thirty, yet instances have been recorded as early as twelve and as late as fifty-six years. An overgrowth existing in an active organ would be expected to induce pain and impair function; and the first expectation is verified in many cases, for pain in the breast during menstruation and pregnancy is common; during menstruation and pregnancy, also, increase in size of the tumor may occur, to subside as the gland regains physiological rest. Hereditary predisposition is not apparent, and it is a singular fact that the negro, in whom fibroma uteri is very often found, is very rarely the subject of circumscribed fibroma mammæ. The variety of growth under consideration presents itself as a circumscribed, rounded mass, firm and elastic to the touch, with here and there, perhaps, a protruding boss, in which fluctuation may be apparent, indicating cystic association. The most usual site is that of the periphery of the breast, above the nipple, where the tumor will be found projecting under the skin; when deeply situated within the gland a fibroma is more apt to be intracanalicular. Variation in tension of a cyst, from absorption of its contents, will cause an apparent change of consistence in the tumor. A capsule is usually present, but where much glandular tissue is joined with the fibrous —*e.g.*, in intracanalicular growths,—the capsule is not complete. Neighboring tissues move freely over the growth. Section shows interlacing bundles of white fibrous tissue, with moist surface, and also, perhaps, acini or ducts dilated into cysts. While these fibroids usually occur singly, several may exist in one breast, or in both breasts simultaneously; they only exceptionally attain great size. The rate of growth is slow in solid tumors, but more rapid in the cystic variety; a sudden and very rapid increase is almost certainly an evidence of the cystic character of the tumor, and will cause change in its shape; cysts are more apt to occur (cysto-fibroma) toward the end rather than the beginning of menstrual life. A discharge of serous fluid from the nipple may occur with an intracanalicular growth; when the fluid is bloody, telangiectatic formation, or rapid growth (with increased vascularity), is probable. Adhesion of the growth to the skin, or surface ulceration, occurs as an accident only. The neighboring lymphatics are not involved, and though a recurrence may be, and is, observed in rare cases, yet such recurrence is as a local growth without tendency to infiltrate adjacent parts. Fibroma rarely undergoes degenerative change—fatty, myxomatous, and cystic changes being the most frequent. So far as regards danger to life, a favorable prognosis is indicated. The treatment proper for fibroma is removal by incision, so directed as to interfere as little as possible with mammary function.

Lipoma and *enchondroma* are not met with in the mamma, or so rarely as to be museum curiosities. Submammary lipoma has been seen, however, a certain number of times, and in no respect does it differ from fatty tumor elsewhere in the body, save perhaps that it has been more frequently observed in early life. The diagnosis and treatment are the same as in other parts of the body. Myxoma is rare, and presents itself in the breast as a single, rounded, perhaps bossed tumor, usually in the upper half of the breast. On section it appears as a light-colored, jelly-like mass, yielding apparently mucin—hence the name myxoma. Not infrequently fibrous, vascular, or fatty areas exist in the growth. The tumor originates in the connective tissue between the lobules and is usually encapsulated. The latter half of menstrual life is the chosen age. Inflammation occurs exceptionally, but may induce ulceration of skin already infiltrated or stretched, with, perhaps, protrusion of the growth, which is movable usually in the mammary tissue and also upon the thorax. Increase is more rapid than that of fibroma, and the consistence is less firm; a cyst, if present, will not be recognized very easily. Involvement of both breasts (simultaneously) is not seen. Retraction of the nipple is not observed, pain is wanting, and adjacent lymphatics are uninvolved. An incision will usually be required in order that the diagnosis may be made. Removal of the tumor by careful dissection will sometimes be followed by a recurrence *in situ*; removal of the entire gland, together with any involved skin, is therefore indicated.

The term malignant, applied to a morbid growth, is used to indicate a tumor differing histologically from the tissue in which it is situated, having a tendency after removal to recur *in situ*, and having also a tendency to reproduce itself in distant parts of the organism.

