CASE VI. A. H., a labourer, aged 27, was admitted under my care on May 1st, 1859, suffering from long standing scrofulous disease of the right knee. He was pale and thin, being wasted from much pain; but otherwise he was in good health.

History. Eight years back, the disease originated in a blow. He was under surgical treatment for various periods during this time; and, about two years since, was under my care in the hospital. At that time, the use of issues, and absolute rest to the limb, sufficed to control the disease; and he was enabled to leave at the end of two months, free from pain; and to get about by the aid of crutches and a support for the knee. He remained well, with the good prospect of a stiff knee, for eighteen months. It then again became painful, and increased in size, so that, his health beginning to suffer, he determined to submit to amputation, and accordingly sought the hospital once again with this view.

On examination, the joint was observed to be evenly enlarged, all the bony prominences having disappeared, and an uniform whitish pulpy appearance being presented. The limb was straight; but the least movement of the joint, or pressure of the patella, occasioned acute pain.

May 18th. I excised the joint, in preference to amputation. The operation was accomplished in the customary manner, half an inch of the femur, and the same amount of the tibia, being sawn off, and the patella being likewise removed. There was rather abundant hæmorrhage, a large superior external articular artery requiring a ligature.

Examination of the Resected Parts. The excised parts presented an appearance of profound destruction of cartilage. The faces of the condyles, and the corresponding surfaces of the tibia, were hollowed out by the extension of mischief, and the bony structure adjacent was rendered of a spongy character. The under surface of the patella was similarly affected. There was no trace of the synovial membrane remaining. There was no collection of pus within the joint, but there was a large gathering of matter freed in the course of the incision by the side of the tibia.

For the first few days following he suffered from severe constitutional disturbance, and from a threatening of erysipelas. These drawbacks having subsided, he was doing well, when, on the 24th—six days after the operation—he was seized with alarming arterial hæmorrhage from the situation of the ligature on the superior external articular vessel, which had been thrown off. Before assistance could be rendered, he had lost nearly two pints of blood, and, but for a timely fainting, would in all probability have died, as it was night, and the occurrence was for a few moments unobserved by the attendants. Pressure on the femoral, at the pubic arch, happily sufficed to check any renewal of the bleeding; and for a few days he was most closely watched. However, under the liberal use of stimulants and abundant nourishment, he gradually revived in strength, whilst the wound closed in with marked rapidity. Some suppuration occurred about the situation of the patella, and required relief by an incision; but otherwise the progress of the case, though slow, was satisfactory. The limb was perfectly straight, and the union between the sawn extremities of a fibrous character.

After getting about the ward for some time on crutches, the joint being supported by a splint, he left for fresh air in the country, on September 29th, four months and a half after the operation.

CASE VII. S. E., aged 13, a delicate strumous-looking child, of marked intelligence, was admitted under my care on July 27th, 1859, with long standing scrofulous disease of the right knee.

History. Two years and a half since, a fall for the first time injured the joint, leading to pain and swelling, and inability to bear weight in standing or walking. Twelve months since, he came under my care in the hospital. At this time the limb was flexed, and of no use. It was straightened under chloroform, and, by the aid of rest and careful bandaging, became so free from pain that he left able to bear his weight, and to get about without the aid of a crutch. However, twelve months passed by, and the knee becoming painful, he was again admitted.

Present State. The joint is very large, globular in shape, acutely painful to the touch, or on the least attempt at movement. It is semiflexed, and the limb above and below is greatly wasted. The child has a hectic appearance, and is much reduced in strength from long continued pain.

August 17th. Under chloroform, I excised the joint in the ordinary way. The operation was quickly accomplished, and there was no hæmorrhage of the least moment. The amount

of bone removed altogether from the femur and tibia amounted to about three-quarters of an inch, the epiphysal junction in either bone being untouched. The patella was removed.

