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Wm Murray M.B. et C.M. (1879)

The Relation of environment to Disease among Colliers as exemplified at Parkfield during the Years 1880-1892

For nearly twelve years I have performed the duties of surgeon to the Parkfield Collieries, where between 600 & 700 men and boys are employed. In this thesis I propose pointing out the mode of life of these men, their surroundings the diseases from which they suffer and die, and, as far as I can, their etiological connection. In many instances I can not furnish statistical data: nor do I imagine would figures on such a small scale be of any practical use. I much regret the difficulty of obtaining post-mortem examinations in order to verify results; but this regret I must share with many others in private practice, owing to a false but pardonable sentiment existing very generally in the minds of the public.

The day of a working miner naturally divides itself into the working portion, and the remainder. As many of the miners live one, two, three miles, or even further from the pit, and they require to be at the pit-bank about six a.m. they ~~require~~ to get-up ~~for~~ half-past four till five o'clock in the morning. ~~Most~~ Some of them take tea & bread and butter before starting ~~for~~ from home their work, and they go on with their work till nine or ten when they partake of tea again with bread & cheese, bread & meat, or some may vary that by taking milk. Again work proceeds till half past twelve, and the same kind of food is eaten. At 1.30 p.m. work is resumed till four p.m. when they come up and go home. No intoxicant in the form of alcohol is

allowed on the works: hence tea chiefly, & cocoa, or milk from the staple beverages. The tea is taken strong & black, very often of an inferior quality. Smoking is allowed, and most avail themselves of the permission. There men work ten hours between bank and bank, except on Saturdays when they work only eight. This has obtained during the winter months only, from the latter end of September till the beginning of April. During the summer months the days of labour have varied from 5, 4, 3, & even 2 per week.

There is, however another shift of men who do repairs only, and who work from 10 P.M till 6 A.M. between banks. They have only one meal during the night which is of the kind mentioned above; and during the day at home they have their food like other labourers. Most of them go to bed at noon. There is no alternation of shifts, except among those connected with the engines and the stables. The day-men are always day-men, and the night-men always night-men. In consequence of this arrangement the men who work by day during the depth of winter never see the sun except Saturday afternoon for an hour or two, and Sunday. Pallour of skin is characteristic of miners in this locality, and I can attribute it to no other cause than want of exposure to sunlight.

When the men arrive home, they mostly wash all over with soap and warm water, and don their other clothes, nearly every man keeping a separate suit for pit-work. The skin is thoroughly clean & healthy and reacts to differences of temperature very efficiently. The meal now partaken of is the principal one of the day consisting of meat & potatoes & some other vegetable, ~~frequently~~ with frequently tea again.

As many of the men under my care are sober men, the evening is spent about home, and finished up in the great majority of

cases by bread & cheese & half a pint of beer before going to bed.
Such is a brief account of the average miner's day in relation to work, food and rest, amongst those with whom & am connected.

The home itself is as a rule superior to that of the same class of men in the North. There are few one-storied houses; the rooms are of a fair size, and the bedrooms are usually sufficient in number & are on an upper storey. Ventilation is good by day & night. Cleanliness is very general in person, clothes & home. Ornamentation in the shape of prints and pictures is common; and every one has his flower patch or border in the garden; while many are adepts in the art of raising vegetables & rare flowers in small green-houses erected by themselves. These may apparently be small matters; but they all are included in the sum-total of the miner's life, and have a definite influence on character, duration of life, & disease.

The pits are situated on the eastern border of the Bristol Coalfield. The strata lie in the form of a basin in the centre of which, for the greater part of the last 12 years, the work has been carried on. On account of great lateral pressure, these strata, are much broken & distorted; and therefore the workings are intricate & require much attention & skill. The seams of coal vary from 2ft- to 4ft- in thickness, & four are being worked at different levels. The pits are 300 yards in depth; but most of the present workings are at least 100 yards deeper. Although the coal is bituminous & a good gas-producer there is practically no gas in the pits mine & naked-lights, chiefly candles, are used. As the men live practically one third of their time in the mine during winter, and a smaller varying portion of it in summer the Ventilation of becomes a matter of great importance