Sarcoma is a tumor composed of cellular elements of the connective-tissue type, which do not develop to maturity but remain embryonic; an intercellular substance is present, though but in scant quantity, and there is a new growth of vessels.

Sarcomata are named according to the character of the cells of which they are mainly composed: spindle-celled, round-celled, myeloid, lymphoid, etc. Not infrequently different parts of the same tumor show variations of cell growth, and with some this is the rule, *e.g.*, with myeloid tumors, in which the giant cells (myeloplaxes) rest in a spindle- and round-celled stroma (for histology see article on *Tumors*). Rarely seen before the establishment of menstruation, sarcoma invades the breast by preference between the ages of thirty and forty years, appearing infrequently after the cessation of menstrual life. In this respect it differs from carcinoma. Spindle-celled sarcoma is most often met with at an earlier age than other varieties. I am unable to connect the sterile or multiparous state with the etiology of sarcoma, although the relation with menstruation has been referred to. Traumatism is the unmistakable starting-point in certain cases; antecedent inflammation, save in very exceptional instances, is lacking.

Carcinoma, as I have noted, may develop from an induration left by puerperal mastitis; but I cannot recall ever having had such an experience with sarcoma. The upper half of the breast is more often affected.

In its general outlines sarcoma of the breast is rounded, oval, etc., in shape, and there exists a capsule which does not shut off the tumor from surrounding parts, so as to prevent extension; the capsule is formed of connective tissue pushed aside by the increasing tumor, and is infiltrated by its proliferating cells; outside of the capsule there are to be seen (microscopically), principally along the vessels, numerous cells, which I believe are already impressed with the character of the original tumor, or are direct offshoots from it, and develop into a similar neoplasm. The insufficiency of any operation which attemps to effect a cure without destroying such an area of infection is patent. The shape of the sarcoma varies with the rapidity of its growth, there being always a tendency to increase in the direction of least resistance. Sudden change in outline indicates a giving way of an opposing structure, cyst formation, or else extravasation of blood from a ruptured vessel; a general rounded outline will be preserved, however. Trauma may give rise to extravasation of blood and consequent change of shape, but here the history aids the diagnosis. The growth of sarcoma varies much, and bears a certain relation to its anatomy, the spindle-celled variety being of slowest growth and firmest consistence, and having a more perfectly defined capsule; while, on the other hand, a round-celled sarcoma is softer, grows rapidly, presents often rounded outcroppings, and the new-formed vascular channels are apt to rupture and permit extravasation, not in one only but in several places. Cystic formation may cause sudden change of shape. Variation in rate of increase characterizes sarcoma; a nodule may remain for years without exciting suspicion, and then, from no known cause, grow with extreme rapidity. It is not usual for rapid growth to be succeeded by slow increase, but nevertheless this has been observed. When cystic or other degeneration occurs, slow growth is not to be expected, but rather continuous progress; and the same is to be said when extravasation occurs, save from trauma. An intercurrent inflammation is apt to induce quick growth.

Increased temperature is noted in rapidly growing sarcomata. The volume sometimes attained is enormous, tumors of many pounds in weight being recorded.

Sarcoma is usually single, and very rarely affects both breasts simultaneously.

Adhesion to the chest wall is not usual, even if the tumor be of extreme size; on the other hand, implication of the great pectoral muscle is seen, but not so frequently as in the case of carcinoma. Protrusion through an intercostal space into the thorax has been observed.

Implication of the chest muscles will be recognized by investigating the mobility of the tumor when the great pectoral is alternately rendered tense and relaxed. The skin, although greatly stretched, generally remains movable over the neoplasm for a long time, and may be discolored red or purplish. Ulceration of the skin from pressure of, and incorporation with, a subjacent growth is much less often seen than in the case of a carcinoma. When, however, the skin has given way, fungous protrusion is usual; the nipple is not affected, and a serous or somewhat blood-stained oozing, which has been observed in many cases, indicates involvement of ducts in or by the morbid growth; hence it occurs with cysts.

