

ON
BLACK EXPECTORATION,
AND THE
DEPOSITION OF BLACK MATTER
IN THE
LUNGS,
PARTICULARLY AS OCCURRING IN COAL MINERS, ETC.

By WILLIAM THOMSON, M.D.,
FELLOW OF THE ROYAL COLLEGES OF PHYSICIANS AND SURGEONS
OF EDINBURGH.

COMMUNICATED BY DR. JAMES CLARK.

THE Society are aware that the peculiar form of morbid animal production now so familiarly known to medical men under the name of melanosis, was first particularly pointed out to the attention of the profession, about the beginning of the present century, by the pathological anatomists of Paris. The inquiries that have since been instituted with regard to this singular substance—its relation to other animal productions—and the causes of its characteristic colour, have tended to direct the attention of medical men in an especial manner to various black matters—some of a solid and others of a fluid nature—which

are met with in man and other animals, in the state of health or of disease.

There are obviously three ways in one or other of which the presence, in the texture of any part of the animal frame, of a substance not belonging to its natural constitution may be accounted for. 1st, It may have been separated from the mass of circulating blood by a process of secretion. 2d, It may have been discharged from the blood-vessels either through preternatural ruptures of their coats, or through their natural pores, without having undergone those changes in which secretion consists. And, 3d, It may have been introduced into the body from without, either by natural or by artificial passages. In each of these cases, it is obvious, the substance may either retain the properties it possessed at the time of its being deposited in the situation in which it is found; or have undergone some subsequent change of properties in consequence of its being acted on by the surrounding solids and fluids of the body.

The presence within the body of different kinds of morbid matters of a black colour, has been accounted for on each of these three suppositions—that is to say, these matters have been conceived to be, in some instances, products of secretion; in others, to consist of extravasated blood; and in others, again, of foreign substances introduced into the body from without.

The frequent occurrence of black discolouration of the sputa during life, and the detection of black matter in the lungs and bronchial glands after death, more frequently than in any other parts of the body

of which such matter does not form a constituent element, has led to the suspicion that in many instances these appearances must depend on the introduction of foreign substances into the respiratory organs by inhalation, and are not referable to either secretion or extravasation. It is the object of this communication, by investigating the circumstances under which black sputa and the deposition of black matter in the pulmonary organs, take place, to endeavour to ascertain in which of the various ways above enumerated these may be produced ;—to determine how far the suspicion of their being in some instances of extraneous origin is correct ;—how many varieties of black discolouration of the sputa and pulmonary organs ought to be recognized, whether attributable to external or internal origin ;—and how these may be distinguished from one another during life, or on examination after death. I am desirous in particular to call the attention of the profession to the evidence in favour of the extraneous origin of the black matter by which the sputa are liable to be discoloured and the lungs to be infiltrated, which has been supposed to be derived from the occurrence of these affections in persons who, from their occupations, are particularly exposed to the inhalation of carbonaceous powders or gases, such as coal-miners and moulders in iron-works. This is a subject on which for some years past my father and myself have bestowed considerable pains in collecting information ; and in the prosecution of which we are still desirous to interest professional gentlemen in different parts of the country.

I shall divide the following paper into three parts. In the first part, I propose to bring together all the individual cases of these affections as occurring in the class of persons to whom I have alluded, which have yet come to our knowledge; and to subjoin some communications relative to them which we have received from gentlemen who have had an opportunity of witnessing them on an extensive scale. In the second part, I shall briefly recapitulate the observations and opinions respecting black sputa and black deposition in the pulmonary organs, to be found in the writings of authors previously to the time at which the class of cases to which I have alluded began to attract attention.

PART I. *Individual Cases and original Communications.*

The cases which we have collected may be referred to two classes, 1st, Those in which the lungs have actually been found infiltrated with black matter on examination after death; and, 2d, those in which from the attendant symptoms, and particularly from the occurrence of black expectoration, there has been reason to believe that such an infiltration had taken place, though an opportunity was not afforded of verifying the suspicion by anatomical examination. The first of these classes may be again subdivided under two heads; 1st, those cases in which there occurred symptoms of pulmonary affection during life, and in which for a longer or shorter period of time, the expectoration was of a black colour; and, 2d,

those in which no mark of pulmonary ailment, or at least no black expectoration had been observed during life, and consequently no suspicion of black infiltration having occurred, was entertained previous to dissection. I shall arrange the following cases in conformity with these divisions.

Of cases of the first description, that is, in which there occurred during life black sputa and other symptoms of pulmonary affection, and in which, after death, black infiltration of the lungs was found to exist, we now know of ten examples, of which nine occurred in persons engaged in coal-mines, and one in a moulder employed at the Carron iron-works.

But before proceeding to detail these cases, I may mention that the first specimen of black lung which I remember to have seen, was taken in 1824-5 from the body of a patient of the Royal Dispensary of this city, who was under the immediate charge of Dr. Probart, now of Bury St. Edmond's. Of the appearances which the lungs presented in that case, Dr. Carswell has given the following account in his article on Melanosis in the *Cyclopædia of Practical Medicine* *. "The whole of both lungs was perfectly black; in many parts indurated and œdematous; in others softened and excavated. There were no tubercles, nor was there any similar discolouration in

* A drawing of the lungs in this case was made at the time for my father, by Dr. Carswell, and portions of the lungs have been preserved in the Museum of the Royal Medical Society of this place.

any other part of the body." The morbid appearances observed in the lungs were, according to Dr. Carswell, in almost every respect the same as those that are detailed in a case related by Dr. Gregory, which will afterwards be noticed. I am sorry that in consequence of the circumstances mentioned in the following communication with which Dr. Probart has kindly favoured me, it is not in my power to state whether the individual in whom this degeneration occurred, had been by the nature of his employment exposed to the inhalation of carbonaceous gases or powders.

"I regret exceedingly," says Dr. Probart, "that I cannot give you any particulars of the case to which you allude, and a second search after notes of it has proved unsuccessful, for Dr. Carswell also wrote to me upon the subject. I do not think the man had been a miner, or was ever engaged in any occupation of that kind; because had it been so, the circumstance, I suppose, would have been in my recollection. I well remember commencing the dissection, under the expectation of finding emphysema and the other consequences of chronic catarrh, which all the symptoms led me to suppose was the disease under which he laboured. The melanosis was confined to the lungs, but it pervaded them on both sides, and the poor man was at length universally anasarcaous."

In the beginning of March, 1826, my father, on his return from a professional visit to East Lothian, informed me that in passing through Tranent, he had been carried to see a man, by occupation a col-

lier, who was discharging by expectoration a large quantity of matter tinged deeply with black. So considerable was the amount of the black matter thus discharged, that my father expressed his conviction that the man's lungs must be in the same state as in Dr. Probart's case, to which I have just referred. The man having died a short time afterwards, I had, through the attention of the late Mr. Hume, surgeon in Tranent, an opportunity of making, along with my brother, Dr. Allen Thomson, an inspection of the body. The following are the notes of the case which I made on my return.

Tranent, 24th March, 1826. — Drysdale, æt. 43, a collier, has for about four years past been unable to work, except a few days occasionally, on account of great bodily weakness. On the last day on which he worked (viz. in November last) he received a blow with a mass of coal upon the right breast, where a tumour gradually formed, in which fluctuation could be felt. Since December, i. e. for from three to four months, he has been observed to spit a large quantity of a dark-coloured sputum. On the 13th inst. (March) a number of purpurous spots appeared all over his body—one upon the tumour on the breast, which soon afterwards burst by a small aperture in the centre. For two nights previous to death he passed a large quantity of blood by stool. During the course of his illness he has been subject to frequent and copious sweats, but his body is little, if at all emaciated.

Dissection. On cutting into the tumour on the

breast, the pectoral muscle was found destroyed to about a hand-breadth in extent. The tumour was found to contain a quantity of dirty purulent matter. No sinus could be discovered in the parietes of the thorax through which a probe could be passed into its cavity. On opening the chest the lungs on both sides were found to adhere firmly to its parietes. This union was particularly firm under the seat of the external abscess, so that it was necessary, in removing the lungs, to leave a portion of rib adhering to them. The whole of the substance of the lungs was of a deep black colour. In the upper portions, particularly on the right side, they were of a solid texture. In the lower, the cellular structure of the lungs was somewhat preserved. In cutting, two days afterwards, through the portion of lung which had lain below the external abscess, three or four small cavities could be seen, which at that time were filled with an inky fluid. Water dissolved the black matter rapidly—salt water sparingly—whiskey not at all. The mucous membrane of the lower portion of the intestines was lined with a layer of frothy blood, an eighth of an inch in thickness*.

Circumstances which came subsequently to our knowledge, and which will afterwards be noticed, having rendered it desirable to ascertain in what particular department of coal-mining this man had been

* Portions of the lungs, which we brought away, are deposited in the Museum of the Royal College of Surgeons of this place (No. 1438), and a drawing of the chest was executed at the time by my brother.

engaged, I applied to Mr. George Cunningham, surgeon at Ormistoun, who ascertained from a comrade of Drysdale's that he had been employed at Birslaw colliery, near Tranent, for six years previous to his death, and that in that colliery he worked at the coal-wall; but before he was settled in Tranent he had been employed at Rosewell colliery, near Lasswade, as a stoneworker. Mr. C. inquired of his informer whether Drysdale had a black spit when at Rosewell, to which he replied that he thought he had, but that this was nothing uncommon, as it was caused by the blast of the gunpowder used in their operations.

The above case has never before been published, but the drawings of it and of Dr. Probart's case were exhibited, and the cases referred to, for several successive sessions, by my father and myself, in our lectures on the Practice of Physic. The singularity of the circumstance that in the latter case the affection had occurred in a coal-miner, and the question how far the black condition of the lungs could be supposed to depend on the inhalation of extraneous matter, were especially noticed.

In 1831, a case similar to that of Drysdale occurred in the Royal Infirmary, under the care of the late Dr. James C. Gregory, the details of which were published by him in the 36th Volume of the Edinburgh Medical and Surgical Journal (p. 389), under the title of a "Case of peculiar Black Infiltration of the whole Lungs, resembling Melanosis."

The subject of this case was a man, aged 59, who

had formerly gone through much service as a soldier, but had for the last ten or twelve years of his life been employed in the coal-mines at Dalkeith. It is not stated, nor have I been able to ascertain, in what particular department of the work.

