is by means of this process that you may determine whether you have really binoxalate of potass or not.

The salt which is met with principally in commerce at the present time, contains four atoms of oxalic acid, one atom of potass, and seven atoms of water, and thus only half as much potass and one atom of water more than the true binoxalate. In order to render this salt neutral, it is necessary to divide the crystallized salt into four equal parts, by means of the balance, to expose three parts to the action of a red heat, and to add the residue to the solution of the fourth part.

Oxalate of lime is one of the least soluble of the lime salts, and it is on this account that the soluble oxalates, and especially oxalate of ammonia, are used as a means of precipitating lime from fluids; the precipitate of oxalate of lime is thrown down in the shape of fine flakes; it is dried, and heated to redness; there remains a white residue of carbonate of lime, from which the proportion of lime may be inferred. Considering, however, that carbonate of lime in a state of red heat readily loses carbonic acid, it is advisable to transform the residue of carbonate of lime into sulphate of lime, by moistening it with sulphuric acid, and then to deduce the proportion of lime from this gypsum after it has been heated to redness. In fluids containing lime and at the same time free nitric acid, or free hydrochloric acid, no precipitate is obtained by means of oxalic acid or of oxalates, since the oxalate of lime which forms upon the addition of this acid or of these salts to the calcareous fluid, dissolves readily in these acids; however, upon neutralizing the latter, especially with application of heat, the oxalate of lime is completely precipitated. Acetic acid does not dissolve oxalate of lime. Oxalic acid forms a very remarkable double salt with oxide of chromium and potass; the oxalate of chromium and potass was discovered by Dr. Gregory. The crystals of this salt are of such a deep colour as to appear black, (by reflected light,) but they appear of a splendid blue by transmitted light, (when sufficiently thin to be transparent;) their solution appears green by reflected light, and red by transmitted light.

It is to Professor Graham that we are chiefly indebted for our knowledge of the composition of these salts.

I have already mentioned that oxalic acid, whether free or in its salts, is converted into carbonic acid by the addition of oxygen. In order to obtain the carbon of oxalic acid, as carbonic acid, you require one equivalent of oxygen to one equivalent of oxalic acid; the result is, the formation of two atoms of carbonic acid. The knowledge of these proportions is of importance, since a method has been based thereon to determine the amount of oxygen contained in certain oxides, by inferring it from the amount of carbonic acid formed of oxalic acid by the absorption of oxygen from the oxide under investigation. Indeed, if you once know the amount of carbonic acid evolved from a mixture of oxalic acid with a metallic oxide, you can readily determine the amount of oxygen which the oxide has yielded. If, for instance, you take finely pounded peroxide of manganese, and heat it together with a solution of oxalic acid, there ensues a vivid effervescence, owing to the evolution of carbonic acid; the peroxide of manganese changes from black to a yellowish-white hue, being converted into oxalate of the protoxide of manganese. The evolution of carbonic acid, and reduction of the peroxide into the protoxide of manganese, are easily explained. The peroxide of manganese to be converted into protoxide must yield up oxygen, and this oxygen combines with the element of oxalic acid; for every equivalent of oxygen yielded by the peroxide of manganese, you obtain two equivalents of carbonic acid. Now if you know the amount of carbonic acid thus produced, you know also the amount of oxygen which the peroxide of manganese has yielded in its reduction to protoxide. Peroxide of manganese contains to one atom of manganese two atoms of oxygen, and one of these two atoms separates upon its reduction into protoxide.

The weight of one equivalent of peroxide of manganese is = 44, (one atom of manganese = 28; two atoms of oxygen = 16.) Upon heating peroxide of manganese together with oxalic acid, there are formed 44 of carbonic acid, (two equivalents of C = 12; four equivalents of oxygen = 32.) A mixture of 100 grains of pure peroxide of manganese with oxalic acid ought therefore, upon heating, to suffer a loss of weight of 100; it is obvious that a lesser amount of carbonic acid is obtained from the common manganese ores, because they contain extraneous minerals, peroxide of iron, alumina, &c., in admixture; but the proportion of weight of the carbonic acid evolved from a mixture of 100 parts of manganese ore with oxalic acid, indicates invariably, and with positive certainty, the amount of peroxide contained in the manganese ore, and thus we ascertain its commercial value. If you, for example, obtain from 100 parts of manganese ore, 90 parts of carbonic acid, the ore contains only 90 parts of peroxide.