Pain is often complained of; not, however, in my experience, until the tumor had attained a certain size. When ulceration is present, a certain discomfort is to be expected. I am inclined to attribute the occurrence of pain to pressure and traction upon nerves, rather than to the fact of their being involved in a rapidly growing tumor. Pain is referred to the arm in certain cases.

Lymphatic enlargement is rare in sarcoma, and, when present, is due to irritative rather than to specific implication of the glands. Axillary bubo is therefore not often seen, and, if present, would raise a suspicion of carcinoma. The presence of ulceration, either from implication of skin in the morbid growth or from irritating applications, is often followed by hyperplasia of the adjacent lymphatic glands.

It is believed that sarcoma becomes generalized by way of the blood-vessels rather than by that of the lymphatics; hence the apparent immunity of the axilla in advanced disease.

General infection (sarcomatosis) is recognized by the formation of metastatic tumors. The lungs, presenting the first set of capillaries which sarcoma elements would meet after entering the circulation, would be expected frequently to be the seat of secondary growths, and such is indeed the fact. It is not possible to say at what time secondary tumors are most likely to appear, but it is always wise to question the lungs before operating upon a sarcomatous breast, lest a pulmonary metastasis be present, and the operation do harm by reducing the patient's strength. Local recurrence after operation is frequent, and while it is not possible to state the percentage in which a return *in situ* is to be looked for, yet it can be accepted as the result of clinical observation that the softer and more rapidly growing a sarcoma is, the more likelihood exists of recurrence; conversely, the firmer and more slow-growing the tumor is, the less chance is there of a return. Youth is more disposed to recurrence than age.

From the foregoing, one would expect a round-celled sarcoma to justify a more unfavorable prognosis than a spindle-celled one.

Cystic formations are present in many sarcomata; they result either from dilatation of ducts or from fatty or mucoid degeneration. Calcareous, bony, or cartilaginous formations have been noted, and are to be regarded as curiosities.

The only *treatment* that offers any prospect of a cure is extirpation, free and complete, so as to remove not only the tumor, but the area of infection, already referred to, as well. Failure to succeed in this latter condemns a patient to early recurrence *in situ*. Local recurrent tumors also are to be excised, and immunity from return is thus gained. The removal of one tumor, when the disease is generalized, is useless. The well-known case of S. D. Gross may be recalled with advantage:—A single woman was subjected to twenty-two operations in four years; the number of recurrent tumors removed was fifty-one, and varied in size from an almond to a hen's egg. Large portions of the pectoral, and also of the external and internal intercostal muscles, were cut away. Ten years and nine months after the last operation she was in perfect health.

Melanotic sarcoma is very malignant.

Carcinoma is an atypical new formation of epithelioid elements; for the anatomy, the reader will consult the articles on *Carcinoma*, and *Tumors*.

Carcinoma is the most common and at the same time the most fatal of breast tumors; it affects all classes and all social conditions. Scirrhus and encephaloid, usually known as hard and soft cancer, are the varieties most often met with, the former in far greater proportion than the latter, however. Forty-eight to forty-nine years is generally accepted as the average age of patients coming under treatment; but it is to be remembered that the tumor will have existed for a certain time already before being seen by a physician, or, what is occasionally met with, but I am glad to say rarely, a patient will have been advised by a physician to pay no attention to the lump, and so a long time may be passed in fancied security. My personal experience leads me to consider forty-eight years too late an average age when carcinoma is first observed, forty-five or forty-six being more exact. The menopause is the period just before or just after which carcinoma may be expected to appear; indeed, the period of two years preceding the cessation of menstruation is especially favorable for its development. The earliest age at which I have seen a scirrhous carcinoma of the breast is twenty-seven years. Before thirty-five the occurrence of carcinoma is very rare. Traumatism and preceding inflammation are occasionally exciting causes, but not sufficiently often to be considered as exercising a potent influence for evil.