About sixteen months before his admission into the hospital he had first begun to experience palpitations, easily induced, with some dyspnœa and pain along the course of the sternum, which prevented him from following his occupation as a coal-miner. At the time of his admission he complained, in addition to these symptoms, of severe cough, sometimes occurring in paroxysms, with dark-coloured viscid mucous expectoration, which had existed for five months. His breathing was rather frequent; he lay with most ease on the right side, but generally preferred the erect posture. He had slight œdema of the legs, and also of the under part of the arms near the elbows. Five days after his admission into the hospital there were symptoms of an attack of pulmonary inflammation. Shortly after this the œdema began to increase considerably, and his urine was found to become hazy on the application of heat, while its density was lower than natural. The dyspnœa became more urgent, amounting at times to orthopnœa. The sputa became much more copious, and of a peculiar dark grey or nearly black colour, and his tongue acquired a coating of a similar appearance. He died within three weeks after entering the hospital.

“On examination of the body, both lungs,” says Dr. Gregory, “and particularly the right, were found

to adhere strongly to the pleura costalis. The pleura pulmonalis of both lungs was much thickened, in some places, especially in the right lung, exhibiting a fibro-cartilaginous appearance and consistence, and about one-fourth of an inch in thickness. The pleura costalis corresponding to this portion of the pleura pulmonalis was ossified, and had caused bony union of several of the ribs. When cut into, both lungs presented one uniform black carbonaceous colour, pervading every part of their substance. The right lung was much disorganized, and exhibited in its upper and middle lobes several large irregular cavities, communicating with one another, and traversed by numerous bands of pulmonary substance and vessels. These cavities contained a good deal of fluid, which, as well as the walls of the cavities, partook of the same black colour. A considerable portion of the pulmonary substance surrounding them was dense, hepatized and friable. The rest of the lung was also somewhat condensed and very œdematous. The serum, when expressed, was of the same black colour as the substance of the lung. The left lung did not appear to contain any cavities, but was condensed and loaded with black serum. Some minute hard points could be felt in various parts of both lungs, but they did not differ at all in colour from the surrounding substance, and no distinct tubercular deposition or infiltration could be detected in those portions of the lungs which were most hepatized, even with the aid of the microscope. The texture in these parts appeared quite uniform, and the minute

hard points felt in other parts rather conveyed the impression of their being merely the ends of small bronchial branches divided on making the section. The bronchial glands did not appear enlarged, but partook of the same black colour as the substance of the lungs." There was slight enlargement of the heart, and some morbid organic changes in the aortic and mitral valves. The structure of the kidneys was altered in the peculiar manner so ably pointed out by Dr. Bright. No other organs presented any black colouration besides the lungs and bronchial glands*.

On conversing with some of the medical practitioners of Fifeshire, who have ample opportunities of being acquainted with the diseases of the coal-miners of that district, my father found that several of them had noticed black spit as frequently occurring in that class of persons, in the progress of fatal pulmonary affections; but from the deep-rooted prejudices against anatomical examinations entertained by the coal-miners, none of these gentlemen had, at that time, had an opportunity of ascertaining after death, the state of the lungs in persons in whom such sputa had occurred. On the 17th March, 1833, however, Mr. Philp, surgeon, of Aberdour, sent him a preparation of black lung, accompanied with the following note.

"I now send you a specimen of the lungs of a man who died of that peculiar form of pulmonary consumption to which miners are liable. There can be no doubt that it is melanosis of the lungs, and

* Portions of the lungs of the subject of this case are in the possession of Dr. Alison.

caused by inhaling the choke-damp of the mines. This individual only laboured under the disease for a twelvemonth, which is a shorter period than usual, and the symptoms were also less characteristic than they commonly are, until towards the close of the disease. I could not get an accurate examination made, and only opened the thorax. The pleura was extensively and strongly adherent; the pericardium contained about six ounces of serum, the heart was small in size, and very pale. The lungs on both sides were found to have lost their elasticity, and to be converted into the consistence of liver, and of a deep jet black colour; the right lung was rather blacker than the left, and the blackness in both deeper at the superior than at the inferior parts. The right lung at the upper part contained a cavity capable of holding a middle-sized orange, lined with and containing liquefied melanotic matter, similar to that which was expectorated during life, and of which the expectoration during the latter periods of the disease generally consists.”*

In a second case, in which Mr. Philp had an opportunity of examining the body after death, the patient laboured under symptoms of chronic bronchitis, together with those of black lungs, and the bronchitic affection, he conceives, modified the symptoms and hastened the fatal event, as the patient was only five months under the last stage of the disease; the symptoms, towards the termination of the case, being

* See preparation in the Museum of the Royal College of Surgeons, No. 1439.

more those of chronic bronchitis than of black lung. In this case there was more scanty expectoration of black matter than is usual in the disease.

Dissection.—Thorax.—There existed very strong adhesions of the pleura pulmonalis to the pleura costalis; and considerable effusion of serum into the cavity of the chest. The lymphatic glands attached to the internal surface of the sternum, were all converted into melanotic matter. The whole substance of the lungs was converted into the same structure, and was hard and inelastic. No cavities could be discovered on making different sections of the lungs. There were several enlarged air-cells. Effusion had taken place into the cavity of the pericardium, and the heart was in a state of hypertrophy, but otherwise unaltered in structure.

Abdomen.—Considerable effusion of serum into this cavity had taken place. The stomach, liver, and intestines were natural. The mesentery and its glands were of a greyish-blue colour, and seemed to be partly converted into melanotic structure*.

In a subsequent communication, of date 6th October 1834, Mr. Philp referred to the case of a man about 40 years of age, who had been under treatment from August 1833, and in whom the disease had made considerable progress. Under the treatment pursued, however, the black spit had vanished, he had got quit of his cough, and although invalided from the debility in his breathing, he was

* See preparation in the Museum of the Royal College of Surgeons.

without any urgent complaint, and the progress of the disease seemed checked. This individual died in January, 1836, and Mr. Philp had an opportunity of examining the state of the thorax. On raising the sternum, the pleura pulmonalis was found to adhere very strongly both to the ribs and the sternum. The pericardium was thickened and distended with a pound and a half of brownish coloured serum. A thick layer of coagulable lymph was deposited on the outer surface of the heart, from which adhering bands stretched to the pericardial sac. The size of the heart was natural, and its structure natural, but its texture was soft. The left lung was much compressed, and throughout of a melanotic structure, with here and there a tubercle. The right lung was a complete mass of the disease, and contained a cavity of the size of an orange filled with liquefied melanotic matter *.

Being desirous to ascertain whether this affection was known to occur among the coal-miners of the west of Scotland, my father, in the spring of 1833, drew up a series of queries on the subject which he transmitted to his friend, Dr. Cumin, Professor of Midwifery in the University of Glasgow, by whom they were circulated among his medical acquaintances in charge of coal-miners. Dr. Cumin, however, could obtain no information regarding the affection except from Dr. Marshall, of Cambuslang. That gentleman subsequently published in the Number of the Lancet for

* A portion of the right lung which Mr. Philp had the kindness to transmit, we have placed in the hands of Dr. Christison for chemical analysis.

17th May, 1834, a paper entitled "Cases of Spurious Melanosis of the Lungs ; or of Phthisis Melanotica." In this paper he relates two cases of the kind occurring in coal-miners, in which he had had an opportunity of ascertaining, by dissection, that the lungs had undergone the black degeneration. These cases I shall take the liberty to introduce here.

John Cowan, æt. 58, a coal-miner from his boyhood, is of temperate habits, and has enjoyed good health until within these last seven years, during which period he has had cough, with occasional attacks of dyspnœa, these symptoms being generally aggravated during winter ; but latterly his cough had increased in severity, and his expectoration had become purulent. He had lost flesh and strength, and, in a word, presented all the symptoms of a person labouring under phthisis. In March, 1831, he was compelled by the state of his complaints to abandon working in the mine, but he continued to do light work above ground until the succeeding December, when his increasing debility obliged him to confine himself, and Dr. Marshall's regular attendance upon him became necessary. His expectoration at this time was very profuse, and presented, when agitated with water, the characters of pus mixed with mucus. These characters it retained until February, 1833, when it assumed the deepest black colour ; a quantity of it collected on a glass presenting a closer resemblance to printers' ink than to anything with which it could be compared. The quantity of this black matter which was spat up was immense, amounting occasionally to two English

pints in the twenty-four hours : at other times it was much less profuse, and he was then harassed by a constant hawking, occasioned by a feeling as if some tenacious mucous were lodged in the wind-pipe.

His symptoms after this period were such as characterize every fatal disease of the lungs. He had, however, occasional attacks of burning pain in the left side, likened to the application of a hot iron ; there was very slight œdema ; his pulse was little above the natural standard throughout the whole course of the disease ; and his appetite was good until his death, which occurred in June 1833, apparently hastened by an attack of diarrhœa.

Post-mortem examination. On opening the thorax, the glands under the sternum were observed to be of a black colour. Both lungs adhered generally and strongly to the pleura còstalis ; the pleura pulmonalis of both lungs, especially of the left, was much thickened, exhibiting, when cut into, a fibro-cartilaginous consistence and appearance. The substance of both lungs exhibited throughout an uniform coal-black colour, not a vestige of the natural colour of the lung being observable. The left lung was entirely disorganized, both lobes being converted into one large irregular cavern, traversed by numerous bands of pulmonary substance. At one part the substance of the lung was entirely destroyed, and the wall of the cavern was formed by the pleura alone. The bronchiæ communicated with this excavation with abrupt and open mouths, and the pulmonary substance around their roots was dense, friable and at

some points like cartilage. The right lung presented throughout numerous irregular excavations of various sizes, communicating with each other, and traversed by shreds of disorganized lung. Around these excavations there was pretty general hepatization, the respirable portion of the lung bearing a very small proportion to its entire volume. The excavations in both lungs contained a considerable quantity of inky fluid, similar to the expectoration during life; and indeed all the fluids which were expressed from the lungs were of the same deep black colour. With the exception of effusion into the pericardium, no other unhealthy appearance was observed.

This patient referred the commencement of his disease to a period when he had wrought for some time in a coal-mine, the atmosphere of which was almost irrespirable.