In regard to quantity of air I may state that the amount passing down the pit varies from 26 000 to 35 000 cubic ft per minute- Allowing for 600 men, the amount owned be about right viz 500 c ft: per minute per head. But candles

lamps, 30-40 horses, & engines must all be allowed for. On the other hand the measurement is made by anemometer to register rate, and multiplied into area of section of the pit to give C. Ft.; and every one knows that the experimental error in this observation must be considerable. I have on several occasions examined the air & estimated the amount of carbonic acid, which never exceeded .635 per 1000: of course I mean the air at the face where the mains are working. The amount of organic matter in the same specimens, estimated by the albuminoid ammonia process of Wanklyn was on several occasions considerable. The highest was .7 mgr per metre. So that the air in this mine may be called good, if compared with some of the specimens from other mines, where Angus Smith states the oxygen to be 20.5 p.c. and the Carbonic acid amounted to 7.85 per 1000. As we will see afterwards diseases of the respiratory apparatus are as rare among the workers in Parkfield as among a similar population working above-ground.

There men who work with gunpowder and other explosives the branchers as they are called,- are an exception to the above statement. Up till recently gunpowder alone was used; but ~~recently~~ at present various explosives have been tried. Now to understand the position accurately it is necessary to premise that branching is done by contract. The air is carried down a branch by pipes of sheet-iron, and necessarily these pipes are not always close to the face. The men are of course induced to earn as much as possible by using their time to the best advantage; and thus they often rush down to the face before the gases have had time to escape or be properly diluted at the face. Then they must breath air al-

admixed more or less largely with the products of com-
bustion of the explosive used. The products of gunpowder
combustion are well-known comprising chiefly, carbonic acid &
oxide, sulphurous acid & nitrous compounds. I have conquered
even a good many - if not all of the old branchers cases from
bronchitis in its Chronic form, with emphysema. And I
may also mention that the branchers, are liable to inhalation
of other dust, than coal-dust; as they are cutting through
strata of different rocks: they may therefore more properly
be classed among workers in stone, than among coal miners.

Considering the question of air supply to these men, we
may say that they live in an atmosphere, at least as good
& frequently much better than the dwellers in towns & cities.
And if we take the whole twenty four hours into considera-
tion, the amount of oxygen possible to them is very much
greater than to the very poor in our cities, who are huddled
together at night where the sleeping accomodation is scanty.
Nay more, I may say that they are better off than the
upper ten who crowd saloons for hours together in the
blaze of gas which vitiates the air to an enormous ex-
tent, already deteriorated by the products of human respir-
ation & the stinks of so-called perfumes.

I have mentioned generally the food these men eat, the
work they do, the air they breathe, and I must now men-
tion in the same way the water they drink. With regard to clothes
the subject
there is little to say, and I may dismiss it by stating that
flannel is usually worn next the skin; and that other-
wise a sufficiency is the general rule.

Water.

I have already said that the Lias overlies over a wider area; but the water-carrying strata are generally the same. Limestone or lias overlying new red sandstone, with layers of pennant stone intervening or cropping to the surface here & there is the general character of these strata. The result is that in certain parts of the district hard water of a soft nature is used, in others very hard water; in others hard water containing a good deal of magnesian salts. Take as samples the three following.

I. The West Gloucestershire Water Company.

Report submitted to Parliamentary Committee by E Frankland & Bennett Dicky

	Total solid matters	organic carbon	organic nitrogen	ammonia	nitrogen as nitrates & nitrites	Total nitrogen	Hardness Chl.	Hardness Temp.	Hardness Perman.	Hardness Total
No 1 overflow near the River	31.05	0.068	0.030	0.017	none	.039	1.5	12.7	3.2	15.9
No 2. From the overflow	31.89	0.062	0.037	0.014	trace	.044	1.59	11.9	3.2	15.1
No 3. From shaft	31.61.	0.082	0.042	0.017	trace	.042	1.59	11.9	3.2	16.1

This water arises from the pennant series in an old unused iron mine, and used to overflow into the river Frome. The water Company was got up to supply a large area containing many populous villages whose supply was known to contain many polluted wells.