Heredity has long been held up as having causative power, but such predisposition can at most be traced to nine or ten per cent. Occasionally the opposite is seen, as in the case of Mme. Z—— and family,[26] in whom sixteen deaths from cancer occurred in seventy years.

While, then, blows, the remains of a previous abscess, and hereditary peculiarity may and do exist in a causative relation with carcinoma, yet the degenerative changes in the mamma consequent upon cessation of function is, without doubt, the most powerful influence in the development of carcinoma. Carcinoma begins in one breast; its presence in both should be accepted as indicative of general infection; it is never encapsulated, but is infiltrated into the adjacent structures. Thus, the outline is not so well defined as in sarcoma, and while outcroppings are rounded, the body of the tumor may be in shape irregular; this is especially the case with scirrhus. Soft carcinoma is of rapid growth as compared with the hard variety; it is more vascular, more rounded in form, and gives to the hand a sense of fluctuation; the mammary gland is incorporated with, and not distinguishable from, the neoplasm. Scirrhous carcinoma, on the other hand, is of slower growth, of extremely hard consistence without much elasticity, presents to the examining hand firm but not large irregularities, and is apt to be flattened, as indeed the mamma is flattened; in a late stage only is it to be seen as a projecting tuber elevating the skin. Scirrhus conveys to the hand a sense of weight rather than of bulk. Soft carcinoma may attain great size. As a point of differential diagnosis it is to be noted that scirrhus commences generally within the mamma, which is felt, in an early stage, to surround it on all sides, except toward the thorax, of course. Adhesion to chest-wall contraindicates an operation, the rule in this respect differing from that for sarcoma, which may sometimes be removed with advantage under such circumstances, if of slow growth. Fixation to skin, as well as to chest, is marked in the scirrhus variety, showing itself by lessened mobility and later by the formation of dimples.

Adhesion to chest is recognized by lessened mobility, and is always preceded by the tumor becoming incorporated with the great pectoral muscle; axillary swelling will also be found at this time if sought for. Retraction of the nipple is an almost constant symptom in scirrhus, and results from incorporation of the large ducts with

the tumor. Soft carcinoma and sarcoma do not present this peculiarity; hence its importance from a diagnostic view. A discharge from the nipple would indicate implication of the ducts; it is a rare symptom and has no clinical significance. In adeno-carcinoma a serous discharge from the nipple is common. From the preceding it would be expected that a certain fixation of the nipple, the impossibility of drawing it forward, would be present before retraction took place; this is so, and constitutes a valuable diagnostic sign early in the life of carcinoma (scirrhus). Besides adhesion and dimpling, infection of the skin may be recognized by the appearance of small, firm infiltrations, without elevation of surface or discoloration, in the neighborhood of the original growth. These indurations, which are first recognized by the touch, become harder, elevated, discolored, livid, and then ulcerate; in atrophic carcinoma they may even cicatrize. Their presence is indicative of an extremely large infected territory around the primary growth.

I have never seen good results follow operations upon such growths; the resulting wound does not cicatrize, and the skin edges rapidly become infiltrated with new growth. Much importance has been attributed to the presence of large veins in the skin of a breast as indicating a certain kind of tumor; I cannot admit that this is quite the fact, except in the general way that it is usual to find large vascular channels in the vicinity of a rapidly growing neoplasm. In atrophic carcinoma enlarged veins are very rarely seen, for here the circulation near the surface is not greatly increased. Ulceration in the skin is seen, commencing as a crack or fissure, which widens out and deepens, presenting the appearance of a shallow excavation with indurated edges and base usually ragged, of pale color; the discharge is thin and ill-smelling; partial healing, with a thin, unhealthy scar, sometimes takes place. When softening of the tumor occurs, from one cause or another, and the skin gives way, there results a deep, crater-like pit, with everted edges, hard, irregular base, and profuse discharge. Hard carcinoma pursues the manner of ulcerating first described, soft carcinoma the latter. Fungous protrusion I have not seen follow carcinoma ulceration. As has been said already it is seen in the ulceration of sarcoma.