David Dunn, æt. 62, a collier from boyhood, has been affected for many years with chronic rheumatism, and has likewise had occasional attacks of difficulty of breathing, which have been especially severe during cold or changeable weather. He was originally of a robust constitution, but has been latterly rather of intemperate habits. In January 1833 he was attacked with cough accompanied by palpitation and occasional dyspnoea; he continued, however, at his employment till June, when his symptoms became so far aggravated as to compel him to put himself under treatment. He dated his complaints from a period, fifteen years back, when he wrought for several

months in a mine the atmosphere of which was exceedingly impure.

A quantity of his expectoration being collected, was found to present a dark grey or nearly black colour, like mucus mixed up with lamp-black. His symptoms from this period until his death in January 1834, were such as are seen in every case of phthisis. The pulse, however, was never much quicker than natural; there was no œdema, and his appetite continued good till death.

Post-mortem examination. The glands under the sternum were filled with black matter. The left lung adhered throughout its whole surface to the pleura costalis; it was converted into one large irregular cavern, containing an immense quantity of inky fluid; the substance of the lung had contracted numerous old adhesions to the pleura; its substance was throughout deeply stained with the black infiltration, but the greater portion of it inferiorly was respirable, and floated in water, and the serum or mucus which could be expressed from this portion was untinged. In the upper part of the lung, however, several portions of its substance were hepatized, and a section of these portions shewed commencing excavation in various stages of progress; the largest cavity, however, did not exceed the size of a nut-shell. The contents of the bronchia in the neighbourhood of these excavations, were remarked to be tinged with the black matter. The other organs were healthy.

Inquiries having been instituted by our friend Dr. James Y. Simpson, among the medical practitioners of West Lothian, as to whether they have had an opportunity of observing this affection, he was assured that it is not known either among the practitioners or the miners of that district. During the progress of his inquiries, however, a case was discovered in the person of the superintendent of the Collinshiel colliery, near Bathgate, who had formerly worked in a coal-mine in Mid Lothian. This case eventually proved fatal, and a post-mortem examination was obtained. I am indebted to Dr. Simpson for the following very circumstantial history of the case.

“ May 1st, 1833. To-day I visited at Collinshiel colliery, along with Mr. Dixon, surgeon, Bathgate, George Hogg, a man, 40 years of age, tall and of a very athletic form. At present, and for nine or ten months past, this individual has been unable to follow any active employment. He labours under a continual slight dyspnoea, which does not prevent him from taking gentle exercise, but it is always aggravated to a great degree by any considerable exertion. His breathing, even when he is at rest, is somewhat laborious and sonorous. He has frequent cough with expectoration. The matter expectorated is at present generally tinged more or less of a dark colour, but it is only at times that this is particularly well marked. For instance, about eight days ago, when attempting some slight work in his garden, he suddenly coughed up two or three profuse sputa, the

matter of which he could compare, he says, to nothing but *black ink*. There does not appear to be any distinct hectic fever, and the symptoms altogether approach, perhaps, more to those of asthma or of chronic mucous catarrh, than to those of tubercular phthisis.

“Hogg’s present situation is superintendant of the workmen at the colliery. He has not himself worked below ground for three years past; but previously to that period he was employed at Pencaitland colliery, near Tranent, as a coal-setter, or in removing the strata of sandstone, and the beds and veins of secondary trap and other rocks of the mine that impeded the free working of the coal seams; an operation which constantly required the aid of gunpowder, and consequently kept those engaged in it breathing a confined atmosphere, loaded with vapours containing a large quantity of carbon. He had, unremittingly, followed this occupation for many years, and some of the coal-setters that worked in the same mines as himself, have, to his knowledge, died after labouring under catarrh of a more or less chronic character with black expectoration.

“April 29th, 1834. Having to-day heard of Hogg’s death, I obtained permission of the relatives to inspect the chest, a task in which I was assisted by Mr. Dixon.

“I learned that after I saw the patient last summer, the black expectoration remitted for some time. It again became darker in colour, as well as more

copious in quantity towards the middle of winter, especially about the month of January. From that time, also, the dyspnœa and debility gradually increased. Latterly, the peculiar black expectoration appears to have been very profuse. About three weeks before his death, he collected and measured the whole quantity which he spat up during the course of a single day. It amounted to about a Scotch mutchkin, or nearly fifteen fluid ounces. Altogether Hogg had laboured under pulmonary symptoms for about twenty-two months, and the black expectoration first distinctly appeared about fourteen weeks before his death. He had remained free from any marked pulmonary complaint, for more than two years after he had finally given up working in the mines.

“ Inspection of the body ninety-six hours after death. —The cartilages of the ribs were much firmer than natural, but not ossified. On raising the sternum the lungs were seen projecting forwards, and appeared to fill completely the cavities of the chest. Their external surface presented a black or rather blue-black colour. In the left cavity of the pleura there was a considerable quantity of a reddish serous effusion, and the lower lobe of the lung adhered intimately to the corresponding surface of the diaphragm. The right lung was extensively, indeed almost universally adherent to the costal pleura. Judging from the strength of these pleuritic adhesions, and from the difficulty with which they were torn, they appeared to be of an old date.

When the lungs were examined, after being removed from the chest, the upper lobes were found to present the usual characters of pulmonary œdema in a very considerable degree. Their external surface, particularly that of the left lung, felt in numerous points rough and a little elevated by defined deposits of a solid matter beneath the pleura, in the form of compact masses or nodules, roundish, oblong, variously irregular in their figure, at some points isolated, and at others more or less agglomerated, and varying from the size of a hemp-seed to that of a cherry-stone, or larger. Similar masses existed in the centre or substance of the same lobes, and gave to the fingers an impression exactly like that conveyed by the presence of tubercles in the pulmonary tissue. On a section being made into the upper lobes, their substance was seen to present a deep and uniform black colour throughout, and a quantity of serum of the same colour flowed from the cut surface. On washing a portion of one of these lobes repeatedly in cold water, the deepness of the inky-black colour of the proper, and still in part crepitant pulmonary texture, was considerably lessened, though that of the solid tubercle-like masses above alluded to remained as intense as ever. The section of these masses shewed them to be of an intensely deep black colour interiorly.

“ At one part of the surface of the upper lobe of the left lung, and immediately connected with and covered by a portion of corresponding, thickened, and almost cartilaginous pleura, the substance of the

lung, for about an inch in extent and a quarter or half an inch in breadth and depth, seemed transformed into a mass, the section of which very much resembled, both in point of density and colour, the section of a piece of compact black caoutchouc; and from this mass there passed off several firm linear prolongations into the substance of the surrounding lung. The lower lobe of this same lung (the left) seemed unusually large, and felt, before it was divided, as firm as a portion of lung in the second stage of inflammation. At one part, where its investing pleura was, for about the extent of a crown piece, preternaturally thickened, the pulmonary substance lying immediately beneath it was still more compact than the rest of the lobe. The internal structure of the whole lobe appeared, on a section being made of it, of a deep, somewhat bluish-black colour; throughout some parts of it were very friable, and others even pulpy and fluid. These parts were removed when the lung was gently washed in water, and left irregular anfractuous cavities of different sizes; some of them very large, and having their walls formed of shreddy disintegrated pulmonary tissue and vessels, which projected into, and in two or three instances ran quite across the cavities. These vessels and the pulmonary parenchyma seemed both equally black. The tissues of the smaller bronchi of this lobe, and, indeed, throughout both lungs, partook of the general black colouring; but their larger branches, as well as the larger branches of the blood-vessels, nearly preserved their

usual appearance, and were the only parts, with the exception of the two thickened portions of pleura already alluded to, and a part of the lower lobe of the right lung, to which I shall presently refer, that had escaped the general black discolouration.

“ The lower lobe of the right lung seemed still larger and more distended, and had its angles still more rounded off than the corresponding lobe of the left lung. Externally it presented the same black appearance, and it felt extremely firm and solid. I was surprised, therefore, on dividing it with the scalpel to find the greater part of it consisting not of a solid structure but of a number of cells, divided from one another by partitions of a firm and compact structure, and of a greyish or straw-coloured appearance, interspersed with points and small patches of black matter. The idea which suggested itself to me, on the hurried examination of this lobe at the time of dissection, was, that the appearance in question might have been produced by the occurrence of chronic inflammation in the parenchymatous substance of a portion of lung previously affected with vesicular emphysema—this inflammation having run on to the stage of grey indurated hepatization. The morbid appearances, which a large portion of the lower lobe of the right lung thus presented, gradually passed in the remaining and upper portion of this lobe into a compact black tissue, similar to that of the lower lobe of the left lung, and, like it, it contained some irregular excavations filled with a black pulp and fluid.

“The heart was flabby, and the muscular substance forming its walls soft and bloodless, and almost without any red tint. Its cavities did not contain any coagula of blood; its different valves and orifices appeared to be healthy.”*

In the month of July, 1835, Dr. Simpson had an opportunity of seeing a second case of this disease, occurring in a coal-miner at the village of Redding in Stirlingshire.

“The patient was under the professional care of Mr. Graham of Polmont, and I visited him along with that gentleman and Mr. Girdwood of Falkirk. The following was the history and state of the patient as I found him at that time.

“Robert Leishman, æt. 60, the father of a numerous and healthy family, had been employed as a coal-miner from very early life, principally in the coal-pits belonging to the Carron Company. He had sometimes worked at the coal-wall itself, and at other times been engaged at setter-work, or in removing the other rocks of the mine, an operation in which he constantly employed gunpowder. Though capable of taking a considerable degree of easy exercise on foot, and to external appearance rather a hale-looking old man, he has been perfectly unable to work in the pits, or at any employment above ground for five years past, on account of ‘great want of breath.’ For four or five years previously to his giving up work, he had suffered much from this dyspnœa, especially on going

* See preparations in the Museum of the Royal College of Surgeons, Nos. 1440, 1441, and 1442.

to the pit in the morning, the road being up-hill. He had also, at that time, been very subject to headaches. For a long period he has been troubled with a cough and expectoration, and about five weeks ago he suddenly began to spit up large quantities of a perfectly black matter, on which occasion Mr. Graham was called to him under the belief, on the part of his relatives, that he was spitting blood. He continued to expectorate this black matter, in quantities amounting to nearly eight fluid ounces daily, until about a week ago, or altogether for a period of four weeks, when this species of expectoration ceased as suddenly as it had begun. He never at any period of his illness experienced a fit of dyspnœa in the night-time, or when at rest. He has a considerable degree of the stoop or rounded curvature of the back which is so frequently seen in old asthmatics, and his sternum and ribs are projected forwards in the manner in which they are usually seen to be in such individuals."