FOREIGN DEPARTMENT.

PHYSIOLOGICAL & PATHOLOGICAL RESEARCHES ON TUBERCULOSIS.

By H. LEBERT, M.D.

(*Muller's Archives*, Nos. 2 and 3. 1844.)

THE following is the summary appended to this very valuable paper:—

1. The pathological peculiarities of tubercle are exhibited in its microscopical structure.

2. The constant elements of tubercle are, molecular granules, an adhesive hyaline mass, and peculiar tubercle cells, from 0.05 to 0.01 of a millimetre in diameter—of irregular form, containing no nucleus but molecular granules. Water, æther, and weak acid, scarcely change them. Concentrated alkalies, liq. ammonia, dissolve them completely.

3. The dimensions of tubercle cells undergo many variations, which depend rather upon the different organs than upon differences of age. They are most easily recognised in crude yellow tubercle.

4. Tubercle corpuscles consist of cells having a very low power of development.

5. The opinion that tubercular substance is a modification of pus is contradicted in the most positive manner by the microscope.

6. Tubercle corpuscles are distinguished from undeveloped pus globules, by the spherical form and greater diameter of the latter. Cancer cells are clearly distinguished by their being two to four times as large, and consisting of a cell wall, and a large clear nucleus, often containing nucleoli.

7. When tubercle softens, the adhesive matter becomes fluid, and the corpuscles rounded; their opposition to each other is destroyed, they become distended, and hence appear larger. This, however, is not the result of growth, but the beginning of decay.

8. The pus which surrounds softened tubercle never originates in the tubercle itself, but is formed directly in the surrounding parts.

9. The microscope can determine whether we have to do with softened tubercle, with purulent matter, or whether there be a mixture of both.

10. Pus appears to destroy quickly tubercle corpuscles, and thus to make their individuality undistinguishable.

11. When the irregular outline and close apposition of tubercle cells, in their first stage of development, present the second stage of separation from each other, distention and roundness, then the third stage of disintegration commences. The corpuscles are broken up into a granular, half-fluid mass, and lose their individuality.

12. Tubercle becoming hard and calcareous (*état crotacé*) is a natural process of cure. The peculiar elements of tubercle disappear, and become in part absorbed. In their place, small mineral granules, and sometimes crystals of cholesterine, are deposited. The deposition of lime is generally accompanied by an increase of pigment. According to the chemical analysis of M. T. Boudet, there exist, as principal elements, chlorate of sodium, and sulphate of soda; salts of lime only in small quantity.

13. Among the occasional elements of tubercle may be mentioned melanosis, which is the most frequent; further, fat, filaments, dark olive-coloured globules, and crystals. Sometimes we find mixed with tubercle, but in no way belonging to its substance, the products of inflammation, serum, pus, and the elements of epithelium in various forms.

14. The seat of tubercle in the lungs is generally the elastic cellular tissue. Yet it is also found in the air vesicles, and in the bronchial capillaries.

15. The tissue of the lung surrounding tubercle may be sound, but is mostly in a state of congestion or inflammation. The last is either globular, or spread over a large portion of a lobe.

16. The pus found surrounding tubercle is often not the result of grey hepatization, but comes from the mucous membrane of the small, partly destroyed and open bronchi, in the substance of the lung.

17. The pneumonia surrounding tubercles has nothing specific; there is found in it the same elements of the exudation as in ordinary pneumonia—viz., aggregate globules, fat vesicles, pus corpuscles, &c. Tubercle corpuscles are not generally found among the products of exudation.