The analysis of the Bristol water is as under.

Saline Ammonia	.001
albuminoid "	.005
Nitrogen as Nitrates &c	.08
Chlorine	1.02
Oxygen absorbed in 4 hrs	.045
Total hardness	16
Permanent	3.5

the degrees of hardness

I have examined this water 5 times & by Clark's test always made it 19

In one particular district I examined the water of many wells and I found the quantity of magnesian salts a distinctive characteristic. The following is the result of one examination and a fair example of the whole. This water is pumped up, from half way down the pit out of a stratum of permanent, and supplies about 600 families. The analysis is given in grains per gallon.

Free ammonia	albuminoid ammonia	Cl.	O. absorbed in 3 hrs	Nitrogen as nitrates & nitrites	Total solids
.002.	.005	2.	.02.	trace	30.

Total hardness	Temporary	Permanent	MgO.	CaO
19.1	14.	5.	4.1	9.2.

The hardness here is the objectionable point; and the amount of magnesia I consider makes the objection grave. Organically the water is good.

Such being the "environments" of this population of over 600 miners, it is now my business to trace their effects upon their organisms.

The minor ailments which in the end lead to the more important are not always easily diagnosed; and at first I found them more difficult to deal with than seemingly more important diseases. I have to keep an open Surgery for three hours daily and the exigencies of the practice require rapid diagnosis, which is apt to lead to slovenly habits & great inaccuracies, besides tending one's thoughts to runs in ruts especially in regard to treatment. I attended the out-door practice of the Infirmary, and the Fountain bridge Dispensary much more diligently than the average student of my time; and yet for a long time I found these three hours the most burdensome of the day. The system of benefit societies renders this work very responsible work, for upon the opinion the Surgeon states

depends the liability of the Society for Sick-pay. a (8)
Careless or ignorant Surgeon, or one without the courage of his o
pinion would ruin any benefit society by giving way to ma-
lingerers. Hence the very work which has to be done und
the most disadvantageous circumstances comes whe the
most important financially to these societies, and throu
them to the individual members who compose them.
This work is just the work which the University training
in my time did not fit me for; and had it not been for
the persistence of Dr Murdoch Brown at the Fountain-
bridge Dispensary in urging the students to attend to minor
ailments chiefly I would have been more unfit than I was.
It does not require much clinical acumen to recognise the
well-marked diseases seen in our large Hospitals; but it require
a great deal of that acumen, and certainly far more profound
knowledge to recognise & treat the common ills of every day
life. Now the Dispensary practice is frequently taken by
Students at a period in their career when they are quite un-
fitted to benefit by it. This is a matter that could easily be
remedied; and the rank & file of Scotch Students who un-
der England to practise would thereby be placed on a level
with their English compeers from the very beginning; while
the more profound scientific training they get, at the Uni-
versity of Edinburgh at least, would soon enable them to
rise above those with mere qualifications. It is true that ex-
perience & interest do that for them; but while the Scotch
man
University is gaining that experience, and making his blunders
the English Hospital-trained man is gaining his footing, & the

former has lost his opportunity for years. This is no exaggeration. I can quote instances, and give names if needed, to prove my position. I may be told there are plenty of opportunities afforded for this kind of training. Looking back on twelve or 14 years ago I would question the statement; but even if it were so, what care is taken to compel the student to attend out door clinigues. Is he ever asked a question upon the minor ailments in the written, oral or clinical examination? Nearly every student would leave a case of dyspepsia to go to a case of Aneurism or locomotor ataxia. And who is there to tell him that the former is much more important to him than the latter?

Diseases of the Digestive Organs.