The patient continued in nearly the same state in which I saw him in July up to the middle of August, when the black expectoration again appeared and continued for three weeks, at an average quantity of four ounces daily. In September he suffered a severe attack of acute dysentery, which was very prevalent at that time in the village in which he resided, and he sank under this disease in the course of ten or twelve days.

Mr. Graham has further informed me in regard to the history of Leishman's case, that before his expectoration first became black in June, and during the pe-

riod between that and the second similar attack of black expectoration in August, his sputum was white and frothy, without smell, and scarcely such as to be at any time called purulent. Mr. Graham also states, that Leishman never had the profuse perspirations, nor the ordinary hectic of a phthisical patient, and œdema of the legs was never observed, except in a very trivial degree.

September 20th.—Examination of the body about sixty hours after death. The body was not much emaciated. The cartilages of the ribs were unossified. Numerous and strong bands of false membrane united the opposite surfaces of the pleuræ. In both lungs, the bands of false membrane forming these adhesions were perfectly black, and on examining the internal surface of the uplifted sternum, a number of deep-black roundish or oval-shaped flattened bodies or patches, of three or four lines in diameter, were seen running irregularly parallel to its sides. Most of these roundish bodies or patches appeared to correspond to the points of insertion of the black-coloured bands of false membrane, but others of them were, as Mr. Girdwood particularly pointed out to me in one instance, distinctly seated beneath the pleura, at a point where that membrane was perfectly healthy. I regret extremely, that in the hurry in which the dissection was conducted, I did not inspect these bodies more narrowly, or procure a specimen of them for more minute examination afterwards. From since looking, however, at the description and delineations by Mascagni and

Cloquet, of the lymphatic glands, which run irregularly along the anterior parietes of the chest, in the course of the internal mammary arteries, I am myself convinced that the bodies alluded to consisted of these glands infiltrated with black matter. At least, their general situation, appearance, and outline corresponded very exactly with those of these glands. Except in the situation of these black bodies, and of the adherent portions of black false membrane, the pleura lining the sternum and anterior parietes of the chest, was of a white and perfectly healthy aspect. On each side of the chest there was an effusion amounting to four or five ounces.

On removing the two lungs from the chest, they were seen to present, over their whole surface, a general deep or dark blue colour. The surfaces of both lungs were very rugged and uneven, from irregular superficial puckerings at some parts, and small and apparently emphysematous elevations at others. Both their lower lobes were extremely emphysematous, some of the emphysematous cells being as large as walnuts. The walls of some of the largest of these bullæ, shewed the black matter only in lines or striæ, and not in continuous patches or layers. The substance of both lungs, when cut, presented throughout an intensely deep black hue, and contained a considerable quantity of serum of the same colour. The black colour of the pulmonary structure was not in any degree removeable by washing or compression, and stained every thing that was brought in contact with it. The upper lobes of the two lungs, and

some portions of the other lobes, though considerably œdematous, were crepitant, elastic, and light enough to float in water. Several portions of greater or less extent in the lower lobes were converted into a compact, indurated but always deep black structure, and at one or two points in the middle and lower lobes of the right, and in the upper part of the lower lobe of the left lung, these solidified portions were very friable, and had broken down into irregular excavations, traversed by shreds or bands of the disintegrated pulmonary structure, and filled with a substance like thick liquid blacking, or a very strong solution of China-ink. Throughout the whole substance of both lungs, except at the points where the structure of the organ was generally solidified, a number of small, firm, scattered knots or granules, like miliary tubercles, could be felt and seen.

The coats of all the smaller pulmonary blood-vessels and bronchial ramifications partook of the general black colouration; but the larger had more or less completely escaped it in proportion to their size. The bronchial glands were of the same deep black colour as the lungs, but not enlarged in any marked degree. The free and attached edges of the semi-lunar valves of the aorta were the seat of slight cartilaginous degeneration*.

The last case belonging to this series, which I have to mention, is one that occurred in a man, forty-eight years of age, who had been employed for forty years

* Dr. Simpson has sent a portion of lung from this individual, to Dr. Hodgkin, to be deposited in the Museum of Guy's Hospital.

by the Carron Iron Company, as a moulder, and which has been related by Dr. G. Hamilton, of Falkirk, in the 42d volume of the Edinburgh Medical and Surgical Journal, p. 297, as a "Case of Melanotic Infiltration of the Lungs, with old and recent Pleuritis."

This person, who was of rather dissipated habits, came under Dr. Hamilton's care about the end of December, 1833. At that period, he stated that his health had been for some time declining, and that latterly he had become so weak as to be incapable of following his ordinary employment. His legs were observed to be considerably swollen, and the action of the heart greater than natural; his respiration, however, was nearly natural, but he had some cough. These symptoms were somewhat relieved by the use of digitalis, diuretics, and purgatives. In the beginning of May this patient appeared to be gradually losing strength, but was not confined to bed, and he continued in nearly the same state till May 20th, when he was seized with violent pain on the left side, and great breathlessness, and expired the following morning. He had not sweated immoderately during his illness, and his sputa, until within a few days of his death, were of a bluish colour; they were at that period reported by his attendants to have become perfectly black, as if they had been mixed with a quantity of soot.

Inspection.—Upon opening the chest, the upper lobes of the lungs were found strongly attached to the pleura costalis. Upon the pleura of the left lower

lobe there was some apparently recently effused coagulable lymph. When pressed with the hand, a large portion of the pulmonary tissue seemed tolerably crepitating, interspersed, however, in all the lobes, with indurated portions. On cutting into the lung, it presented universally an intensely black colour, exactly as if it had been infiltrated with soot or finely powdered charcoal. This black colouring matter pervaded every part of the lung, but appeared to be collected into particularly dense masses in the portions above mentioned, which had become indurated. Nothing like tubercular matter was found. The heart was very little enlarged, and nearly in a normal state. A small cyst was found in one of the kidneys; but, excepting this, the abdominal viscera seemed to be very healthy. The brain was not examined.

The second class of cases which I have to mention, are those in which the lungs have been found, on examination after death, to be infiltrated with black matter, though no marks of pulmonary affection had occurred during life, or at least there had been no discharge of black sputa. Six cases of this kind have come to our knowledge.

Three of these are related in an essay, "On the existence of Charcoal in the Lungs," by Mr. Graham, lecturer on chemistry in the Andersonian University of Glasgow, to which are appended, "Observations on Spurious Melanosis," by Dr. Wm. Craig, published in the forty-second volume of the Edinburgh Medical and Surgical Journal, p. 323. In these cases, this

state of the lungs was found to exist in colliers, whose death had been occasioned by accidents, and who, during life, were robust and healthy, had no cough nor expectoration of black matter, nor exhibited any symptom of pectoral affection.

The first was communicated to Mr. Graham by Dr. Laurie. The patient had received a compound fracture laying open the left knee-joint, and fracture of the clavicle, scapula, and some of the ribs of the same side, by a mass of coal falling on him. The leg was immediately amputated, and the patient was doing well till the fifth morning after the accident, when he was suddenly seized with a very acute pain on the left side of the chest, confined to a small spot in the situation of the fractured ribs, and accompanied by a severe rigour, for which he was bled, &c.; but he sank rapidly and died four hours afterwards.

Inspection of the Thorax.—A few ounces of bloody serous fluid and some adherent lymph were found on each side of the chest. The pleura costalis was ruptured, the lung not torn. The pulmonary tissue was very black, and afforded the black colouring matter with great facility when cut down and pressed in water. It appeared, however, sound, and to have suffered no change of structure.

The second and third cases were communicated to Mr. Graham, by Dr. M. S. Buchanan. Dr. B.'s first patient, a man, aged 40, from Polmadie, two miles from Glasgow, died four days after a dreadful fracture of the pelvis. On both sides of the lungs was every where remarked the carbonaceous deposit, denomi-

nated by Dr. Carswell "spurious melanosis." The second patient, an engineer, from Garnkirk, aged 29, presented precisely the same appearances, but with the addition of some stratiform melanosis in the peritoneum.

In a communication with which I have been favoured by Mr. McConechy, he mentions another case of black lung, in which no symptom had occurred during life leading to a suspicion of its existence. "In the beginning of June, 1833, a young man, about twenty years of age, who had been all his life a collier, died in the infirmary of Glasgow, of pericarditis. I did not see him during his illness, but I am informed that he never had any symptoms of pulmonary disease, except such as were induced, during the last few days of his life, from œdema of the lungs, consequent on the disordered action of the heart. When in the hospital, he laboured under acute rheumatism, and his death was caused by the translation of the rheumatic inflammation from the extremities to the central organ of the circulation. On inspection, the lungs were found to be black, and through the kindness of Mr. Howie, house-surgeon, they were sent to me. They presented the following appearances:—Though œdematous, they were still crepitant, elastic, and lighter than water. Their complexion was a very deep bluish black, but this colour was not of uniform intensity. I would say, that the whole texture of the lungs was more or less dyed with the black matter; but the correct statement is, that they had a morbid appearance, the black matter having been

deposited in patches or spots, from the size of a pin-point to that of a well sized pea. There was no disease of the lungs that I could discover, which could in any material degree interfere with their functions, except the accidental infiltration. The air-tubes, as far as anatomical inspection could detect, were perfectly patent, and retained the white glistening look of a fibrous tissue, in the midst of the surrounding black mass. The pleura pulmonalis was not in the least degree affected by the black matter, as was obvious when a portion of lung was put into a filtered solution of chloride of lime, to which a little nitric acid was added, for it was then detached from the surface of the lungs of a pure white colour."

Dr. Marshall, of Cambuslang, in a letter of date the 10th of December, 1835, which I have received from him, says, "I have not of late had any additional opportunities of observing this disease, with the exception that on the inspection of a collier, aged 35, who had died of scirrhus contraction of the lower intestine, the black infiltration of the lung was discovered in what I presume to be its early stage—that in which the substance of the lung, though charged with the black matter, is still crepitous and respirable. In this individual, affection of the chest had not been suspected during life."