18. Sometimes there is found surrounding tubercle a peculiar form of chronic inflammation, with yellowish hepatization, and increased consistence of the tissue. The vesicles of the lung,

small bronchi, and parenchyma, are partly filled with coagulated fibrin, and a formation of new fibrous filaments, partly with aggregate and pus corpuscles, and in the centre of the chronic slightly vascular hepatization there is found a highly vascular acute lobular pneumonia.

19. The degree of consistence of acute or chronically inflamed lungs depends upon the amount they contain of fibrin, fluid blastema, and corpuscles. Much fibrin, with a small quantity of blastema and corpuscles, produce induration; much fluid blastema, with a small number of corpuscles, cause softening. An equal proportion of these different elements produces a medium degree of hardness.

20. Lungs rendered compact from the pressure of a pleuritic effusion often exhibit throughout no appearance of inflammation.

21. The grey semi-transparent granulations of the tissue of lung are also a true form of tubercle. Their colour and transparency are partly dependent on the apposition of the tubercle corpuscles to each other, throughout the intact fibres of the lung, partly on the existence of a large quantity of adhesive material.

22. The grey granulation is not always the commencement of the formation of yellow tubercle; the last is often primarily developed as such.

23. The vascular network found surrounding the grey granulations is neither a proof of inflammation nor of a new formation, but rather results from the pressure on many capillaries, occasioned by the tubercular deposition, and the consequent distention of the remaining capillaries, which are reduced in number.

24. The opinion that grey granulations may be the result of inflammation is opposed by positive observation.

25. The process of ulceration is throughout different from that of suppuration. Thus we find on the mucous membrane of the bronchi, suppuration without ulceration, and on the intestinal mucous membrane, ulcers without suppuration. The last cause of ulceration is from inflammation by parasitic deposition, sometimes from causes unknown to us producing obliteration in a certain number of capillary vessels.

26. The tubercular ulcer of the lung is not physiologically different from the tubercular ulcer of the intestines or of the skin.

27. In tuberculosis a general ulcerative diathesis is found to take place even in organs where tubercles appear very seldom. This is clearly established by the excellent labours of Louis.

28. The internal fluid layer of the contents of a cavernous ulcer of the lung, contains—*a*, tubercular substance, seldom intact, the corpuscles for the most part in a state of distention, or broken down into granules; *b*, pus corpuscles sometimes in small quantity; *c*, "puridea" corpuscles; *d*, aggregate corpuscles; *e*, purulent mucus; *f*, blood corpuscles; *g*, filaments of the lung; *h*, black pigment; *i*, epithelium; *k*, sometimes crystals; and *l*, adipose tissue.

29. Amongst this thick fluid are generally found pseudo-membranes, consisting of coagulated pus elements inclosing fibrin.

30. Among the pseudo-membranes covering the diseased tissue of the lung is found a true pus membrane, consisting of filaments inclosing small corpuscles. It generally becomes partly destroyed by a new irruption of tubercle occurring in the same.

31. This membrane is a natural effort towards cure, isolating the ulcerous tissue of the lung, and thus favouring its cicatrization.

32. Between the pus membrane and the tissue of the lung is often found newly-formed filamentous tissue.

33. Surrounding the cavernous ulcer is generally found a deposition of recent crude tubercle.

34. The healing of caverns takes place—*a*, from isolation, by means of the pus membrane, and shrinking of the cavern; *b*, by deposition of fibrin, which fills up the cavern, grows to its walls, and so forms a fibrous cicatrix; *c*, by mineral deposition in the cavity, and formation of a filamentous tissue around the same.

35. There are no peculiar mucous bodies; what has been described as such are nothing but pus corpuscles secreted from diseased membranes. Pus tests are thus henceforth useless.

36. In the sputa of phthisical individuals the following elements are found—*a*, mucus; *b*, pus corpuscles, existing in large quantity—they are sometimes found in a shrunken state, and may easily induce error; *c*, epithelium in its various forms; *d*, granular substance in great quantity, probably consisting of broken-down tubercle corpuscles; *e*, small yellow shreds, pieces of pseudo-membrane; *f*, filaments of the lung; *g*, fat vesicles; *h*, blood corpuscles, sometimes combined with coagulated fibrin; *i*, aggregate corpuscles; *k*, small infusoria, vibrios, but this seldom, and only accidentally.