Pain is variable. I have repeatedly seen carcinoma of the breast, with implication of the skin and several glandular enlargements in the axilla, and yet the patient only accidentally discovered that the mamma was involved in any morbid process. Two such cases have come under my notice within the past month: both patients were seen within four days after the discovery of the mammary swellings. The classical, lancinating, darting, shooting pains are exceptional in the incipient stage of the tumor; later, however, they are present; with inflammation and sloughing the pain is great; in atrophic scirrhus, with ulceration long continued, pain is extremely varied. Infection of adjacent lymphatic glands in carcinoma is a question of time; sooner or later it will occur, save in rare instances. The axillary glands, substernal, intercostal, and supraclavicular, sooner or later become involved. Just how soon glandular infection occurs is not known, as the primary growth exists some time before being discovered.

The axillary enlargements result from the passage of elements from the original tumor through the lymphatics, and their arrest and growth in the lymph glands, thus reproducing the disease in the armpit, from which, continuing their journey by lymph channels, tumor elements enter the general circulation, and carcinosis results. It will sometimes, though very rarely, be found that general infection occurs without glandular implication to any degree; this is to be explained by direct transmission through veins. Occasionally also slight glandular enlargement will disappear after removal of the original growth; in such a case it is clear that the glands were not carcinomatous, and were probably only irritated; but why this should occur in one case and not in another, we do not yet know. Carcinoma shows a predilection for the liver, lungs, and serous surfaces when it attacks internal organs. Colloid and cystic degenerations are those most often met with in carcinoma. Inflammation running into abscess is rarely seen except in connection with rapid growth, when also acute sloughing may occur.

The prognosis of carcinoma is extremely grave, if left alone or if operated upon. S. W. Gross[27] gives the average duration of life for patients not operated upon as 27.1 months, and for those who died after they had submitted to an operation, as thirty-nine months; which shows that the operation added a year of life to each patient. He furthermore computes the percentages of recovery at 9.05. Owing to the fact that operation for removal of carcinoma is now extended so as to remove adjacent structures which may be involved in the growth the percentage of recovery has increased enormously; probably twenty-seven per cent. of patients operated upon for carcinoma mammæ are now free from recurrence for three years after operation.

Carcinoma following long-continued ulceration of the nipple—Paget's disease—has already been referred to.

Within the past few years our knowledge of adenoma has undergone a great change. Instead of being often met with it is now believed to be one of the growths most rarely encountered, and the so-called adenoid growths, adenocele, and adeno-cystic tumors are recognized as composed of connective tissue, containing deformed glandular elements—fibromata.

It is doubtful whether it would be possible to differentiate clinically between fibroma and adenoma, nor indeed does it appear to be necessary, since both belong to the category of benign growths, and are to be subjected to like treatment. Perhaps the most notable fact observed in connection with adenoma is the extreme frequency with which cysts occur in its substance, a circumstance which is due of course to the presence of ducts which have undergone dilatation.

Transformation or change in a tumor is met with and is always to be regarded with suspicion if characterized by rapid growth.

TREATMENT.—A benign tumor of the breast is removed by freely uncovering it; the incision is to be directed from the nipple outward so as to do as little harm as possible to adjacent ducts, after which the growth is to be freed from attachment. It has been suggested that, to avoid a scar, the following manner of operating be adopted: "Carry an incision as long as necessary around the lower edge of the breast where it joins the thorax, raise the breast, and through the incision indicated remove the growth from the posterior aspect of the gland, arrest hemorrhage, insert a glass drainage tube, replace the breast," etc. Lateral stitches can be inserted before replacing the breast so as to give prominence to the breast. It is probable that few tumors require such an operative measure; benign growths are usually situated in the upper half of the breast, not beneath it, so that an incision through the skin, and at once down upon the tumor, is more simple. As the mamma is generally covered save in exceptional instances, the presence of a scar may be disregarded.