As a group these are the most common, as they are everywhere. The miners habits of drinking strong, black inferior tea containing a good deal of tannin leads to a form of dyspepsia with palpitation easily recognisable. Smoking strong tobacco in large quantities complicates matters; but a little experience enables one to eliminate the cases of mischief caused by tobacco. A man complains, for example, of fulness & distension after food, a sickly feeling, anorexia, quickened pulse, innumerable sensations which vary according to the individual, regularity of bowels, & fairly good circulation & respiration; I should diagnose a case of tea-dyspepsia with a moderate use of tobacco. The almost total discontinuance of tea, a little soda & rhubarb, & light milky diet for a fortnight will put that man right. If however, with the same gastric symptoms, there is frequent fluttering pulse aggravated after meals to faintness with some shortness of breath, the probability

of tobacco excess as a factor is present. A Reduction of the amount of tobacco used, along with a week's rest must be added to the other treatment. There is no chance of getting an old smoker to give it up altogether; and, besides, I am not sure if it is advisable; for the moderate use of tobacco counteracts to some extent the evil effect of the tannin contained in the tea in causing constipation. Dyspepsia is very frequent; constipation rare. Of course it must always be remembered I speak exclusively of males.

I am not aware that these frequent attacks of dyspepsia lead to any grave forms of disease. Simple Ulcer of the stomach has as yet been entirely absent amongst these men; and Cancer is certainly rare. Two cases of epithelioma of the tongue have occurred in my practice, both traceable to smoking, one possibly complicated by the results of the sins of his youth. At least three cases of pyloric stricture, in all cases malignant, and one of malignant disease of the rectum. But there is no evident connection between the slight ailments & these. In fact in all these cases of malignant disease the dyspepsia was the first symptom.

Having used the word dyspepsia, I must explain that by that term I mean any simple disorder of digestion, not due to a recognizable lesion; and the form I meet with is most frequently characterised by the symptoms mentioned. There are cases of dyspepsia evidently due to some form of portal obstruction & want of proper hepatic circulation; these are mostly due to constipation, or followed by it. The old

blue pill followed by a saline purgative helps them cases, followed in turn by nitro hydrochloric acid & a bitter infusion.

Now there is nothing new or original in the study of these cases; nor is there anything peculiar in their causation. But avoidable the habits of the men lead to their complaints. And a question arises of how to avoid them. I have tried various plans. Seeing that the food in the pits take for two meals, & the morning meal before going out, are not easily varied as to the solids; and that the tea is in the majority of cases the real cause of the mischief, it is easy to suggest that a substitute for the tea ought to be made I have suggested coffee & cocoa & milk, but the men all say that they cannot work so well, and revert to the tea after a short time. Alcoholic liquors are inadmissible. Water as it is found in the pits is very impure; and the men always say that drinking pit water causes either boils, or diarrhoea. Certainly facts go a long way to support that assertion. A certain amount of liquid is an absolute essential; and I am constantly met by the question, What do you recommend me to drink? I am driven back on the advice of taking good tea properly infused. In cases where this has been done, the dyspepsia has disappeared, although the quantities have remained the same - about a quart per diem. But it is strange how constant is the reversion to the old black tannin-loaded infusions. It is not a question of taste simply for many have asserted that they prefer the tea without the tannin, but that they do not feel so fit for their work after it. Can it be possible that tannin has any thing

to do with that feeling of well-being? or does the length of time required to bring out the tannin, bring out anything else for the tea having that effect? I know of nothing in the composition of tea that would support the miner's assertion. The only explanation is that the men are under a delusion, & custom drives them back to their early habits.

Diseases of the liver are rare. Obstruction of portal circulation secondary to heart disease is common enough, leading to enlargement and secondary cancer has occurred in my practice. But primary diseases of the liver such as hepatitis, abscess &c are rarely seen. and chronic diseases of the cirrhotic type due to alcoholism I have never met with in a mine.

Several cases of jaundice have occurred, all apparently of the obstructive type. Three of them due to impacted gallstone. I should imagine the hard water of the district would give rise to the formation of gall-stones more frequently than I can vouch for. It is possible that many of them may pass out of the system without giving rise to symptoms sufficiently severe to have my attention drawn to the case. Or the active habits of these men may keep up the circulation in the liver in such an active condition that deposition is impossible. However it may be, it is certain that men living as these men do in regard to food drink & exercise, enjoy an almost total immunity from liver diseases, causing jaundice.