37. The peculiar tubercle cells are not commonly found in the expectoration of phthisis. There are also no constant means of distinguishing the sputum of phthisis pulmonalis from that of other diseases.

38. Filaments of the lung in sputum indicate an ulcerous cavity. Their presence, however, is rather exceptional than otherwise.

39. The greatest portion of the sputa in phthisis does not come from caverns, but is secreted from the bronchi.

40. The copious mucus and purulent secretion of the bronchi, so frequent in phthisis pulmonalis, is one of the ways nature adopts in order to prevent the great destruction of the circulation which would necessarily result from the complete imperviousness of one portion of the capillary system, and distention of the rest.

41. A portion of the broken down tubercle of the ulcerous cavity mixes itself with the expectoration; another portion is re-absorbed.

42. The law announced by Louis, that after the age of 15 years the lungs contain tubercles; when they are found in other organs, is throughout correct. It may, however, be so far modified, that if very extensive tubercular deposition has occurred anywhere in an organ—as, for instance, in the liver, the kidneys, or the peritoneum,—the lungs often contain very little.

43. In childhood, tubercles are more frequent in the membranes of the brain, the glandular system, and the peritoneum, than in adults.

44. The thickening of the pleura in tuberculosis of the lung, not only originates in inflammation, but also in increased nutrition, from its greater vascularity, dependent on the diminution of blood in the lungs. Thus a supplementary organ for the circulation of the lung is produced, and at the same time, from its growth to the thoracic walls, the anastomosis with the great circulation is increased.

45. It results from embryological and pathological researches, that neither around the tubercle, nor in the pseudo-membrane of the pleura, are new vessels formed independent of the general circulation. New vessels in diseases are rather formed centrifugally from the general circulation.

46. The apparent transformation of the pseudo-membrane into cartilaginous substance consists only in the filaments being pressed together, without the formation of the peculiar cartilage elements. In the same manner the so-called ossification of the pseudo-membrane only consists in the deposition of an amorphous mineral formation.

47. The three principal forms of glandular tubercles are those of the more superficial—the bronchial and mesenteric glands: the last have a very slight tendency to soften.

48. The tubercular matter in the glands is throughout the same as that in other organs.

49. The existence of a sensible scrofulous matter we cannot admit; what has been considered as such is either the result of common inflammation or of suppuration—certainly under the influence of cachectic elements, but without a peculiar material or tubercular deposition accompanying the inflammation or suppuration.

50. Tuberculosis in the osseous system is a much more rare disease than is generally supposed at present. There is frequently found here a difficulty in determining between concrete pus and tubercular matter. In doubtful cases, the microscope can alone determine the diagnosis.

51. True scrofulous diseases, which are mostly distinguished by inflammatory and suppurative eliminations, are to be separated, on the one hand, from tuberculous diseases, and on the other, from idiopathic chronic inflammations of the eye, skin, glands, bones, joints, &c. The last category is often confounded with scrofula in children.

52. In a word, the positive diagnosis and abstract separation of scrofula are most urgent desiderata in modern medicine.

53. The gray granulations of the membranes of the brain—viz., of the pia mater, exhibit clearly between the filaments of the serous membrane depositions of tubercle corpuscles. They present themselves, besides, frequently in the brain, together with yellow miliary tubercle; with tuberculous infiltration, as well as with large tubercles.

54. In the liver, tubercles are often found in very considerable masses, and even with true caverns. These cases are easily confounded with cancer. In like manner, the change into softening and breaking down of certain cerebriform tumours of the liver often present a similar appearance to tuberculous depositions.

55. Besides the fatty depositions in the liver, fatty degeneration of the heart is sometimes present in phthisis; also a tendency to internal depositions of fat, whilst, for the most part, it disappears from the external parts.