When malignant disease of the breast is presented for treatment it becomes necessary for the surgeon to decide whether an operation is expedient at all or whether the disease has spread so extensively as to preclude the possibility of benefit by operative measures. While it is impossible to lay down hard-and-fast rules, it may be said generally that operation is not expedient if the growth cannot be removed; if life is to be shortened by the operation; if pain and suffering are not to be diminished by the operation. The operation is to be undertaken if there is a good prospect of removing the growth; if life is to be prolonged; if pain and suffering are to be diminished. These questions the surgeon must decide, after which the operation itself must be considered.

It has been before said that outside and around a malignant tumor there is an area of tissue already sown with seed which, if not removed, will reproduce the original growth. Any operation which removes the tumor and leaves this infected area will certainly be followed by

speedy recurrence; free and complete extirpation is therefore the first duty of the surgeon. In carcinoma, and perhaps sometimes in sarcoma, the lymph glands are involved: they are to be taken away. If they are enlarged and cannot be removed, no operation on the breast is to be undertaken. The glands above the clavicle, under the edge of the sternum, and along the ribs are to be searched for and removed. These two latter groups are more apt to be involved if the growth lies to the sternal side of the nipple. Not only the lymph glands but the lymph channels should be taken away with the breast, and these channels are in close relation with the pectoral muscles and axillary fat; so that extirpation of a carcinomatous breast or a sarcomatous one calls for removal of the tumor itself together with the entire mamma and skin over it which is or may be infected, both pectoral muscles, and axillary contents, consisting of fat, fascia, and lymphatics. It will be best, save in rare cases, to carry an incision into the neck, exposing the supraclavicular space, and to remove any lymphatics there found. It is difficult to state the lines of incision which shall enable the operator in all cases to carry out the above requirements. A tumor involving the skin near the sternum, and one involving the skin near the axilla, will call for different incisions.

Speaking generally, then: the breast is to be removed by an incision circumscribing widely the skin over the centre of the growth and passing through healthy tissue. This incision is to be extended into the axilla and down the arm, and will be more or less racquet-shaped, the handle passing through the axilla, and the other end, more or less round, corresponding to the mamma. From this incision a cut is to be carried upward over the clavicle into the neck. To facilitate closure of this extensive wound I divide the skin downward several inches along the anterior axillary line. The flaps so marked out, consisting of skin and connective tissue, are very freely reflected, the incisions are then deepened, and the great pectoral muscle on which rests the mamma is reflected from the thorax and clavicle. The lesser pectoral may be separated with the greater or be taken away during the dissection of the axilla. The axilla is now carefully cleaned by dissection of all fat and lymphatics, during which the lesser pectoral if present is removed. The supraclavicular region, edge of sternum, and intercostal spaces are searched for lymphatics, which are removed. It may be expedient to take away a piece of rib if suspiciously near the neoplasm. Dissection is facilitated by removal of breast and axillary tissue in one piece. Bleeding during the operation is controlled by hæmostats or ligature. As a marked furrow in the muscle distinguishes the portion of the great pectoral which is attached to the sternum from that which is attached to the clavicle, separation of fibres is quickly and easily made, and the clavicular portion rarely if ever requires removal. When left it assists motion of the humerus. So far as my experience goes, splitting the great pectoral tendon and dividing the portion that corresponds to the removed muscle can be accomplished most easily with scissors.

Closure of the large wound resulting from this operation may be effected by skin grafting or by forming flaps as occasion seems to justify; or else healing by granulation may be permitted. Mixter fashions a large flap from the other side of the sternum, and causes the unaffected mamma to slide until it lies near the middle line.

When dissecting an axilla I at once uncover the axillary vein at its lower (brachial) end, and with this as my landmark the affair becomes simple.