Appearances of the Sawn Extremities. The cartilages covering the condyles presented, in places, various stages of destruction, in some being only thinned, and in others entirely removed. The semilunar cartilages of the tibia were entirely gone, and in parts also the cartilages immediately covering the bone. The crucial ligaments were not greatly affected, their external surfaces being only somewhat softened by contiguous mischief. The bones, where sawn through, presented a perfectly healthy section, though the articular extremities were much enlarged from the effects of former disease. In many places, the bone, from which the cartilaginous covering had been entirely removed, was roughened; but in no instance did it appear to be softened. There was no appearance of synovial membrane left. Suppuration was commencing within the joint, but there was none in the textures around.

For two days the boy suffered a little constitutional disturbance. After this subsided, his progress was uninterrupted by any drawback. The wound suppurred and contracted, and the joint presented a solidifying appearance.

September 28th—six weeks after the operation. The wound is almost healed. The joint is becoming firm. The boy's health is excellent.

At the end of eight weeks, he was permitted to get up, and to move about with the aid of a single crutch and a small leather case. The wound was completely closed, and the boy possessed the most perfect power of raising the entire extremity, the bones having become firmly ankylosed.

[To be continued.]

DEODORISATION IN CARCINOMA UTERI.

By THOMAS SKINNER, M.D., Liverpool.

[Communicated to the Liverpool Medical Society, November 3rd, 1859.]

IN perusing the number of the JOURNAL for October 29th, I notice a report of a discussion at the Medical Society of London, on the "Deodorisation of Ulcers." I also notice that one of the members present, Dr. Mackenzie, has to a certain extent forestalled me by communicating to the Society the result of his observations in the use of *tar water* in the treatment of *foul ulcers*. I am fully aware that priority belongs to neither of us, as Bishop Berkeley believed in it as a panacea for most diseases (Berkeley's Works by Rev. G. N. Wright, vol. ii, p. 308, *et seq.*) It has also been highly spoken of by Romberg, Wetherfield, Alibert, Emery, Todd, Bateman, and many other authorities, for internal and external use in cutaneous and pulmonary affections, as well as in the treatment of *foul* and *indolent* ulcers. In the treatment of the last mentioned lesions, it has been extolled chiefly, if not entirely, for its *stimulant* properties, until Dr. Mackenzie's late allusion to it.

With these few preparatory remarks, I beg to draw the attention of my fellow associates to the claims of certain substances as deodorants, particularly tar water, in carcinoma uteri. In the month of June last, a most intelligent and old established practitioner in this town met me in consultation about a lady who is the subject of far advanced scirrhus cancer of the uterus. The cancerous deposition had then extended to the bladder and rectum, rendering the uterus perfectly immobile. The ulcerative process was so far advanced, that the index and middle fingers could be introduced into the cavity, and could be moved freely about. The ulceration also easily admitted Simpson's vaginal speculum, No. 4, an inch and a half in diameter. (This instrument was used twice, simply to apply a solution of the perchloride of iron to abate a temporary hæmorrhage.) The offensiveness of a cancerous discharge from so extensive a surface, and pent up in such a locality, may be more easily imagined than described. So tenacious and so indestructible were the odorous particles, that soap and chloride of lime failed to deodorise my fingers for hours, and my washhand-stand retained the effluvia for more than forty-eight hours, until I made a free use of McDougall's disinfecting powder, so deservedly praised by Professor Simpson (*Medical Times and Gazette*, Jan. 22, 1859, p. 80.) The smell was so disgusting to the patient, that she told me she thought "her inside must be like that of a putrid corpse." In such a case, an effectual, speedy, and safe deodorant was a desideratum, if it was not a *sine quâ non*.

In order to save others the trouble of repeating my ex-

periments, I will briefly state the means I have tried, and their relative success.