Mr. Dawson, of Bathgate, in a letter to Dr. Simpson, 5th of November, 1835,) mentions the case of a man of the name of Latta, aged 40, who had worked latterly at Mr. Wier's colliery,

but whose previous history was not known. He was attended for about two years by Mr. Dickson, surgeon in Bathgate, on account of symptoms of severe asthma, attended with violent palpitation of the heart and with cough, but without any peculiarity in the expectoration, either as regards its quantity or quality. He never had any black sputum during life. On examination after death, the lungs were found as black as soot. There was no thickening or enlargement or other disease of the parietes of the heart, but the valves were completely ossified*.

Before concluding the detail of cases in which the lungs have been found, on examination after death, infiltrated with black matter, I may mention that my father, when on the continent, in the summer and autumn of 1833, learned from Professor Schoenlein, formerly of Wurzburg and now of Zurich, that he had seen several cases of the black infiltration of the lungs occurring in miners, both at Wurzburg and at Zurich, and was satisfied that, in some instances at least, the disease had appeared in persons belonging to mines in which no gunpowder was used.

* Mr. Dawson, in the same communication, refers to the case of W. Hynd, collier, æt. 21, employed at Collinshiels. Had worked coal all his life. For many years had severe coughs, and expectorated a viscid yellow matter, which Mr. Dickson thinks was rather mucus than pus. For two or three days before his death he expectorated a small quantity of black spittle, some of which was very black, at other times mixed. On inspection after death, the lungs were only partially black, with some ulceration, &c.

The third class of cases which I have to mention, comprehends those in which black sputa have been observed during life, but in which there has not been an opportunity of examining the state of the lungs after death. Besides individual cases, I shall, under this head, introduce several communications of great interest, with which we have been favoured by medical gentlemen practising in different districts of Scotland, and which contain the general results of their observations on this affection.

First, as regards the mining district of Lanarkshire. Dr. Marshall, of Cambuslang, in the essay formerly referred to, mentions that some time previous to his having had an opportunity of ascertaining the nature of this disease by dissection, two cases came under his care, which he now regards as examples of melanotic phthisis. The first occurred in 1825; the patient had been a coal-heaver the greater part of his life. He had been labouring under chronic rheumatism for some years, and had occasional attacks of cough, difficulty of breathing, and palpitation. He attributed the commencement of his ailments to having worked for some time in a very impure atmosphere. In June, his debility had increased so much as to confine him totally to his house; and along with this there was great emaciation, with aggravation of the cough and dyspnœa, and his expectoration now assumed a dark inky colour, which became deepened as his disease advanced. In September, he was reduced almost to a skeleton, and the black expectoration had become

very profuse. At this time he was removed to another part of the country, where he died shortly afterwards.

The second of these cases came under Dr. Marshall's care, in September, 1827. "The patient, a collier from boyhood, likewise referred his complaints to working in an impure atmosphere. He had been troubled with cough and dyspnœa for five years; at this time his dyspnœa was increased. There was great emaciation and debility; his pulse, however, was little accelerated, and his appetite was good. His expectoration consisted of dark ink-coloured mucus in considerable quantity: it had assumed this appearance a few weeks before this period. Latterly, slight œdema of the legs made its appearance, and an attack of diarrhœa, which continued two weeks, cut him off in December, 1827."*

* In reply to queries, which I addressed to Dr. Marshall, relative to the kind of employment of the persons affected with this disease, who had fallen under his observation, he has done me the favour to communicate the following particulars. "In the first place, the use of gunpowder is strictly prohibited in the pits here, excepting in getting through stone, a work not entrusted to the regular colliers. Second, one of the individuals had wrought at stone work in driving a level, but not for a great length of time previous to the obvious development of the affection; and third, this same individual, while employed as above mentioned, was in a pit charged with a most impure atmosphere. I may remark, in conclusion," adds Dr. Marshall, "that after weighing all the circumstances connected with the cases I have seen, I still regard the deposition of the coal itself in the lungs as the cause of the disease."

I had an opportunity in the autumn of 1835, to make personal inquiries of some of the medical practitioners of Airdrie and the neighbourhood, as to whether any cases of black expectoration or black lung had fallen under their observation. The only case of the kind respecting which I was able to obtain any precise information was the following one, which has been communicated to me by Mr. Wilson, surgeon.

Francis Black, aged 47, had been employed from his youth in working in a free-stone mine in Fifeshire, till within a few years of his death. After leaving Fifeshire and coming to this part of the country he was engaged for three years and a half as a coal-miner. Till about the end of this time he enjoyed excellent health in every respect, but for three years subsequently, he suffered greatly under a very severe attack of sciatica, which reduced him very much, and continued to harass him as long as he lived. About a year before his death, symptoms of pectoral affection for the first time made their appearance. These he attributed to his having caught cold by being carried by his friends one evening to the door. From that time the cough never left him; the sputa before long assumed a bluish appearance, and they grew gradually darker in colour, so that for some time before his death they were jet-black. Except in the nature of the sputa, the case in all other respects resembled one of phthisis pulmonalis. Permission was not obtained to inspect the body after death.

The next communications which I have to submit to the Society relate to the mining district of Fifeshire. The first of these was addressed to my father by his esteemed pupil and friend, the late Dr. James Stenhouse, of Dunfermline, of date 25th March, 1833.

“ I have seen several of the old colliers at Bevyllaw die after long continued expectoration of the black mucus ; but I regret that I had not an opportunity of examining the lungs after death. I will certainly embrace the first opportunity that offers. One well marked case occurred a few months ago in a middle aged man, who ultimately recovered perfectly from a state resembling hopeless consumption. He was ill about three months, and during that time spat up an immense quantity of mucus as if tinged with coal-coom.”

The following communication from Dr. Dewar, also of Dunfermline, and of the same date as the above, opened up a view of the circumstances in which this affection of the pulmonary organs is produced, of great interest and importance. It will afterwards be seen, that other practitioners are not disposed to concur in the view which that gentleman has taken of the etiology of the affection ; but the very extensive series of observations on which his opinion is founded, as well as Dr. Dewar's well known intelligence and accuracy, entitle it to the most respectful consideration.

“ The facts which I am now to state have passed under my own observation during the last ten years, at the colliery of Hallbeath. Since I saw you, I have revived my recollection by inquiries on the spot at the

relations of the persons of whom I have to speak, and by reference to some scanty notes which I have accidentally preserved.

“ You will please to observe the distinction between colliers and stone-workers. The former are employed merely at the coal-wall, and use only picks and wedges at their work ; while the stone-workers are occupied, in whole or in part, in removing the free-stone and other rubbish which separate the different layers of coal. In these latter operations, the aid of gunpowder is constantly required, and the workmen, from the very imperfect state of the ventilation, are frequently enveloped in dense smoke. The persons who are exposed to this noxious atmosphere are, so far as my experience goes, the victims of this most fatal species of disease in the lungs, viz., consumption with black spitting.

“ 1. Four brothers, of the name of Smith, died with black spitting ; all of them were stone-workers. Four sisters, of the same family, who have worked regularly in the coal-pit, are all in good health.

“ 2. Four men, of the name of Bowman, died with black spitting ; all of them stone-workers. Three brothers and four sisters, of the same family, who have worked in the pit, but not at stone-work, are all well. One sister died of consumption, the wife of one of the Smiths, but she had no black spitting. She died before her husband.

“ 3. Two men, of the name of Brown, died with black spitting ; both stone-workers. Three sisters, who have worked in the pit, are well.

" 4. Two Wilsons, stone-workers, died with black spitting. Three sisters, workers in the pit, well.

" 5. Four Campbells, stone-workers, died with black spitting. Three sisters and four sons, workers in the pit, well.

" 6. Williamson, a stone-worker, died with black spitting. Two brothers and one sister, pit-workers, well.

" 7. Black, a stone-worker, died with black spitting. Three sons and four daughters, workers in the pit, well.

" 8. Three Simpsons, stone-workers, died with black spitting. One son, a stone-worker, now dying with it. Two other sons and four daughters, pit-workers, all well.

" 9. Three Duncans, brothers. James, a stone-worker, died of the disease. Archibald, a stone-worker, now labouring under a cough with black spitting; and John, a collier, an old broken-down man, with a cough and difficulty of breathing, but no black spitting.

" Such are the facts. The conclusion, so far as they go, is obvious. I shall be glad to give you any farther information I can."

In a second communication from Dr. Dewar, dated Dunfermline, the 2d of September, 1834, he says:

" I regret that I have no new facts to add to those I formerly sent respecting the disease of the chest accompanied with black spitting. My connexion with the colliery ceased very soon after the period of my last communication, and in consequence my

opportunity of observation has since been very limited.

“ 1st. In answer to your first question *, the facts I have observed are as follows. Twenty-two persons, all stone-workers, have died of the disease, while forty-one persons of the same families, who are accustomed to work in the pit, are in good health. I should think that those who have suffered from the disease were constitutionally pre-disposed to pulmonary complaints; indeed two individuals out of these families died of consumption, (both colliers, but not stone-workers,) but without black sputa.

“ 2d†. To this very interesting query, I am sorry I can return no answer. There are no lime-works in this neighbourhood in which the operations are carried on by mining.

“ 3d‡. All those who have suffered under my observation, have been somewhat advanced in life; none younger than forty, generally fifty, and upwards.

“ 4th§. I have never seen a case in which the progress of the disease was rapid. On the contrary, many years elapsed from the first-feeling of infirmity in the breathing to the final termination. One circumstance I have observed to be of universal occurrence, viz., that the cough was not influenced by the weather in the same degree as in ordinary phthisis.

* “ Whether the black spittle occurs in one class of workmen employed in coal-pits more than another?”

† “ Whether other miners than those employed in coal-pits are liable to the disease?”

‡ “ Whether it occurs at one time of life more than another?”

§ “ What is the general course of the disease?”

I have often obtained for such invalids a situation in the work above ground, where perhaps they had covering but not shelter, and the progress of the disease was uniformly for a time arrested, yet in no instance was a cure effected.

“ 5th. I have had no opportunity of examining a body after death. To dissect a collier is *periculosæ plenum opus aleæ*.

“ I have only one other observation to make. At the colliery I attended, not a single case of this peculiar disease occurred among those employed in the pits where gunpowder was not used, and yet all worked by lamp-light. If the lamp-black from the oil-lamps be the cause, this fact is not easily explained.”