Occasionally ligation of the axillary veins is required; I have never seen trouble follow this procedure.

I have observed that patients whose wounds do badly, from erysipelas or other cause, suffer speedy recurrence; an additional reason for securing early cicatrization. Recovery from amputation of the breast is usually rapid, and the mortality is small.

Recurrence after amputation demands extirpation as in the first instance, unless the secondary growth occur at a spot where complete removal is not possible. By repeated operations I have prolonged life and given comfort for years. Several years ago I operated upon a single woman, aged forty-eight, for the third time, removing a small nodule as large as a pea, one-fourth inch in diameter, and also two indurated axillary glands. She was first operated upon in 1878, and for the two recurrences in 1882 and 1885 respectively. Microscopical examination enabled me to make a positive diagnosis in regard to its carcinomatous nature. An operation should not be undertaken if the primary growth cannot be removed together with involved axillary glands, or when it is apparent that general infection has already taken place. The surgeon, therefore, must not only examine the apparently affected region, but also investigate the integrity of internal organs as well. Extirpation of mammary growths by means other than the knife, *e.g.*, by caustics, scarcely requires mention; so much the best instrument is a knife, if properly guided. Until we can find a caustic which will seek out and destroy the neoplasm, sparing healthy tissue, the knife will hold the first place. It may perhaps be expedient, when the tissue is very vascular, or when the ribs are suspiciously near the base of a carcinoma, to apply a caustic after the knife has been used, but such instances are exceptions. When an operation is inexpedient, the surgeon must direct his efforts to the relief of the local discomfort by proper dressings, and to the amelioration of the general condition by appropriate medication. The condition of the patient is most unhappy, and I have always thought it expedient to allow opium or its alkaloid, morphine, in sufficient quantity to bring about a state of comparative relief. I have observed that in stout people recurrence of an extirpated growth is more rapid than in those of more slender build.

L. McLane Tiffany.

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[10] Thèse de Paris, 1880, p. 63.
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[15] Gaz. méd. de Paris, 1859, p. 818.
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[18] Bibliot. de Manget, t. iii., liv. ii., p. 252 (from Labarraque, Thèse de Paris, 1875). [19] *Loc. cit.* [20] *Loc. cit.*
[21] Dub. Quart. J. Med. Sc., 1870, p. 340. [22] *Loc. cit.*
[23] Brit. Med. Journ., 1874, ii., 106. [24] Joly: Thèse de Paris, 1851.
[25] Trans. Edinb. Obst. Soc., 1875, iii., 122.
[26] Broca: Traité des tumeurs, vol. i., p. 152.
[27] Tumors of the Mammary Gland, p. 164.

BREATH,—air respired (E.) A. S. bræd, breath, odor. Perhaps allied to Latin *fragrare*, to emit a scent: *fragum*, a strawberry; but this is uncertain.* Thus in the very origin of the word there is inherent the idea of odor. The breath consists of nitrogen and oxygen, the proportion of the latter being less than that present in the atmosphere; a little more than four per cent. of carbonic acid, aqueous vapor, ammonia, and organic impurities. Within the last quarter of a century, much work has been done in investigating the nature of the organic matter of expired air. Ben, in 1893, obtained 100 c.c. of water from 3,000 litres of expired air. The odor of this water was peculiar but not disagreeable. Its organic contents weighed 5 mgm. There were no alkaloids in it, but it gave a reaction for ammonia. It would seem that this organic matter is not capable of producing acute intoxication, but the untoward effects incident to breathing in limited spaces are due to lack of oxygen. There is no certain knowledge as to whether micro-organisms may be eliminated by the breath, although the laity believe in this possibility. Welch states that the consensus of authority is against the probability of such an occurrence. Experiments have shown the difficulty with which micro-organisms are detached from moist surfaces by air currents, so that it is likely that they are never conveyed to the outside air by ordinary quiet breathing. The proportion of car-

* Skeats' Etymological Dictionary of the English Language.