56. The kidneys also may be almost entirely filled with tuberculous degeneration. In these cases fewer tubercles are found in the lungs.

57. In tubercles of the peritoneum there are found, together with tubercle corpuscles, several filaments of the serous mem-

brane. Peritoneal tubercles have little tendency to softening. They are mostly accompanied by a considerable pigmentary deposition.

58. Tuberculosis of the peritoneum produces sometimes perforation of the intestine, which is generally fatal; but in very rare cases, life is maintained by the formation of an artificial anus.

59. The consistence of crude tubercle in the intestines is usually less thick than it is in other organs. No pus is found upon tuberculous intestinal ulcers.

60. The microscopic elements of tubercular ulcers of the intestines, besides broken down tubercle cells, are, cylinder epithelium, broken down granular mucous membrane, and the filaments and bundles of the muscular coat. The young epithelial cells are not to be confounded with pus corpuscles.

61. On the diseased mucous membrane of phthisis are occasionally found polypi, melanotic and tubercular excrescences.

62. In extremely rare cases, tubercles are found deposited between the coats of arteries, an exceedingly important fact for (in favour of) the excretion of tubercle from the blood.

63. Tubercles are also found in the pericardium and heart. An extensive adhesion often thus takes place, and a vascular anastomosis of the branches of the coronary artery with those on the surface of the lungs, a remarkable communication between the vessels of the larger and smaller circulations.

64. Tubercles in the cavity of the chest, as well as of the abdomen, can open themselves externally, and thus form fistulae of the lungs and of the intestines.

65. Tubercles and cancer do not exclude one another, or even interfere with their separate march. Both morbid processes can at the same time run through their stages of development in the same person.

HISTORY OF A CASE OF SUSPECTED ABSCESS OF THE TIBIA, OF FORTY YEARS' DURATION.

(Read before the Harveian Society, Dec. 16th, 1843.)

By WILLIAM MACLURE, Esq., Surgeon, London.

A GREAT many opinions have been given by numerous eminent surgeons with respect to this case during the last forty years, and these, of course, have differed very considerably. This discrepancy has arisen as well from the imperfect, though progressive, state of the science of surgery during that long period, as from the obscurity of the symptoms, as exhibited at different times of the patient's life and sufferings. A becoming modesty, therefore, requires me to speak rather doubtfully as to the true nature of the disease which I am about to describe, and the real pathological condition of the parts which have been, and are still, perhaps, its seat.

This obscurity and difficulty of ascertaining the truth may afford ample apology for the mistakes, if any, of the practitioners who have gone before me in the treatment of this case, and I beg leave to plead the same circumstances as an excuse, if I shall be found to have committed any error of judgment either in my diagnosis or treatment of the disease.

The patient, who is an extensive breeder of sheep and black cattle in the Highlands of Scotland, dates the commencement of his sufferings so far back as the year 1805, when he was about four years of age. He belongs to a healthy and robust family, and I am not aware that any strumous tendency was ever developed in any other member of it, should his disease be conjectured to have arisen from that diathesis. He thinks his complaint arose from a sprain which he met with when playing, at the athletic game called *shinty*, with his brothers. From this cause his right ankle became swollen and painful. Surgical advice was obtained for him, not, however, for a day or two after the accident, owing to the great distance at which the medical man resided. Leeches and other remedies were employed, but it would seem with little benefit. Suppuration took place, and an abscess burst near the inner ankle. He was confined to his bed and to the house for nearly a year upon this first occasion. In 1806 he was taken by his father to Edinburgh, in order to obtain the opinion and advice of the then celebrated Mr. John Bell. Here he remained upwards of a year, under the care of that surgeon. He experienced much deep-seated pain in his leg, extending upwards from the ankle to the knee, as if the whole bone was in an inflamed state. Leeches, blisters, lotions of various kinds, and embrocations, were employed with various success. The discharge, however, continued, and some small splinters of bone came out near the internal malleolus, and one, an inch and a half in length, made its exit about three inches below the knee, the cicatrix of the wound caused by which is still visible. After a year's residence in Edinburgh, he returned to the Highlands, with

directions to use sea-bathing. This he did for the next two years, or thereabouts, during which time openings took place in various parts of the limb, whence matter and small pieces of bone were from time to time discharged, attended with much pain locally, and great constitutional irritation, with loss of flesh and other hectic symptoms.