Diarrhoea, with vomiting and abdominal pains used to be common when I first entered upon my duties here. I noticed that I was frequently sent for, especially during warm weather to see a patient reported to be taken ill suddenly & severely; and that when I arrived I had more than one patient to deal with in the family

The symptoms were usually those of acute irritation of stomach & bowels 2/3 vomiting, or retching, severe pain in head, stomach & abdomen, with cold clammy perspiration & sudden onset. Dinner had usually consisted of pork, green vegetables, potatoes. The usual strong black tea had been taken about 2 or 3 hours afterwards, & the pain usually began about an hour after the tea. A study of a few of these cases led me to teach these people to avoid such a diet, or rather such a combination, and to use it very moderately. The result is that such cases are much less common. I never had any deaths from this cause; but in some instances the amount of poison generated & absorbed left the patient weak for some time. I believe the early stage at which the irritation gave rise to the pain in both stomach & bowels gave no time for the generation & absorption of the ptomaine which I believe to be the active agent causing collapse & death in such cases. Unless nature had evacuated the stomach before my arrival, I always administered plenty of warm water with either zinc sulphate or apomorphia, with a strong dose of castor oil as soon as the stomach would retain it. This seems a harsh treatment, and a reversion to an old plan now fallen into desuetude. But other plans failed, and this one always succeeded. May more it is based on a good sound principle. Given a material causing irritation, and from its decomposition liable to give rise to symptoms of poisoning, the obvious indication of treatment is to get rid of it as soon as possible

I may say before leaving this matter that the quantity eaten always had made an element in this disorder. But whether or no we admit this, the result was the ingestion of what the stomach could not digest, & at the same time was easily & early decomposed into

In this connection I had better take up the subject of typhoid fever. The local lesion is in the digestive tract, and I do not intend to have anything to say about the other members of the zymotic group of diseases; for their connection with my subject is not very evident. Except influenza also.

I have had only one outbreak of typhoid fever to deal with and only one of twenty eight cases was not clearly traced. In the summer of 1888 a case was imported into the village of Mangotsfield where the water-supply was chiefly derived from wells; many of which were polluted, & I had condemned years before. The public supply of the West-Gloucester Water company was only in process of being laid down & had not then reached the village. I urged the company to hasten on their works to this village, but the supply was not available till the summer of the following year. Meantime isolation of the case as far as possible, disinfection of stools, person & clothing, a second disinfection of stools before burial in the garden were all ordered; and, as far as possible, I watched the carrying out of these instructions. They were, however, eluded. I also closed the well of supply after having found it impure. The result was that no other case arose till October. There was a good deal of heavy rain in September, the stools had been buried about 30 yds from the well I mentioned, which was the furthest available point - and the well had been used a week by five different families before I knew of it. I closed the well again at once, but the mischief was done. The rains had no doubt carried the germs from the stools, which were

not always properly disinfected into the well, through its dry-stone wall; the polluted water would form a good cultivation medium; and hence arose 9 new cases. Two families in the same row of houses used water from a distance of a good public & were the only ones not affected. One of the 9 cases lived in a different part of the village and served as a focus for 3 other cases. Other four cases arose from the original source: three of these died, one from debility caused by free & recurrent epistaxis. One from delirium ending in coma; and one from sheer exhaustion. Thus ended the outbreak in this village. Meantime the public water supply was completed, and almost universally used.

In the following summer one case arose in another village about two miles off. As the communications between the villages were frequent & intimate, both being mining villages whose inhabitants wrought at the same pits, one naturally sought for the source of this case in the immediately anterior outbreak. But no satisfactory connection could be traced; and eventually it was found in another quarter. Nine new cases were most satisfactorily proved to have arisen from this one, — the link of connection being again a popular but polluted well. Out of nine houses using this well, water only one escaped, and this one had discontinued its use for some time for some other reason unconnected with the fever. The only adult affected was a teetotaller who had always drunk freely of the water, and who died of perforation: he was the only teetotaller in the group. A ditch, dry for the most part in summer, except for the soakings from open middens ran behind the houses & in dangerous proximity to this well. On sinking this ditch the chlorine was increased in the water

from 4·5 grs per gallon to 8·2 grs per gallon, showing the possibility of contamination. The albuminoid ammonia was .05 grain per gallon = nitrates & nitrites were both present; showing actual contamination. Yet this water had been used for years, and was actually a popular source of supply. It would have been extensively used in the village, but for the fact that it lay at the bottom of a steep incline; and the consequences would have been disastrous. One other case arose in the late autumn, which I was unable to trace, but no other case occurred as a consequence.