I have much pleasure in laying before the Society the following very interesting communication from Mr. Philp, surgeon, of Aberdour, in which he has very ably pointed out the influence exerted upon the health of coal-miners, by the nature of their occupation, and the accessory circumstances under which it may be pursued.

“ Aberdour, Fife, 6th October, 1834.

“ MY DEAR SIR,

“ I had the pleasure to receive a letter from your son a few weeks ago, regarding some notice of the disease peculiar to miners, which I promised to send to you: I had not forgotten the subject, but have delayed writing to you until now that I might make farther inquiry, and also that I might be able to

communicate to you the particulars of another *post mortem* examination, which I expected to obtain. It was only two or three days ago that the opportunity of making this occurred*.

“ In detailing the history and symptoms of this disease, which is strictly spurious melanosis of the lungs, I think it right in the first place to mention the symptoms produced by exposure to the foul air or choke-damp of the pits. When an individual has been thus exposed, he complains of severe pain and violent throbbing in his head, languor, loss of appetite, feeling of distention in the epigastric region, furred tongue, costive bowels; and where the exposure has been for a considerable time there is, in addition, a smart attack of fever. This is the first stage, which generally passes off in a few days. If the individual continues to work in foul air, he does not suffer so acutely; there is seldom any fever, neither is the head-ache of the same severe character as in the first stage. The symptoms are now more those of dyspepsia,—great loss of appetite, flatulent and acid eructations, torpid bowels, and a feeling of debility. Severe pleurodynia is also a very constant symptom at this time, and is very difficult to remove. There is also occasionally severe muscular pain of the head and neck.

“ In a short time after the occurrence of these symptoms, the patient suffers from habitual dyspnoea and wheezing, and subsequently a hard, dry, rending

* “ My opportunities of observing this disease, I may mention, have been at Fordel Colliery.”

cough, occurring chiefly in the mornings, accompanied with retchings. This stage is of various duration, according to the constancy with which the individual continues to work at the mining employment, but generally it is of more than two or three years' duration.

"The individual continuing to work in the foul air, the above symptoms all become aggravated, particularly the dyspnœa and the cough, which is now accompanied with an expectoration, at first of viscid mucus of the usual colour, but soon becoming of a greyish or bluish colour, and acquiring a darker tinge as the disease advances, until it is of a deep black colour, like printers' ink, or the pigmentum nigrum. This black matter is expectorated in the greatest purity in the mornings; during the day it is generally mixed with mucus. The dyspnœa is now of a peculiar character, different from what I have observed in other diseases of the lungs. The patient does not complain of pain or oppression about the chest; when sitting still, he can often take a tolerably full inspiration; but on walking across the room two or three times, or on walking up the least ascent, the breathing becomes painfully laborious or spasmodic, respiration being then performed by the aid of the subsidiary muscles of respiration. When the patient is asked how he feels, he answers that he is quite well, if allowed to remain quiet. The countenance becomes very sallow, emaciation takes place, the strength gradually declines, the most prominent symptoms towards the close of the disease being the

cough with difficult expectoration of the melanotic matter and mucus, and the above described affection of the breathing. There is no hectic fever, no colliquative diarrhoea or perspirations, the patient dying rather with the symptoms of exhaustion than of severe disease, and consciousness remaining almost to dissolution.

“The above detail of symptoms applies to the genuine form of this disease, for it is sometimes combined with chronic bronchitis and tubercular phthisis, which modify the symptoms and alter the course of the affection. The quantity of melanotic matter expectorated is often to the extent of ten or twelve ounces daily. The duration of the disease in the last stage, or that of debility, is very various, generally from six to twelve months. The pulse during the middle period is not increased in frequency; but when the hard, rending cough begins, the pulse is hard and inflammatory: during the last period, it seldom exceeds 90 or 100 per minute. Hæmoptysis has occurred in only one case, and that in a slight degree. In two persons of scrofulous habit, father and son, the peculiar symptoms of the disease were lost in those of tubercular consumption, and death took place in these two cases in a much shorter time than in any of the others.

“During the last eleven years I have lost eighteen patients in this disease. Of these, two were under twenty years of age; three or four from twenty to thirty; the greatest number from thirty to forty-five, and one forty-nine years. In two or three cases,

in persons who had shewn decided symptoms of the middle period of this disorder, and who had been persuaded to refrain from working at the mining department, the disease has for several years made no progress; the patients enjoy comparatively good health, although they still suffer from indigestion and dyspnœa. I have had an opportunity of making a *post mortem* examination in three instances only. There are probably two stages in the disorganization of the lungs, first a solidification, and in the further progress of the disease, a softening and liquefaction of the melanotic lung.

“ The principal points of diagnosis betwixt this disease and tubercular consumption are, the affection of the stomach forming the chief symptom during the early part of the disease; its slower progress; the peculiar affection of the respiration; latterly the pathognomonic symptom of the ‘black spit;’ the absence of purulent expectoration in the genuine cases of the disease, and likewise the absence of hectic fever, colliquative perspirations, and diarrhœa. The emaciation is also to a less extent; the countenance is of a sallow hue, and consequently very different from that of a hectic patient, and the termination is also different in the two diseases.

“ It appears to me that this disease is caused by inhaling, for a length of time, the impure air of the mines, this impurity being caused by a mixture of carbonic acid gas with the atmospheric air. I have come to this conclusion from a consideration of the following circumstances. All the individuals whom

I have seen suffering from this disease were males. In tracing their history I have always found that they have worked less or more at what is technically called 'stone-work.' The stone-workers form but a small proportion of the workmen employed in a coal-pit, not more than twenty out of 130 or 140. Among the greater number who work constantly at the coal-wall, that is in heaving the coal, I have not found any instances of the disease to occur. In working at stone-work, that is in sinking pits and driving mines of communication, the workmen are exposed in an eminent degree to the influence of the impure air; for besides working in a confined space, and in a cul-de-sac, where the ventilation is very imperfect, there is also a considerable exudation of the carbonic acid gas from the fresh-cut surfaces of the minerals. In this impure air they continue to work for many hours daily for some months, their operations being frequently carried on several yards in advance of where their lamps will burn. In working at the 'coal-wall,' on the other hand, the workmen are in large roomy spaces, where every attention is paid to maintain a free ventilation. Amongst this class of workmen I have only met with two cases of the disease, some having worked for forty or fifty years as colliers without suffering at all. The first exception occurred in a man named Robert Beveridge. Two or three months ago, a fortnight after having received a contusion on the chest, this man was attacked with severe cough, and expectorated daily, for some days, a considerable quantity of pure melanotic matter,

exactly like black paint, without any mixture of mucus. With the exception of habitual dyspnoea, this man is now in good health, and at work. He never worked at stone-mining, but for a long time he worked in a colliery where the air was very impure. The second case is that of James Japp. When exploring a mine, he was knocked down and his light extinguished by a gust of foul air, after which he lay for some time in a helpless state. Since then he has suffered from the dyspeptic symptoms, and from the cough peculiar to this complaint. This man never worked at stone-work, and previously to the above mentioned occurrence, was free from all symptoms of the disease. Further, although a number of labourers (not colliers) and of women are employed underground in various parts of the pits, no case has ever occurred amongst them. During the close sultry weather of summer, ventilation cannot be properly accomplished ; the air becomes impure in all the workings, and in consequence of this all classes of the work-people, colliers, labourers and women, become affected with symptoms of the first stage. I may also mention that horses long employed underground in those pits in which the air is foul, become affected in their breathing and with cough, making it necessary to bring them to the surface for change of air. Those pits and mines which have been noted for the impurity of the air have given origin to the greatest number of cases, for instance, Cuttlehill pit and the Holborn mine. In the working of this last,

out of a gang of ten or twelve, four have died. In the Renown pit the air is frequently impure, and the workmen often suffer from headache, dyspnoea, and dyspepsia. On the contrary, the new Venerable pit, remarkable for the purity of its air, has not furnished any cases.

“ In conclusion, on this point I have to remark, that a considerable diminution has occurred of late years in the number of instances of this disease, attributable, I think, to the necessary mining operations being now completed, and no new mines in operation. The cases at present under treatment are chiefly of old standing, and their origin can be traced to the older workings.

“ It has been supposed by some, that this disease is caused by the inhalation of carbonaceous matter, such as coal-dust, and the soot and smoke of the oil-lamps used in working. In refutation of this opinion, I beg to refer to what I have before stated, regarding the exemption of colliers from this disease, who are freely exposed to both of these alleged causes ; and I have further to mention, that no case has ever occurred amongst the waggon-fillers and the coal-stowers, who are much more exposed to the influence of coal-dust than the colliers.

“ It has also been supposed, that this disease is caused by inhaling the smoke from the gunpowder used in blasting. In opposition to this, I think it only necessary to mention that cases have occurred where there has been no exposure to the smoke of

gunpowder; and, further, that I am not aware of this disease prevailing amongst those who are much more exposed to this cause than miners are.

“ Since writing the above, I have seen and examined an intelligent miner in the Carron Company’s lime-quarries at Newbigging, a short distance from Dunfermline, who has worked in various mines. His evidence is corroborative of what I have stated as to the cause of this disease. He says, it prevails most amongst workings in free-stone and in whinstone, or a mixture of both of these minerals, but is unknown amongst the workings in lime-stone.

“ These are all the particulars with which I consider it necessary to trouble you concerning this disease. I shall continue to investigate it, and any thing further worth communicating that may come to my knowledge, shall be forwarded to you. If there is any point on which you may wish further information, I shall be happy to furnish it. I remain,

“ My dear sir, yours sincerely,

“ J. PHILP.”

With regard to the occurrence of this affection among the miners of Mid Lothian, we have received two very important communications from Mr. Steele, of Craighall, and from Stevenson, of Gilmerton, to both of whom I am indebted for an opportunity of seeing cases of the disease that had occurred in their practice.

"Craighall, Musselburgh,
9th September, 1834.

" DEAR SIR,

" That peculiar form of pulmonic affection to which coal-miners are so subject, and to which you allude in your late communication, has very often attracted my notice. It is a malady of frequent occurrence among the workmen at the Sherriffhall, Craighall, and Edmonstone collieries, and I have at all times under my care individuals in every stage of the disease.