1. *Condy's Disinfecting Fluid (purple)*. This fluid, which is, I believe, a concentrated solution of the permanganate of potass, was used in the proportion of two drachms to a pint of water as a vaginal injection three times a day. The proportions were rapidly increased up to one fluid-ounce to a pint of water. The result was in every way satisfactory. The gentleman previously alluded to, digitally examined the patient with me a few days after it had been used, and the smell was very much lessened, as also the amount of the discharge. (At this period of my observations, a common pewter vaginal syringe was used, and I cannot but think that this accounts for the success being incomplete.) One great advantage in the use of the permanganate is, that it has no smell of its own, and that, being soluble, it may be used either in the form of a medicated pessary, or in that of an injection. Its lovely mauve colour renders it both fashionable and pleasing to our patients. From my experience of its use, I can confidently recommend it in the proportion of one fluid-ounce to a pint of water, as a deodorant in cancer of the uterus; a cupful to be used as an injection thrice daily, and the strength to be increased, if found necessary.

2. *Decoction of Daucus Carota or common carrot*. Being well aware from previous experience of the great value of a carrot poultice in deodorising cancerous and other bad smelling abrasions of the integumental surface, and, as the patient was complaining of lumbar and pelvic pain, with more or less irritation of the vagina, possibly produced by the permanganate, I ordered her to inject a warm and concentrated decoction of the common carrot. At the same time, the patient was ordered to the sea coast. Whether it was the change of air, or the carrot decoction, or both, I was informed by herself and friends, that the smell, pains, and irritation were very much lessened. Yet, the smell was not annihilated, and the patient began to tire of the heavy odour of the carrots, and the trouble of preparing the decoction; it was therefore discontinued. If hemorrhage was to be feared, I would not recommend the warm decoction. I may as well mention that, while my patient was using the *decoctum carotæ*, she drank freely of new wort, a common domestic and excellent beverage for invalids who are the subjects of foul ulcers or ill-conditioned sores. (See *Medical Observations and Inquiries*, vol. iv, pp. 358-367.)

3. *Parisian Disinfecting Powder and Paste*. About this time, the powder and paste of MM. Corne and Demeaux were creating great excitement in Paris, so I determined to give them a fair trial. To the powder made with coal tar three parts, and sulphate of lime one hundred parts, was added enough of olive oil to form a paste of sufficient consistence for vaginal pessaries. The mass was divided into balls, which were dipped in the usual solution of wax, lard, and oil. They were made for me by Messrs. Clay and Abraham, of this town.

So far as deodorising and even lessening the amount of the discharge is concerned, the pessaries were certainly most effectual; but to the use of such means in the treatment of carcinoma uteri, there are insuperable objections; viz.:

a. The coal tar in itself is exceedingly disagreeable to the olfactory organs of females, however little it may affect those of M. Velpeau. This objection, however, may be waived by adopting vegetable instead of coal tar in forming the powder.

b. The discharge is absorbed by the sulphate of lime, which swells to some extent, sets hard, and becomes a source of considerable irritation.

c. As such medicated pessaries do not dissolve, they accumulate, until removed by a second party. On our first essay with the pessaries, I was called to my patient three days afterwards, and found to my amazement a nest of three of them, enlarged and hardened. To obviate this for the future, I ordered them to be threaded with a needle and thread in such a manner, that the patient might withdraw them herself every twenty-four hours. I found, however, that even with this plan they sometimes split in two, and by doing so became a source of discomfort to the patient.

d. The surface of the ball comes first into contact with the discharge, and the plaster of Paris setting, prevents the interior of the ball from being of any use.

e. Applied as a powder, it is worse than useless, as it cakes or sets, and forms fragments which are very disagreeable to the patient, and exceedingly difficult of removal.

From my disappointment in the use of the coal tar disinfecting powder, I saw no reasonable hope of better success from the use of vegetable tar in its manufacture. I therefore concluded that the Parisian powder is impracticable, so far as

the deodorisation of the discharge of carcinoma uteri is concerned.

4. *McDougall's Disinfecting Powder; Vegetable and Animal Charcoal, etc.* MM. Corne and Demeaux's powder having failed me in the treatment of carcinoma uteri, I have not tried the use of McDougall's disinfecting powder (Smith and McDougall's patent), nor of charcoal; nor of any other insoluble substance, however effectual they may be as deodorants; because I think that, if an effectual, speedy, and safe agent can be obtained, which is fluid or entirely soluble, it ought to be preferred.