After this, it would appear from the patient's statement, that the discharge from the vicinity of the ankle and the other parts gradually ceased, and there was a diminution of pain for some years, though entire ease was never experienced. In 1813, he was so far recovered that he was able to attend the College of Glasgow; but during his stay there, the discharge, attended with great pain, recommenced from his leg, which frequently, during the winter, prevented his regular attendance on the classes. He studied at Glasgow only one academic session, but went next year to the College of Edinburgh, where his leg remained much in the same state as before. In 1819, he was for a whole summer at Strathfeffer, in Rosshire, where, by the directions of some medical man, he used the sulphurous waters of the place, both internally and externally, but without benefit. At that period there was a good deal of pain, with some discharge. About the year 1825 or 1826, he was suffering so much from his leg, that he came out to Glasgow to consult Mr. John Burns, the professor of surgery in that university. That gentleman recommended aperient medicines, with different lotions and liniments. These had the effect of reducing external inflammation, but did not produce any permanent benefit.

Things went on in this discouraging and miserable way till 1830, when he again resorted to Edinburgh, attracted thither by the then rising reputation of Mr. Liston. This distinguished surgeon recommended him to use a laced-socking, and camphorated liniment; but no benefit resulted from a protracted employment of these means.

Mr. Burns, of Glasgow, was again, some time after this, had recourse to. The surface of the leg was at that time red and painful; and to remove that state of parts, cooling lotions and aperients were, *more solito*, recommended.

In 1835, our patient betook himself again to Edinburgh, and consulted the late Dr. Aitken, of that city. He continued under the care of that gentleman for about a month. At that period there was a great deal of pain in the course of the tibia, but no discharge. Leeches and blisters, together with cooling lotions, were employed. These had the effect of removing the pain for a time; but after his return home the pain also returned with renewed violence and frequency.

In 1837 our patient again proceeded to Edinburgh, and consulted Dr. Saunders, of that city. This gentleman, like most of his predecessors, merely prescribed refrigerant lotions, to be applied to it when the leg was inflamed and painful.

We now come to the year 1842. In the month of October of that year our patient had occasion to travel from Falkirk cattle-market to the island of Mull. The weather was very cold. After leaving the steam-boat he was obliged to travel over muir and mountain twenty miles in a common cart. In this way he reached his brother's house. About a fortnight afterwards a most violent attack of pain came on; it extended from the shin to the knee, and was attended with great swelling and redness of the surface. He describes his feelings, when his torment was at the greatest, as if the limb had been pierced with a red-hot iron, and kept down with a heavy weight, so that he could not move it without the aid of two or three assistants. The irritative fever ran high, and his sleep, as may be supposed, was much disturbed. The medical man resided at a distance, but came to his aid as soon as circumstances admitted. He applied leeches, blisters, poultices, fomentations, and gave him cooling purgatives, with some blue pill. After the pain had been somewhat mitigated, and the violence of the symptoms subdued, directions were given to rub the knee with an ointment composed of mercurial ointment and the iodide of potassium; iodine was also given internally. Under this treatment, in the course of about six months, our patient got so well as to be enabled to leave Mull, and return to his own house, which is about forty miles distant, on the main land of Argyleshire. It was in April last that this journey was made, the weather being very cold. Soon after the termination of his journey, his pain came on again as violently as before, if not more so. For three weeks he was entirely without sleep. The knee was not so much affected on this last occasion as before, but the skin was more so, there being great swelling and redness in that quarter. There was no discharge whatever on either of the two last occasions; indeed, there has been nothing of the kind for the last twelve or fourteen years, and no exfoliation of bone for thirty years.

By the usual means—viz., by leeches, blisters, and poultices, applied to a great extent, in the course of about six weeks, the