballottement must not be taken as proving the non-existence of pregnancy, for it may be inappreciable from a variety of causes, such as abnormal presentations, or the implantation of the placenta upon the cervix uteri.

Vaginal Pulsation.—There are also some other vaginal signs of pregnancy of secondary consequence. Amongst these is the vaginal pulsation pointed out by Osiander resulting from the enlargement of the vaginal arteries, which may sometimes be felt beating at an early period. Often this pulsation is very distinct, at other times it cannot be felt at all, and it is altogether unreliable, as a similar pulsation may be felt in various uterine diseases.

Uterine Fluctuation.—Dr. Rasch has drawn attention to a previously undescribed sign which he believes to be of importance in the diagnosis of early pregnancy.[1] It consists in the detection of fluctuation, through the anterior uterine wall, depending on the presence of the liquor amnii. In order to make this out, two fingers of the right hand must be used, as in ballottement, while the uterus is steadied through the abdomen. Dr. Rasch states that by this means the enlarged uterus in pregnancy can easily be distinguished from enlargement depending on other causes, and that fluctuation can always be felt as early as the second month. If it is associated with suppressed menstruation and darkened areolæ, he considers it a certain sign. In order to detect it, however, considerable experience in making vaginal examinations is essential, and it can hardly be depended on for general use.

A peculiar deep violet hue of the vaginal mucous membrane was relied on by Jacquemin[2] and Klüge as affording a readily observed indication of pregnancy. In most cases it is well marked; sometimes, indeed, the change of color is very intense, and it evidently depends on the congestion produced by pressure of the enlarged uterus. Chadwick, of Boston, has recently reinvestigated this sign, and attributes to it a high diagnostic value.[3] It has been generally stated to be unreliable, as a similar discoloration is said to be produced by the pressure of large uterine fibroids. This, however, Chadwick declares is not the case.

Auscultatory Signs of Pregnancy.—By far the most important signs are those which can be detected by abdominal auscultation, and one of these—the hearing of the fœtal heart-sounds—forms the only sign which *per se*, and in the absence of all others, is perfectly reliable.

[1] Brit. Med. Journ., 1873, vol. ii. p. 261.
[2] The credit of first drawing attention to this sign of pregnancy is generally given to Jacquemier, a distinguished French obstetrician, who wrote a work on Midwifery. It is due, however, to Jacquemin, médecin en chef de la prison de Mazas, and is, in fact, attributed to him in Jacquemier's work (Manuel des Accouchements, par J. Jacquemier, Paris, 1846, vol. i. p. 215).
[3] Transactions of the American Gynecological Society, 1886, vol. ii. p. 399.

The fact that the sounds of the fœtal heart are audible during advanced pregnancy was first pointed out by Mayor, of Geneva, in 1818, and the main facts in connection with fœtal auscultation were subsequently worked out by Kergaradec, Naegele, Evory Kennedy, and other observers. The pulsations first become audible, as a rule, in the course of the fifth month, or about the middle of the fourth month. In exceptional circumstances, and by practised observers, they have been heard earlier. Depaul believes that he detected them as early as the eleventh week, and Routh has also detected them at an earlier period by vaginal stethoscopy, which, however, for obvious reasons, cannot be ordinarily employed. Naegele never heard them before the eighteenth week, more generally at the end of the twentieth, and for practical purposes the pregnancy must be advanced to the fifth month before we can reasonably expect to detect them. From this period up to term they can almost always be heard to a certainty, if not at the first attempt, at least afterward, if we have the opportunity of making repeated examinations. Accidental circumstances, such as the presence of an unusual amount of flatus in the intestines, may deaden the sounds for a time, but not permanently. Depaul only failed to hear them in 8 cases out of 906 examined during the last three months of pregnancy; and out of 180 cases which Dr. Anderson, of Glasgow, carefully examined, he only failed in 12, and in each of these the child was stillborn. They, therefore, form not only a most certain indication of pregnancy, but of the life of the fœtus also.