5. *Chlorides of Zinc and Iron, etc.* The deodorant and useful properties of those substances are so familiar to all, that comment is unnecessary.

The same may be said of the

6. *Chlorates, Hypochlorites, and Hyposulphites*; none of which I have tried in this particular case, as I wished something superior to all of them. But let me add, that subsequent to the use of the Parisian powder, I did try the value of simple

7. *Metallic or Mineral and Vegetable Astringents*; such as the sulphates of alum and zinc, and the acetate of the latter metal, also solutions of tannin. Comparatively speaking, they were all more or less effectual in deodorising and lessening the discharge, but very much inferior as deodorants to the substances previously made use of. I may here just as well remark, that my patient was fortunately fond of variety; and, as may be seen, I gratified her taste, which gave me an excellent opportunity of making these and the following observations.

8. *Solution of Naphtha and Creasote*. This preparation is highly commended by Dr. Lionel Beale for preserving moist specimens for the microscope. As I had some of it made by myself, I gave it a trial upon a small scale; and it was so satisfactory, that I am induced to give the formula. The only objections to its general use are, the smell of creasote, and the length of time required to prepare it. It is as follows:—"Creasote, three drachms; wood naphtha, six ounces; distilled water, sixty-four ounces; chalk, as much as may be necessary. Mix first the naphtha and creasote; then add as much prepared chalk as may be sufficient to form a smooth thick paste; afterwards, add very gradually the water, and mix well in a mortar. Add two or three small lumps of camphor, and allow the mixture to stand in a lightly covered vessel for a fortnight or three weeks, with occasional stirring. Pour off the almost clear supernatant fluid, and filter it if necessary. Preserve it in well-corked or stoppered bottles." (*The Microscope in Clinical Medicine*, 1st ed., p. 87.) This preparation, when carefully made, is highly antiseptic—a property which cannot be said to be possessed by the powders or pastes of MM. Corne and Demeaux, if Mr. May's experiment can be considered as decisive. (*JOURNAL*, Oct. 15th, 1859, p. 832.) I feel certain that, in hospital practice, such a preparation, variously diluted, and tar-water, would be found of great service as addendæ to the water-dressing of wounds and ulcers, possessing, as they do in a very high degree, deodorant and antiseptic, along with stimulating, astringent, and consequently cleansing and healing properties. In point of cleanliness, they are every way superior to the preparations of MM. Corne and Demeaux. For reasons already given, the naphtha and creasote solution is not so available in general practice.

9. *Solution of Lead and Creasote*. The following was attended with very good effect:—

℞ Plumbi acetatis 3j; acidi acetici 3ss; creasoti ℥x. Misce, et dein adde gradatim, misturæ camphoræ Oj. Solve.

Sig. A teacupful for injection twice or thrice daily.

The creasote may be increased to thirty minims, if thought necessary. Creasote dissolves the acetates, the acetate of silver excepted; and is itself freely soluble in acetic acid. The acetic acid and the camphor serve to mask the odour of the creasote; and a few drops of any essential oil may be added for the same purpose, with the best effect, as creasote is soluble in most of them.

10. *Iodine*. I have not yet had an opportunity of trying the effects of iodine, as recommended by M. Marchal (de Calvi) to the Academy of Medicine of Paris, on August 8th last. Its undeniably powerful antiseptic properties, as proved by M. Duroy, and its being easily soluble, either in the form of a lotion for injection, or in the form of an ointment as a pessary, are sufficient reasons, in my estimation, for giving it a fair trial as a deodorant in carcinoma uteri, and other affections attended with offensive discharges.

11. *Tar-Water. Aqua Picis Liquidæ, D.* While reading a report of the discussion on deodorisation between MM. Renault and Velpeau lately, I observed that it was merely a matter of economy and of olfactory preference, which made the difference between the use of coal and vegetable tar in the manufacture of the disinfecting powder; and, as I was much inclined to believe that the tar, or one or more of its active principles, is the essential ingredient, I determined to try the effect of the injection of tar-water. I was strengthened in this idea by having read the eulogiums passed upon it by Bishop Berkeley and others, and in the pages of the *Medical Commentaries*, alluded to by Dr. Mackenzie at the meeting of the Medical Society of London, on October 24th.