" The black matter expectorated by colliers is of two kinds. One is simply the coal-dust inhaled while the individual is at work, and this is spit by every collier, the quantity varying according to the nature of the coal and the manner in which it is worked. Thus, if the air be confined, and if the coal be dry, and if it be worked in a manner which is technically called *shearing*, the quantity of dust inhaled is considerable; whereas, if the coal be wet, and if, as sometimes happens, there be a current of air blowing in a direction *from* the miner, and more particularly if the workings are conducted according to the *long-wall* method, the quantity is comparatively trifling. The dust thus inhaled is never considered by the workmen as at all dangerous, and is generally wholly expectorated in a few hours, or at most in a day or two after exposure. The miners are of opinion that eating largely of fresh butter facilitates its expectoration.

“ The other kind of black matter is of a very different nature, being generated in the lungs themselves. It does not, however, seem to be connected, either as cause or effect, with any seriously morbid condition of the pulmonary structure, as it may be perceived more or less impregnating the sputa of many miners who do not suffer from any pulmonary complaint. When its formation has once taken place, it appears never afterwards entirely to leave the lungs, but maintains its existence within the body during the remainder of life, and this, although the individual afflicted with it does not continue to work as a miner. When the disposition to produce it has been created, that disposition continues after the cause has been removed. D. Wilson, a miner, was not under ground for twenty-four weeks, and during the whole of that time had black spit. He is a stout healthy man about fifty, of florid complexion, and never had a pectoral complaint. This man’s wife has not been in a pit for fourteen years, and has a constant black spit without any pectoral complaint. T. Ross, after having been a number of years employed as a miner, was at sea for three years; and during the whole of that time his sputa were never perfectly free from a black impregnation. I could cite numberless cases similar to these.

“ There are no men at any of the coal-works which I attend who are employed in removing, with the aid of gunpowder, the free-stone which separates the different layers of coal, but a number of workmen are employed in removing a stratum of stone lying

above the coal. This is done for the purpose of heightening the roads after the coal itself has been removed by the collier, and is effected with picks and wedges. The work is all above head ; a great quantity of stone-dust is inhaled by the men, but they do not complain of it as injurious. The men who do this work are, however, employed at it only two or three days in a week, and sometimes not so much.

"I consider the pulmonary disease of coal-miners to be excited chiefly by two causes, viz., running mines in stone, and working in impure air. In running stone-mines the workmen use gunpowder ; there is often little and sometimes no ventilation ; and the air is loaded with stony particles, with gunpowder-smoke, lamp-smoke, and sometimes, though not always, with choke-damp. This kind of work is a fertile source of evil, and if persisted in, sooner or later produces incurable disease in those who are engaged in it. The morbid affection thus induced is chronic bronchitis, and exhibits all the ordinary symptoms of that disease. It commences with a trifling cough, which is troublesome only in the mornings, and after the expectoration of a greater or smaller quantity of frothy mucus, it goes off, giving no further trouble until next morning, when the secretion of the preceding night excites a renewal of the cough for its expectoration. In this state matters continue, sometimes for several years ; the man determines to give up stone-working, and does so for a time, but the inducement of a higher rate

of wages again tempts him to his destruction. The complaint advances; the cough becomes more severe; the secretion from the bronchia more copious and more difficult to be brought up: the individual complains also of tightness across the chest, shortness in the breathing, with a sense of fulness and occasional pulsation at the epigastrium: he feels himself getting unable for the same exertion as formerly, and when interrogated about the cause of his complaints, invariably ascribes them to stone-work and bad air. This man never recovers. He lays himself off work, and perhaps gets considerably better; he also gives up stone-working and returns to coal; but it is now too late; the evil is done; his bronchial membrane is in a state of chronic inflammation, and the coal-dust, which formerly was all but innocuous, now aggravates the morbid condition. Again he must drop working; he has frequent head-ache, and an aching weariness in the back and loins; his cough becomes more constant and more severe; sometimes it is very troublesome during the night, but in by far the greater number of cases, after passing a few hours during the early part of the night in unrefreshing sleep, he is awake with sometimes an intense feeling of suffocation; his lips and face become livid, he throws his body forwards and grasps his knees with his hands, that being the only attitude in which respiration can be carried on. After a short time a fit of coughing commences, which ends in the slow expectoration of a great quantity of tenacious glairy

mucus, and leaves the patient in a state of complete exhaustion. The sputa are sometimes of a yellowish colour, often grey, and occasionally black; they have also at times a puriform admixture, and are not unfrequently tinged with blood. If the individual thus attacked be under forty years of age, and if he take care of himself, he may still be restored to the enjoyment, for a time at least, of tolerable health; but if towards fifty, there is no hope for him; he gradually becomes emaciated; his countenance becomes wan and anxious, his skin shrivelled, the veins on the surface prominent, the shoulders high, and the body bent forwards. He drags on a wearisome and unenviable existence, sometimes for a number of years, and occasionally attempting some trifling employment for a day or two at a time; but his dyspnoea and cough increasing, he gradually declines and dies from exhaustion.

“ In other cases, although the bronchial affection is the first of which complaint is made, still, when medical aid is applied for, disease of the heart is the more prominent symptom. This seems to be induced by the impeded circulation in the lungs,—the consequence of the long continued inhalation of air impregnated with carbonic acid gas. The same circumstance also causes engorgement in the hepatic and mesenteric vessels, giving rise to abdominal pain, to hæmorrhoids, the discharge of black stools, or of dark blood in an unmixed state from the anus. In other cases, the determination is to the head, and relief is often ob-

tained by the discharge of black blood from the nose. I consider coal-miners to be peculiarly liable to disease of the heart and to aortic aneurism.

“ 2d. My experience does not enable me to say whether other miners are equally liable to this disease with coal-miners, as all those who are employed in stone-mines at the collieries here, work also, when not so employed, as colliers. But I should think that other miners must be equally liable to the bronchitic affection, and when this exists, the presence or absence of black spit seems of little consequence, as regards either the progress or termination of the disease. I form this opinion from the fact that those who restrict themselves to the working of coal are not peculiarly liable to pulmonary complaints, and they are as long-lived and as healthy as any class of labourers whatever. The temperature of the place in which they work is almost always warm and equable; they suffer little from any inflammatory complaint excepting rheumatism, and tubercular phthisis is among them a rare disease. I am informed of several robust-looking men, who wrought merely as sinkers of pits and not as miners, who fell victims to pulmonary disease, and some of whom had black spit. This, however, is not in my experience a common occurrence in the case of mere sinksmen. Some individuals are little injured by stone-mining compared with others. Abram Bennet, aged 68, is a stout erect man, who has wrought a great many years (about fifteen) at

stone-work. He has been a sinksman and has run many stone-mines, both in coal-fields and lime-quarries, and at other times worked as a collier. He complains neither of cough nor dyspnœa. There are others also, with whom I am acquainted, who have enjoyed a similar immunity from disease. Much depends upon the nature of the minerals through which the mine is carried; and in the Mid Lothian coal-field the edge seams are considered to be in a much greater degree injurious than the flat. This is owing chiefly to three circumstances:—1st. In the edge seams the strata are not so much impregnated with moisture. 2d. The cutting process by the pick of the miner is carried on more upon a line with his own face, and hence more dust is emitted and inhaled. But the principal reason is, that the stone contains some poisonous matter which is probably of a metallic nature, as the workmen complain of its exciting a styptic and metallic taste in the mouth. A mine was carried across the strata in the Niddry estate, the finishing of which required a number of years. Six or eight of the miners employed in it died; several were obliged to leave it, and only one of those who commenced it was able to work in it throughout and lived to see it completed. There was a particular stone in this mine, which was repeatedly met with, and to which the miners gave the name of arsenic, which was found highly pestiferous: its exact nature I am not acquainted with. In a stone-mine run some years ago in the Newbattle field, a great many men

died, the average length of time each of the miners employed in it lived, being about two years. The mortality was ascribed to the nature of the stone.

“ 3d. The period of life at which the disease occurs must vary according to the length of time the individual has been exposed to the exciting cause, and to natural difference of constitution; and it must depend also on the nature of the minerals in which the mining operations are conducted. I have often seen it prove fatal about the age of from fifty to fifty-five.

“ 4th. From the description above given may be gathered nearly all the information which I am able to give in regard to the course of the disease. It differs from ordinary tubercular consumption in being seldom attended with hectic fever, and never with the distinct and well marked hectic of the latter. In the disease under consideration the dyspnoea is in general much more distressing than in any cases of phthisis which I have witnessed. The emaciation is not so extreme. There are seldom colliquative sweats or diarrhoea. The fulness and frequency of the pulse met with in tubercular phthisis are not concomitants of this affection. In a great majority of cases phthisis makes its attack, and proves fatal much earlier in life than this disease is ever met with; and in the latter there is a livid discolouration of the lips and hands, and sometimes of the face, and not unfrequently anasarca in a greater or less degree.

“ I regret that I have not kept notes of the *post mortem* appearances in any of the bodies which I examined, with the exception of only one or two;

and in these my attention was more particularly directed to the morbid condition of the heart than of the lungs. Indeed the state of the bronchia has been so uniformly the same, or nearly so, that of late I have not in every case minutely examined it. The mucous membrane is highly vascular, generally soft and swollen, and not unfrequently ulcerated. The lungs in several cases contained black, carbonaceous-looking matter, lying along the course of the bronchial tubes, and enclosed in bags of cellular membrane. I have seen it sometimes distributed through the lungs in little nodules; and in one case which I distinctly recollect, this black matter pervaded their whole substance, and the hand of the dissector on being withdrawn from the chest, after the substance of the lungs had been cut into, had the same appearance as if it had been dipped in a basin of thick charcoal and water.

“It may not, perhaps, be unworthy of being mentioned, that while stone-mining seems injurious, chiefly if not solely, to the pulmonary structure, the deleterious effect produced by the inhalation of choke-damp is exerted principally upon the heart. I have often thought that the production of the black pulmonary matter resulted rather from some condition of the system produced by the circulation through it of imperfectly oxygenated blood, than from any direct effect produced merely on the lungs by the inhaled stone-dust or impure air. There is nothing further in connexion with this subject which occurs to me at present as worth communicating.

It would afford me much gratification if any means could be devised as regards either prevention or remedy, whereby might be lessened the evils of a disease, the ravages of which, upon the most robust constitutions, I have every day cause to deplore.

“ Yours, faithfully,

“ GEO. STEELE.”

“ Gilmerton, 7th November, 1834.