This outbreak shows that under ordinary circumstances typhoid fever is not carried about even where large numbers are assembled together; or I should rather say that the assemblage of large numbers of men in a pit daily even when some of them come from infected households does not necessarily cause a spread of typhoid fever. It is far otherwise with scarlet-fever. Of small-pox I have no experience. I mentioned influenza. That disease did not spread in the usual way. In this neighbourhood it first appeared at Bristol, and gradually got to the outskirts. Staplehill is a populous place just outside the boundaries of the city. Several foci appeared at once, and in 1899 very few escaped; but the incidence was lightest on the young. Even dogs, cats, horses & pigs suffered. The village of Mangotsfield - is a mile further out of town; and the epidemic began there, when it was about over in Staplehill. The same course was followed by it along that same road; and also along two other routes outwards from Bristol. In the two following years the epidemics were much lighter; but exactly the same incidence took place. I think, too, a certain amount of intensity of the poison is required before an Epidemic arises, and that that intensity acquires force in circles. It does not seem to agree with the facts to suppose that it travels along lines of

always thought of the heather-burning on the Scotch-hillsides in spring as an apt illustration of what I saw of the incidence of influenza here. However that may be, the assemblage of men in the pit curing did not act as a means of communication to spread this disease; for its spread was entirely out of relation to the pit as a centre. I am quite aware that the poison of influenza travels along the lines of communication; but it leaves its seed here & there; and we have a circle arising here & there, constituting an infected area all along the route only where a strong seed, in the form of virulence, or amount has been planted.

Respiratory diseases

In former days, and in the Cornish mines of the present day even, respiratory diseases having destruction of lung tissue as their basis, and ending in some form of phthisis, were common. The ordinary Coal-mines of the present day is not more liable to phthisis than the artizan working above ground. The usual aids to the inception of phthisis, such as air loaded with impure gases or dust are present in no larger quantity than in the air of many of our towns. The arrangements are such that pure air goes down the pit and that it supplies the men at the working faces before it is used up in any other way. This is the rule. The men who are making new branches, and those who are keeping the air-ways open are those subjected most frequently to foul air; & of them there is always a considerable number. In mines producing much fire damp or other noxious gas the conditions are different; but as Parkfield is practically free from these, I have no experience of their influence.

Unfortunately the returns of the Medical office of Health for the district are not available for comparison for the years 1890, & 1891 owing to a part of the district having been constituted a local area

For 1889 the figures are as follow; -

Estimated population 14785. Deaths 246. Death-rate 16·6.

	Deaths	Rate per 1000	
Phthisis	34.	2·3. nearly.	83 deaths out of 246 or slightly over one third due to respiratory diseases & phthisis.
Other respiratory Diseases	49.	3·31.	

The population consists of miners and their families; and still more largely of shoemakers, many of whom work in factories, and many more at home in close, ill-ventilated workshops. The females work at sewing, trouser & waistcoat-making, & the various parts of shoemaking. The infant-mortality from respiratory diseases is large. Deducting these we have a reduced mortality among miners from respiratory diseases. But we must add to this again by taking into consideration the fact that miners are usually picked men; for if a youth cannot do his work in a mine, he usually leaves the work & takes to shoemaking.

In this neighbourhood I am quite sure that deaths from phthisis are less frequent among miners than among the similar class of operatives over England & Wales. I have not met with a single case of phthisis among the miners except where a well-marked hereditary predisposition prevailed; nor can I point to a single case in which the mode of life & surroundings of the miner influenced the result. I am quite inclined to think that of two members of a family equally predisposed the one who takes to pit-work has a better chance than his brother who takes to other employment available within his rank of life. This last consideration is a most important one, and one that must be reckoned with in dealing with large numbers of people in such a climate as ours. Let us start with the generally accepted fact that the tubercle bacillus is the constant [illegible]

cause of pulmonary phthisis. The bacillus has no power to invade perfectly healthy tissues. I take it that if the epithelium covering the mucous membrane of the air-passages, the bronchioles & air-cells is perfect you may brush it over with bacilli without any evil effect. But given a breach of surface - a want of continuity of the epithelium, and the result then depends on the comparative strength of the bacilli & the tissue cells with which they are in contact. So that so far as I am at present concerned with the subject I have two questions to answer. (1) Are the miner's air-passages subjected to stronger or more numerous bacilli (2) Are the miner's surroundings more likely to greatly injure the tissues of the respiratory organs than others.