My patient has now used it undiluted for a month or more, and is likely to continue its use, as its beneficial effects have far surpassed my most sanguine expectations. The discharge has much decreased, and is for the present at a minimum. The foul smell entirely disappeared on the first day she used the tar-water as an injection; and, in its stead, the apartment, the bed, and the patient, have a mild and really refreshing aroma of a shipbuilder's yard in the distance. The patient and her friends have become so accustomed to this slight, and rather agreeable odour, that they are not now sensible of its existence; and they, as well as myself, can bear evidence that none of the many measures adopted for the purpose of deodorising the discharge, have been so eminently successful as the simple injection of tar-water.

Formula for Tar-Water. Tar-water was at one time official in the *Dublin Pharmacopœia*; but, in the last edition, the formula has been omitted:—"Aqua Picis Liquidæ, D. Tar, lb. j; water, cong. j; mix, stirring with a stick for a quarter of an hour; as soon as the tar has subsided, strain the liquor, and keep it in well closed jars." (Neligan's *Materia Medica*, 3rd ed., p. 374.) Pereira gives a different formula:—"Tar, Oij; water, cong. j (wine measure)"; otherwise the same as Neligan. My patient has always used the formula recommended by Neligan.

Properties. Tar-water ought to be perfectly clear, and of a pale sherry or amber colour. It has a bitter, resinous, and considerably acid taste; and a slightly creasotish, but rather agreeable empyreumatic odour. It reddens litmus-paper, and has a density of about 1.005. "The volatile oil in tar-water is partly held in solution by acetic acid, which, as is well known, dissolves creasote. It" (tar-water) "consists of water holding in solution acetic acid and pyrogenous oil and resin." (Pereira's *Materia Medica*, p. 1205.) The late Professor Royle says, that tar-water contains "creasote and other matters in solution". (*Manual of Materia Medica*, p. 647.)

Mode of Administration. By the aid of Higginson's invaluable syringe, a tepid solution of soap and water is first to be injected; and, immediately thereafter, a breakfast-cupful or more of undiluted tar-water. This should be done twice a day, if the patient's strength will admit: hitherto, a more frequent use of it has not been required. It is necessary that the tar-water should come into contact with the ulcerated surfaces: therefore, the recumbent posture is preferable, and a long vaginal nozzle to the syringe is of advantage. If there is an intelligent, handy nurse in attendance, and the ulcerated cavity is extensive, and its lips lobulated and lapping over each other, a piece of lint saturated in tar-water, with a piece of tape or thread attached to it, may be inserted within the cavity, or the point of the nozzle may be directed into the ulcerated cavity before injecting.

Lastly, as important in itself, and as bearing upon the action of many of the substances alluded to, I would briefly call to remembrance the well known properties of

12. *Creasote*, which literally signifies flesh-preserver (from *κρέας*, flesh, and *σώζω*, I preserve). It is the most important of the products obtained from wood-tar by Reichenbach, in 1880. It dissolves several salts, particularly the *acetates*, the acetate of silver excepted, which it reduces. It is itself completely soluble in acetic acid, wood naphtha, and alcohol, in most volatile oils, in the alkaline solutions, and in from eighty to one hundred parts of water. Like the chlorides of iron, mercury, zinc, and other caustics, it is a powerful coagulator of albumen; but, unlike these agents, the insoluble compound which it forms with the tissues *resists putrefaction*. In fact, it is the best known antiseptic; consequently, it is a powerful deodorant. Finlay Dun says: "It is believed to have been the essential agent used in embalming the Egyptian mummies. It is extensively employed in preparing various dried meats, and might be used for preparing subjects for dissection, by dissolving it in acetic acid, and injecting the solution into the veins. . . . Externally, it acts beneficially as a stimulant and

astrigent, an antiputrescent and deodoriser." (*Veterinary Materia Medica*, pp. 199, 200.) Of the use of creasote as a deodorant in carcinoma uteri, I believe that Dr. Copland was among the first who employed it. (*Cyclopædia of Practical Medicine*, vol. iii, p. 1283.)