“ DEAR SIR,

“ In your letter of the 30th of August, you ask, 1st, Whether the black spittle occurs in persons working in particular coal-pits more than in others, or in one class of workmen employed in coal-pits more than another?—In answer to this question, I have to state that in this place I have never yet been able to trace it to colliers at all, unless they may have combined mining operations with their usual work at the coal-wall. Indeed, from the cases that have fallen under my own observation, I have come to the conclusion that no collier or individual engaged in working coal only, either by blasting it with gunpowder or hewing it out in the ordinary way, does ever present the least expectoration of this sort while labouring under pulmonary consumption; but that it is confined entirely to those employed in stone-mining, or carrying through a communication below ground from one seam of coal to another, in certain kinds of hard rock, especially when, from the position of the strata or otherwise, much use is made of the pick; and I am further led to believe that

some species of rock are worse in this respect than others*. Some of the workmen suppose, that the use of gunpowder contributes greatly to the formation of the disease, but from what I have been able to learn, without any proper foundation. For although the spittle may be black after inhaling for a length of time the smoke arising from the different explosions in close mines, yet the blackness generally disappears within a few days, or a week at most, in the same manner as when it is induced by lamp-smoke, leaving the lungs perfectly sound.

“ 2d. Whether miners or other classes of workmen, besides those employed in coal-mines, are liable to the disease?—In this neighbourhood both lime and sandstone are extensively quarried, yet the men engaged in that kind of work never show the least disposition towards this affection, when labouring under phthisis; they spit up nothing but mucus, purulent matter, or blood.

“ 3d. Whether it occurs at one time of life more than another? The time of life may occasionally have a slight influence in hastening or retarding the coming on of the disease; for if a workman begins sinking coal-pits or driving mines, while young, the

* Mr. Stevenson has had the kindness to procure me specimens of most of the rocks in which these mining operations are conducted, and to arrange them according to the degree of prejudicial influence which they are supposed to exert on the miners. But it will require an extended series of observations to enable us to judge how far any connexion can be traced between the prevalence of this affection in miners and the particular kinds of rocks in which they have occasion to work.

constitution may, and I have no doubt from my own observation, does resist the baneful effects of such an exposure of the lungs to the noxious influence of the dust which arises from the hard rock in close mines, and especially in those in which there is a scarcity of water. If a miner continues for two, or at furthest three years, constantly, or even at intervals, engaged in this kind of work, he is sure to suffer, let him have been ever so robust before he commenced it. You will observe, that I allude to this locality in saying that so much danger is to be apprehended, because I am quite aware that in other places, nay, even a few miles distant, such a complaint is scarcely ever heard of. It would therefore appear that the evil arises from the particular species of rock through which the mines are driven, and not from the mere operation of mining alone.

“ 4th. What is the general course of the disease; in what respects does it correspond with or differ from the ordinary tubercular consumption; and whether the black discolouration of the sputa is constant or only occasional?—Phthisis, when this discolouration of the sputa presents itself, alters in no respect its regular course. This symptom, however, may occur even so much as eight or ten years before pus is discharged, and at various intervals during that time. Sometimes the colour is regular, of a deep black hue, without either mucus or pus being observed in it, while at other times, in the same person, it may assume a lighter or bluish shade, from the quantity of phlegm or other matter spit up along with it;

and in the morning it is, for the most part, darker and more copious than throughout the day. Its commencement is at times quite unexpected, and the individual is surprised at the colour of his spittle; but oftener it is preceded by more or less difficulty of breathing, general weakness, and an inability to continue work regularly. It will continue for days or weeks together, but frequently it intermits or partially stops, evidently shewing that the black matter is in the form of tubercles, or contained in cells, by the bursting of which their contents are discharged into the bronchia and thus spit up. The quantity brought up varies from a very small quantity to nearly half a pint at a time, according, it is to be presumed, to the size of the space in which it was contained. When this black matter is pressed between the finger and thumb, it does not feel gritty, nor does it contain any particles of small stone: it is of the most delicate fineness and uniformity of texture, similar to lamp-black. At the commencement of the disease it floats in water, from the admixture, probably of mucus; but it sinks towards the end as the pus becomes more abundant.

“The cause of this kind of spittle is evidently working too long in certain coal or rather stone-mines; and some mines are much worse than others in producing this effect. The stone or rock in this district which is reckoned the worst, is what the miners call sand-stone, because more sand or dust flies from it, when struck with the hammer or hewn with the pick, than from the other kinds of rock. It is not

sand-stone in the ordinary sense of the word, but a very hard bastard lime and whin rock, of a dark-blue colour, and sometimes mixed with spar.

“ Colliers spit up the black-coom or dust of the coal, and miners the stone dust, in other districts, without any attack of phthisis whatever. How that disease should happen here, and how the black substance is formed in the lungs, I cannot explain.

“ I confess that not having turned my attention to the *post mortem* appearances in this disease very particularly, nor perhaps with that minuteness which it deserved, I feel unable to give you any thing at all satisfactory on the subject. I may mention, however, from the recollection of two or three examinations, that the parenchyma of the lungs appeared interspersed with tubercles, filled with this sooty-looking matter, and varying in size from that of a small pea to that of a walnut; and that by the time death occurred, a considerable portion of that organ had disappeared, leaving cavities with an irregular ragged surface, partly covered with purulent matter, and having deep indentations where the coloured contents had been discharged. In all other respects the morbid appearances bore the strongest resemblance to those of tubercular consumption.”

Dr. Hamilton, in the communication already referred to, has noticed two cases of which he had been informed by Mr. Girdwood, surgeon of Falkirk, in which persons, who had been employed as moulders in the Carron Company's work, had died after discharging considerable quantities of dark-coloured or

black expectoration, but in whom an examination after death was not obtained. I am indebted to Mr. Girdwood for some additional particulars respecting these cases, as well as for some interesting information respecting the health of moulders, which I hope to have another opportunity of laying before the Society.

“ Braid, aged 56, from Stenhouse Muir, had been a moulder for forty years. He had eleven children. Three daughters, aged 19, 21, and 27 years, died of phthisis previous to his decease. He has four sons, aged 30, 21, 19, and 14, all employed as moulders, and all of whom have enjoyed good health, and are at present well.

“ I first saw him in May, 1833, and was only asked, as a matter of curiosity, to visit him, as his family were astonished at the appearance of his expectoration. He had become ill about the beginning of January, and had been only once in the works from the commencement of his illness. Both he and his wife firmly maintained, that from January to the end of April his expectoration was yellowish,—in every respect similar to what his daughters had discharged; and that the change to dark took place in one day, after which it continued of this character till the time of his death, which happened in the following January. His expectoration amounted to about half a mutchkin (two ounces) or more daily. His widow states, that previous to his illness she had not observed any thing peculiar in his sputum, nor had he ever mentioned such an occurrence to her.

“ Craig, aged 55, stout and of a ruddy face, came under my care the 1st of January, 1834, for severe hæmoptysis. In about a month he was able to go about, and continued so for six weeks, but did not return to his work. During his recovery he had copious expectoration, which, according to my own observation, was of a yellowish colour. About six months previous to his decease it became very dark, though not to such a degree as in the former case. Through the whole course of the disease he had severe pain in the right side of the chest.”

I have now laid before the Society the principal part of the information which we have hitherto obtained, respecting the occurrence of black expectoration and of black infiltration of the lungs in coal-miners and iron-moulders. I may be allowed to express an opinion, that the extent and accuracy of that information are highly creditable to the zeal and intelligence of those by whom it has been furnished. It must be obvious, however, that the co-operation of a number of persons, residing in different districts, is still requisite to furnish the materials necessary for a correct comprehension of the nature and origin of these affections. The queries which have been addressed by my father and myself to those who we thought were likely to take an interest in the investigation, and to have it in their power to advance it, have varied from time to time with the progressive extension of our own knowledge of the subject respecting which we were desirous to elicit information. I shall here subjoin those queries in the form in which

they were last issued, in the hope that they may be useful to those whose opportunities may enable them to prosecute the inquiry.

80, George Street, Edinburgh.

SIR,

Our attention happening to have been particularly called to the occurrence of black expectoration, and of infiltration of the lungs with black matter, in coal-miners and moulders in iron-works, we are very desirous to learn whether these appearances have been observed amongst the same classes of workmen in other districts of the country; and whether they have been met with in other classes of workmen, who, from their occupation, are exposed to the inhalation of an atmosphere loaded with carbonaceous or other matters, either in a gaseous or pulverulent form. With this view we venture to request that you will have the goodness to inform us, whether any thing of the kind has fallen under your observation among the workmen employed in the mines or manufactories in the district or districts in which you have practised.

The black expectoration to which we allude, is not the mere slight tinging of the sputa to which every person is more or less subject, who lives in a smoky atmosphere, and in which the lungs seem to eject in the morning, all the carbonaceous particles inhaled during the previous day; but a very considerable discolouration, which goes on for a length of time in persons who have voluntarily, or in con-

sequence of bad health, abandoned the kind of occupation which exposed them to the inhalation of carbonaceous matters.

If such an appearance has presented itself to your notice, we are desirous to be informed :—

1st. Whether you have found it to occur in particular mines or manufactories more than in others, or in one class of the workmen employed in those establishments more than another ?

2d. Whether it appears to you to depend on an imperfect evolution of carbon from the lungs, in consequence of the persons respiring a confined or vitiated atmosphere, or to be occasioned by the inhalation of extraneous carbonaceous matters ; and if by the latter, what you conceive these matters to be, — the smoke of the lamps or candles employed by the workmen ; or of the gunpowder employed in some mines in blasting ; or what other agent ? Should you have formed any opinion on this point, may we request you to state the grounds of it ?

3d. Whether the black expectoration occurs more frequently in persons apparently healthy, particularly as regards the pulmonary organs, or in persons in whom there is reason to suspect a morbid condition of those organs, such as chronic bronchitis or tubercular consumption ?

4th. Whether the black colour of the sputa is constant or only occasional ?

5th. Whether in any cases of this kind you have had an opportunity of ascertaining, after death, the state of the lungs and bronchial glands ? And,

Lastly, whether in any dissections you have made, of persons whose sputa had not been so discoloured, you have found the lungs infiltrated with black matter capable of tinging the hands, and of communicating to water the colour of china-ink?

Hoping that you will pardon the freedom of this application, and be disposed to assist us in the prosecution of our inquiries,

We have the honour, &c.