The sound has always been likened to the double tic-tac of a watch heard through a pillow, which it closely resembles. It consists of two beats, separated by a short interval, the first being the loudest and most distinct, the second being sometimes inaudible. The rapidity of the fœtal pulsations forms an important means of distinguishing them from transmitted maternal pulsations with which they might be confounded. Their average number is stated by Slater, who made numerous observations on this point, to be 132, but sometimes they reach as high as 140, and sometimes as low as 120. It will thus be seen that the pulsations are always much more rapid than those of the mother's heart, unless, indeed, the latter be unduly accelerated by transient mental emotion or disease. To avoid mistakes, whenever the fœtal heart is heard its rate of pulsation should be carefully counted, and compared with that of the mother's pulse; if the rate differ, we may be sure that no error has been made. The rapidity of the fœtal pulsations remains, as a rule, the same during the whole period of pregnancy, while their intensity gradually increases. They may, however, be temporarily increased or diminished in frequency by disturbing causes, such as the pressure of the stethoscope, which, exciting tumultuous movements of the fœtus, may induce greatly increased frequency of its heart-beats. So also they may be greatly modified during labor, after the escape of the liquor amnii, when the contractions of the uterus have a very distinct influence on the fœtus. An acceleration or irregularity of the pulsations, made out in the course of a prolonged labor, may thus be of great practical importance, by indicating the necessity for prompt interference. Similar alterations,

associated with tumultuous and unusual fœtal movements felt by the mother toward the end of pregnancy, may point to danger to the life of the fœtus during the latter months, and may even justify the induction of premature labor. This is especially the case in women who have previously given birth to a succession of dead children owing to disease of the placenta, and, in them, careful and frequently repeated auscultations may warn us of the impending danger.

The rapidity of the fœtal heart has been supposed by some to afford a means of determining the sex of the child before birth. Frankenhauser, who first directed attention to this point, is of opinion that the average rate of pulsations of the heart is considerably less in male than in female children, averaging 124 in the minute in the former, as against 144 in the latter. Steinbach makes the difference somewhat less, viz., 131 for males and 138 for females. He predicted the sex correctly by this means in 45 out of 57 cases, while Frankenhauser was correct in the whole 50 cases which he specially examined with reference to the point. Dr. Hutton, of New York,[1] was also correct in 7 cases which he fixed on for trial. Devilliers found the difference in the sexes to be the same as Steinbach; he attributes it, however, to the size and weight rather than to the sex of the child, and believes the pulsations to be least numerous in large and well-developed children. As male children are usually larger than female, he thus explains the relatively less frequent pulsations of their hearts. Dr. Cumming, of Edinburgh, also believes that the weight of the child has considerable influence on the frequency of its cardiac pulsations, so that a large female child may have a slower pulse than a small male.[2] The point, however, is more curious than practical, and the rapidity of the pulsations certainly would not justify any positive prediction on the subject. Circumstances influencing the maternal circulation seem to have no influence on that of the fœtus.

The fœtal heart-sounds are generally propagated best by the back of the child, and are, therefore, most easily audible when this is in contact with the anterior wall of the uterus, as is the case in the large majority of pregnancies. When the child is placed in the dorso-posterior position, the sounds have to traverse a larger amount of the liquor amnii, and are further modified by the interposition of the fœtal limbs. They are, therefore, less easily heard in such cases, but even in them they can almost always be made out. As the fœtus most frequently lies with the occiput over the brim of the pelvis, and the back of the child toward the left side of the mother, the heart-sounds are usually most distinctly audible at a point midway between the umbilicus and the left anterior superior spine of the ilium. In the next most common position, in which the back of the child lies to the right lumbar region of the mother, they are generally heard at a corresponding point at the right side, but in this case they are frequently more readily made out in the right flank, being then transmitted through the thorax of the child, which is in contact with the side of the uterus. In breech cases, on the other hand, the heart-