In connexion with the deodorising property of creasote, it is interesting to observe that *carbolic acid*, which is undoubtedly the essential ingredient in Smith and McDougall's patent disinfecting powder, is supposed by M. Laurent to be really identical with *creasote*. (Royle's *Materia Medica*, p. 712.) The late Professor Gregory arrived at the same conclusion as M. Laurent, and about the same time. Professor Gregory stated to the Royal Society of Edinburgh: "If these two compounds be not identical, they are at least very closely connected, and in all probability contain the same radical. It is possible that creasote may be a definite compound of carbolic acid with some allied body. At all events, it is very remarkable that these two compounds, described as different, should agree in density, taste, smell, antiseptic property, power of combining with bases, power of dissolving resins, indigo, etc., and finally, in composition, although probably perfectly pure creasote has not yet been analysed." (*Edinburgh Monthly Journal*, 1845, page 811.) Cooley, speaking of commercial creasote, says:—"The fluid sold in the shops for creasote is a mixture of creasote, picamar, and the light oil of tar; in many cases, it is little else than impure carbolic acid, with scarcely a trace of creasote." (*Cyclopædia of Practical Receipts*, 3rd ed., 1856, p. 665.)

It would appear from the above statements, that, to the best of our knowledge, the disinfecting agent in even Smith and McDougall's powder is none other than creasote, or its analogue carbolic acid; and, as carbolic acid is the acid portion of the volatile oil which is obtained by the distillation of *coal tar* (Royle, p. 712), I make no doubt that creasote or carbolic acid is the active ingredient in the powder and paste of MM. Corne and Demeaux, as prepared from *coal tar*. Creasote is doubtless the active ingredient in the powder and paste prepared from *wood tar*. There can also be no doubt that creasote is the active ingredient in *woodsot* (*fuligo ligni*) and its preparations, which are so highly extolled by the Dublin and continental physicians. (Neligan, 3rd ed., p. 35; Pereira, 3rd ed., foot-note to page 2014. See also an interesting case of the successful external application of the *decoctum fuliginis*, in the case of a severe burn, by Dr. Ebers of Bourdeaux, in the *Edinburgh Monthly Journal* for 1841, p. 755.) I feel much inclined to try the *decoctum fuliginis* of the Dublin physicians as a deodorant in carcinoma uteri, or the *tinctura fuliginis*, sufficiently diluted with water. For the best account of creasote, I beg to refer to Dr. Cormack's Harveian prize essay for 1836.

The *modus operandi* of creasote, or any of the substances spoken of in this paper as antiseptics or deodorants, I have purposely avoided, as I consider the subject of too speculative a nature to serve any practical purpose.

SUMMARY. From the foregoing experiments and observations, I am of opinion—

1. That creasote, or its analogue carbolic acid, or some such empyreumatic product, is the active ingredient in the disinfecting powders of MM. Corne and Demeaux, of Messrs. Smith and McDougall's patent, and of the majority of our best disinfectants which smell of or contain such ingredients.

2. That, as the powder of MM. Corne and Demeaux is something more than insoluble; that, as it sets and becomes hard, and is otherwise objectionable—its use, however effectual as a deodorant, is impracticable so far as carcinoma uteri is concerned.

3. That in the treatment of cancerous ulceration of the uterus, a fluid or soluble deodorant is much to be preferred.

4. That the order in which I rate the various liquid and soluble deodorants I have drawn attention to is as follows:—

a. Tar-water (*Aqua Picis Liquidæ, D.*)

b. Condy's disinfecting fluid (purple), one ounce to the pint; or the permanganate of potass as a vaginal pessary of two drachms, from ten grains to a scruple in each.

c. Solutions of creasote:—the lead and creasote (No. 9); the naphtha and creasote (No. 8); or vaginal pessaries of two drachms, from five to ten minims of creasote and ten grains of camphor in each.

d. Solutions of the chlorides, chlorates, hypochlorites, and hyposulphites.

e. Metallic or mineral and vegetable astringents.

f. Decoction of the *Daucus Carota*, or common carrot, particularly if any of the others should prove irritating, and an emollient requisite.