In the great majority of cases of pulmonary phthisis we have to deal with the air-borne bacilli. Now the air of a pit is derived from the outer air, and its original purity depends entirely on that of the general atmosphere; nor is the air allowed to stagnate for motion is the chief principle of ventilation; and It is a well known fact that movement of air is one of its chief means of purification. Through the whole of that portion of the pit where the men are at work, the air comes to them, with the before mentioned exception almost the same as it enters from the outer air, only warmer, and the it is being constantly changed as a necessity of the case. It therefore seems to me that miners are placed in a situation much the same as men working in a gentle breeze on a summer day, so far as air is to be considered. As stagnation of air gives opportunity for deposition of germs, their growth, and putrefaction arising from their growth, and concentration of these injurious agencies so movement of air prevents them, and conduces to the reduction of the incidence of diseases dependent on them.

The second question involves other considerations; but its answer lies in
this ~~question~~ subject of movement of air. First consider the men working on coal.
No doubt a certain amount of dust is raised in the cutting of coal; but
a good cutter raises less than one would suppose; and the air
rushing past the face clears it away almost at once. In many
pits choke-damp & fire-damp rush out at the face as the cutting
goes on; but with this I have no connection as I have never
known such to occur at Parkfield. The coal-cutters then, & the
lads employed in taking away the coal & sending it to the pit-
bottom are not in any way injured by the coal-dust. and we may
dismiss these employées from our consideration. In fact ex-
perience proves what science theoretically points to viz men
living in air sufficient in ~~quantity~~ initial quantity, & constantly changing, are not
liable to suffer from infective or obstructive lung-diseases.
We have, however, the branchers to deal with. These are the pi-
oneers of the work. They are always working in new places, where
the air cannot possibly circulate so freely. The element of move-
ment of air as an aid to purity is to some extent absent; and
superadded to this condition there is to be taken into account the
fact that these branches are chiefly driven through harder
rocks where ~~fir~~ explosives are required. We have, then, three new
circumstances to consider, 1. The lessened quantity and move-
ment of air, 2. The harder & more angular, & therefore more in-
jurious dust. 3. The gases arising from the use of explosives.
No doubt these men do suffer from respiratory diseases, but,
strange to say, I have had not one single instance of phthisis
among them. It must be understood that everything is
done by the management as well as by the men themselves

to minimise the evils of these conditions, and that every one is a much smaller evil than in a Cornish mine, where many old-fashioned ways are still in vogue.

But every one of these branchers sooner or later comes under my notice. The first complaint is usually some form of dyspepsia, including such symptoms, as nausea in the morning, and pain & fulness after meals. They usually blame the powder smoke. This may go on for months or years intermittently. The next step is a cough with some frothy tough expectoration, chiefly coming on in the morning. And with this they may go on for years unless laid aside with an attack of acute bronchitis. In either case emphysema is the result, which may after a while send them back to coal-cutting, some light labouring employment, or stop them from work altogether. The main course of these men's lives is always the same. The gases upset their digestion first, and then combined with the dust irritate the bronchial mucous membrane. The constant & prolonged irritation with the muscular act of coughing, going on day after day leads to the emphysema; chronic bronchitis ensues, sometimes dyspnoea of a spasmodic kind, dilatation of the heart, and valvular murmurs follow in turn, and an attack of acute bronchitis most frequently ends the life.