[1] New York Med. Journ., 1872, vol. xvi. p. 68.
[2] Edin. Med. Journ., vol. 1875–76, pp. 230, 317, 418.

sounds are generally heard most distinctly *above* the umbilicus, and either to the right or left, according to the side toward which the back of the child is placed. It will thus be seen that the place at which the fœtal heart-sounds are heard varies with the position of the fœtus; and this, when combined with the information derived from palpation, affords a ready means of ascertaining the presentation of the child before labor. The sounds are only audible over a limited space, about two or three inches in diameter; therefore, if we fail to detect them in one place, a careful exploration of the whole uterine tumor is necessary before we are satisfied that they cannot be heard.

The only mistake that is likely to be made is taking the maternal pulsations, transmitted through the uterine tumor, for those of the fœtal heart. A little care will easily prevent this error, and the frequency of the mother's pulse should always be ascertained before counting the supposed fœtal pulsations. If these are found to be 120 or more, while the mother's pulse is only 70 or 80, no mistake is possible. If the latter is abnormally quickened greater care may be necessary, but even then the rate of pulsation of each will be dissimilar. Braxton Hicks[1] has pointed out that in tedious labor, when the muscular powers of the mother are exhausted, the muscular susurrus may produce a sound closely resembling the fœtal pulsation; but error from this source is obviously very improbable.

In listening for the fœtal heart-sounds the patient should be placed on her back, with the shoulders elevated and the knees flexed. The surface of the abdomen should be uncovered, and an ordinary stethoscope employed, the end of which must be pressed firmly on the tumor, so as to depress the abdominal walls. The most absolute stillness is necessary, as it is often far from easy to hear the sounds. Sometimes, after failing with the ordinary stethoscope, I have succeeded with the binaural, which remarkably intensifies them. When once heard they are most easily counted during a space of five seconds, as, on account of their frequency, it is not always possible to follow them over a longer period.

When the fœtal heart-sounds are heard distinctly, pregnancy may be absolutely and certainly diagnosed. The fact that we do not hear them does not, however, preclude the possibility of gestation, for the fœtus may be dead, or the sounds temporarily inaudible.

Other Sounds heard in Pregnancy.—There are some other sounds heard in auscultation which are of very secondary diagnostic value. One of these is the so-called *umbilical* or *funic souffle*, which was first pointed out by Evory Kennedy. It consists of a single blowing murmur, synchronous with the fœtal heart-sounds, and most distinctly heard in the immediate vicinity of the point where these are most audible. Most authors believe it to be produced by pressure on the cord, either when it is placed between a hard part of the fœtus and the uterine walls, or is twisted around the child's neck. Schroeder and Hecker detected it in fourteen or fifteen per cent. of all cases, and the latter believed it to be caused by flexure of the first portion of the

[1] Obst. Trans., 1874, vol. xv. p. 187.

cord near the umbilicus. For practical purposes it is quite valueless, and need only be mentioned as a phenomenon which an experienced auscultator may occasionally detect.

The *uterine souffle* is a peculiar single whizzing murmur which is almost always audible on auscultation. It varies very remarkably in character and position. Sometimes it is a gentle blowing or even musical murmur; at others it is loud, harsh, and scraping; sometimes continuous, sometimes intermittent. It may also be heard at any point of the uterus, but most frequently low down, and to one or other side; more rarely above the umbilicus, or toward the fundus; and it often changes its position so as to be heard at a subsequent auscultation at a point where it was previously inaudible. It may be heard over a space of an inch or two only, or in some cases over the whole uterine tumor; or again, it may sometimes be detected simultaneously over two entirely distinct portions of the uterus. It is generally to be heard earlier than the fœtal heart-sounds, often as soon as the uterus rises above the brim of the pelvis, and it can almost always be detected after the commencement of the fourth month. The sound becomes curiously modified by the uterine contractions during labor, becoming louder and more intense before the pain comes on, disappearing during its acme, and again being heard as it goes off. Hicks attributes to a similar cause, viz., the uterine contractions during pregnancy, the frequent variations in the sound which are characteristic of it.[1] The uterine souffle is also audible after the death of the fœtus, and it is believed by some to be modified and to become more continuously harsh when that event has taken place.