In conclusion, I am perfectly well aware that any number of observations, made in the conduct of a single case, cannot be regarded as sufficient data on which to establish the value of tar-water or any other substance as a deodorant in carcinoma uteri; but, in such a case as the one I have given, any means attended with success deserve consideration.

CHEMICAL, PHYSIOLOGICAL, AND PRACTICAL CONSIDERATIONS, IN THE TREATMENT OF PHTHISIS.

By EDWARD SMITH, M.D., LL.B., M.R.C.P., Assistant-Physician to the Hospital for Consumption, Brompton; etc.

[Read before the Western Medical Society.]

A PHYSIOLOGICAL inquiry of great extent, in which I have been for some years engaged, and which in part appears in the *Philosophical Transactions* for this year, has led me to closely examine the chemico-physiological hypotheses of Baron Liebig on the functions of respiration and nutrition, and the basis upon which, in his opinion, all correct practice must be based. The result has been profitable to myself, and has led me to believe that important guides to practice have been found, and may ultimately be multiplied, both in reference to phthisis and to general disease. As the blind administration of remedies is usually profitless, in reference to the advance of science, I venture to hope that the following paper may afford some matter for profitable reflection.

In every case of chronic phthisis, we have to regard the state of the lungs, with the effect of the interference with their functions; the special symptoms, and the state of the general system. In many cases, the intensity of all these so corresponds, that from one we may predict the other; and these are perhaps the purer forms of the disease; but in many there is no correspondence between any of them. Thus a person with all the evidences of a broken system, leading to the inference that it is due to phthisis, has no deposit of tubercle, and may not even have the earlier condition of lessened vesicular action, although that is unlikely; whilst, on the other hand, the system is to all appearance healthy, and, on examination, there is found extensive mischief, and even a cavity in one of the lungs. Again, it often happens that the irritable cough and frequent slight hæmoptysis, so common as symptoms in most cases of phthisis, are accompanied by very slight or even no lung-mischief; whilst, in cases of extensive disease of the lungs, there is scarcely any noticeable complaint of any kind. These various facts are daily exemplified at the hospital, and become so impressed upon the mind, that in no case presenting itself do I dare to form an opinion without first examining the chest; and constantly have I found phthisis where none was suspected, or not found it where I thought it was certainly present. The lesson which I wish to draw from this great want of uniformity in the relation between the disease of the lungs, the symptoms, and the system, is, that phthisis is not one, but, so to speak, many diseases, and requires not one, but many modes of treatment. A belief in this fact must, I think, lie at the foundation of all improvement of treatment.

In reference to the lungs, when tubercle is deposited, we can have no doubt but that some parts of those organs have lost their power of action; and in that earlier condition, in which the vesicular murmur is lessened, the same result is quite evident to my mind. What, then, are the evils which result from this state of things? In a state of health, I can inspire two hundred and eighty cubic inches of air beyond that large amount which remains in the lungs after the most complete expiration; but, in ordinary respiration, I only inspire about thirty cubic inches at an inspiration; and even with the most violent exercise, I cannot inspire more than one hundred cubic inches at each inspiration. Hence it may appear that the lungs are much more capacious than is really required for the due performance of their functions; and this inference seems to be supported by the fact that, in cases of acute pleurisy of one side, with hydrothorax, the other lung remaining sound, all the ordinary processes of nutrition and growth proceed with something like their accustomed order. Such, again, may be inferred from those numerous cases of tuberculosis of the lung in which there are circumscribed deposits even in both lungs, and which exist for years without injury to the individual. But, whilst admitting that Nature has given us a superabundance of lung-surface, in order to be prepared against the inroads of such diseases, we must not hastily come to this

conclusion. The action of the oxygen in respiration probably does not, at least in great part, take place in the air-cells, or indeed in any part of the lungs; but it must be absorbed and conveyed by the blood to the tissues of the body; and in the tissues is doubtless the chief union of carbon and oxygen. Hence are required two circumstances: first, extent of absorbing surface; and second, duration of contact of air with the absorbing membrane. Whatever lessens one or both, must lessen the influence of the respiratory process. There can be no doubt, therefore, that whilst only so small a quantity of air is inspired at an ordinary inspiration as thirty cubic inches, or one-ninth of that which might be inspired, it is distributed to every part of the immense network of the lungs, and in every part the absorption and elimination of gases and vapours proceed. In the early condition of diminished vesicular action—a condition which is more or less general over one or both lung—there will be lessened absorption of oxygen, and lessened elimination of carbonic acid, vapour, and heat. When there is deposition of tubercle, there will also be a more or less complete exclusion of the blood from that part, and thereby an arrest of all the changes just mentioned? What, then, is the result?

It is a common saying, that deficient respiration leads to, or at least is connected with, deficient assimilation and nutrition; but much more precision of ideas is required than is commonly attained. We may perceive, on reflection, that the amount of chemical change proceeding in the body will vary with the amount of vital action, whether in the transformation of nutritive material, or in the destruction of tissue, or, in other words, with the wants of the system; and this chemical change is in great part dependent upon the respiratory function. In this sense, the respiratory function is subservient—that is, it obeys the call of the vital action; but there is another sense in which it must be regarded as exciting and controlling vital action by means of the oxygen which it furnishes, and which, being introduced, excites or increases vital action. In illustration of the former, we may cite the action of the cereals, milk, and sugar, which excite the respiratory function, and particularly that of exertion, which is the most powerful agent known; whilst, in reference to the latter, it may be stated that the respiration increases as the density and coldness of the air increase (apart from the influence of cold upon the body), and with increased voluntary depth or frequency of respiration, the body being at the same time at rest. The curious fact, that a given degree of exertion in two different temperatures or seasons is accompanied by different amounts of respiration, illustrates both, but chiefly the former.

On the latter theory we explain the lessened amount of vital action in phthisis, accompanying the lessened vesicular action and diminished amount of air inspired, quite as rationally as by that which assumes that the latter circumstances are due to the lessened wants of the system. But Liebig has carried this further, and has inferred, because there is wasting in the disease, that there is a hyperoxygenation of the blood, and, indeed, that the prime evil is this superoxygenation. The highly oxygenised products of secretion—as, for example, the acids passing from the system—are regarded by some as proofs of the truthfulness of this opinion. Rokitansky has made use of this in his doctrine of fibrine-crises of the blood in phthisis, stating that the fibrine of the blood is expended in the formation of the tubercle; but he has seen good cause to induce him to give up this doctrine of the crises. This doctrine of hyper- or hypo-oxygenation is of great moment in treatment, since, if there be hyperoxygenation, increase of respiration is contra-indicated; but if there be hypo-oxygenation, as is assumed by Dr. Churchill in his doctrine of the value of the hypophosphites, then we are justified in our directions as to the increase of exertion in the open air. Here, again, we are reminded of diversity in the nature of phthisis; and whilst we must admit that, in the majority of cases, there is hypo-oxygenation, in some, perhaps the more acute, and probably those in which the disease is more advanced than the system indicates, there may be hyper-oxygenation.

The importance of this question, at this stage of the inquiry, is as to the direct effect upon the functions of the blood. One great function is the elimination of carbonic acid. It is evident that, wherever the union of oxygen and carbon occurs, and the most so if it be in the intimate structure of the tissues, the removal of it by the blood must be by a temporary combination of it with a base, or absorption of it by the blood as a fluid, and its subsequent discharge at the right time and place. Both actions must be temporary and repeated, and be due to the aid of other agencies. It cannot be physically accounted for by the