Very various explanations have been given of the causes of this sound. For long it was supposed to be formed in the vessels of the placenta, and hence the name "*placental souffle*," by which it is often talked of; or if not in the placenta, in the uterine vessels in its immediate neighborhood. The non-placental origin of the sound is sufficiently demonstrated by the fact that it may be heard for a considerable time after the expulsion of the placenta. Some have supposed that it is not formed in the uterus at all, but in the maternal vessels, especially the aorta and the iliac arteries, owing to the pressure to which they are subjected by the gravid uterus. The extreme irregularity of the sound, its occasional disappearance, and its variable site, seem to be conclusive against this view. The theory which refers the sound to the uterine vessels is that which has received most adherents, and which best meets the facts of the case; but it is by no means easy, or even possible, to account for the exact mode of its production in them. Each of the explanations which have been given is open to some objection. It is far from unlikely that the intermittent contractions of the uterine fibres, which are known to occur during the whole course of pregnancy, may have much to do with it, by modifying, at intervals, the rapidity of the circulation in the vessels. Its production in this manner may also be favored by the chlorotic state of the blood, to which Cazeaux and Scanzoni are inclined to attribute an important

[1] Op. cit., p. 223.

influence, likening it to the anæmic murmur so frequently heard in the vessels in weakly women.

From a diagnostic point of view the uterine souffle is of very secondary importance, because a similar sound is very generally audible in large fibroid tumors of the uterus, and even in some few ovarian tumors; it is, therefore, of little or no value in assisting us to decide the character of the abdominal enlargement. The supposed dependence of the sound on the placental circulation has caused its site to be often identified with that of the placenta. It is, however, most frequently heard at the lower part of the uterus, while the placenta is generally attached near the fundus, so that its position cannot be taken as any safe guide in determining the situation of that organ.

Occasionally, in practising auscultation, irregular sounds of brief duration may be heard, which are not susceptible of accurate description, and which doubtless depend on the sudden movement of the fœtus in the liquor amnii, or on the impact of its limbs on the uterine walls. When heard distinctly they are characteristic of pregnancy; and they may be sometimes heard when the other sounds cannot be detected. They are, however, so irregular, and so often entirely absent, that they can hardly be looked upon in any other light than as occasional phenomena.

Two other sounds have been described as being sometimes audible, which may be mentioned as matters of interest, but which are of no diagnostic value. One is a rustling sound, said by Stoltz to be audible in cases in which the fœtus is dead, and which he refers to gaseous decomposition of the liquor amnii; its existence is, however, extremely problematical. The other is a sound heard after the birth of the child, and referred by Caillant to the separation of the placental adhesions. He describes it as a series of rapid short scratching sounds, similar to those produced by drawing the nails across the seat of a horsehair sofa. Simpson[1] admitted the existence of the sound, but believed that it is produced by the mere physical crushing of the placenta, and artificially imitated it out of the body by forcing the placenta through an aperture the size of the os uteri.

It will be seen, then, that although there are numerous signs and symptoms accompanying pregnancy, many of them are unreliable by themselves, and apt to mislead. Those which may be confidently depended on are the pulsations of the fœtal heart, which, however, fail us in cases of dead children; the fœtal movements when distinctly made out; ballottement; the intermittent contractions of the uterus; and to these we may safely add the presence of milk in the breasts, provided we have to do with a first pregnancy.

The remainder are of importance in leading us to suspect pregnancy, and in corroborating and strengthening other symptoms, but they do not, of themselves, justify a positive diagnosis.

[1] Selected Obstet. Works, p. 151.