It may be said that in this short description, I have mixed up things in a wrong order. Of course if the initial stage of bronchial ~~stage~~ irritation is to be called bronchitis, I admit it. But words will not alter the facts. The irritative stage is a curable one to a great extent and precedes the emphysema. By sending these men back to coal-cutting in time, the cough leaves them & emphysema never supervenes. As a matter

of fact I have frequently sent branchers to coal cutting with good effect; and I have at present in attendance several old men who were branchers for years in their younger days.

I have little experience in the comparative results of different explosives in connection with the men's health. Gunpowder has been used more extensively than any other; but when dynamite will effect the purpose they desire, they prefer it. They say the smoke is not so injurious; and they can get down to the face some minutes earlier than with gunpowder. That is their report. I have not tried it myself. Roburite the men detest; they declare it would soon kill them. Ionite they rather favour. I must say I cannot see any good Chemical reason for their preference. I am, however favoured by the management with the promise of being allowed to attend an experiment with several explosives for the purpose of collecting and testing the gases evolved.

In regard to other diseases of the respiratory organs there is nothing particular to say.

Diseases of the Nervous System.

I consider that the miners under my charge have been particularly free from Nervous disorders. One case of locomotor ataxia, is all I have to report of that disease. A brother suffers from well-marked myxoedema. One case of paralysis agitans and three of hemiplegia (all right sided) complete the list. Of mental diseases I have just as little to say in connection with the miners. One case of senile dementia, one of general paralysis of the insane, and one of melancholia followed by suicide complete the tale. Miners are free from worry & mental strain as a class. It is their habit in this neighbourhood to give

the women of the household so much money (nearly the whole
out of their wages every week to maintain the household. They thus
consider themselves free from all responsibility save that of earn
the money. The mental strain is thereby reduced to a minimu
and the liability ~~reduced~~ to nervous disease reduced likewise

Circulatory Diseases.

Diseases of the heart, chiefly valvular, are certainly common.
And of these mitral disease is most common. This is owing to the
frequency of rheumatism in an acute form. In this connection I
may mention that I am hardly ever free from cases of acute tons-
illitis. I may also say that I firmly believe in the occurrence of
these two diseases in the same person; and that somehow they are
closely connected. Some of the affections of the heart are no doubt
due to bronchitis; but the bronchitis remains in these cases the
prominent affection. The connection between the prevalence of
rheumatism and the miner's surroundings is difficult to trace.
The heavy beer which is his constant beverage may be one item in its
causation. The constant exposure to draught in the pit, and the
moisture in the air & under foot may be other causes. The daily
change from the slightly warmer air underground to that above may
also be a cause. The difference of barometrical pressure may have some
influence. I am not aware that any of these causes singly would
produce rheumatism. I do know that drinking beer aggravates it
when present; that sudden exposure to cold moist air will affect
the predisposed; and that difference of barometrical pressure
affects the circulation. Possibly the combination of these causes
operates in its production so frequently. At any rate disease of
the mitral valve commonly, sometimes that of the aortic, is the
net result. There is nothing unusual in the sequel. Death
results from [illegible]

Kidney Diseases

These are rare among the miners, and for the simple reason that they are sober men. Even those who do drink to excess, drink beer for the most part. Amongst the female part of the population who drink to excess, kidney diseases are much more common, for they unfortunately take to spirits more frequently. Albuminous urine is frequent enough, but it is ~~most frequently~~ generally secondary to disease of the valves of the heart. It may be stated that I hold this opinion because I have failed to search for kidney disease. But to this I can answer that the students of Drs Grainger Stewart & Sanders are not men likely to overlook these diseases. I remember to this day a very severe reproof I got from the latter for not examining the urine as a matter of routine, and immediately afterwards listening to the lucid exposition of these diseases given in our systematic course by the former, such as no other I know of can give. I am frequently meeting with kidney disease, but not among the miners. On account of the daily warm washing with soap & water when work is over, the skin acts freely, and reacts to changes of temperature very readily. I am frequently astonished at the readiness with which a miner will strip to the skin in my surgery for examination, and stand for a length of time without discomfort. And yet many of these men work in places having a high temperature. They are frequently subjected to sudden alternations of temperature without detriment or injury. But the skin is clean & sensitive, it performs its duties well; and the kidneys are relieved as much as the skin can. So that as the result of employment or habit, primary kidney diseases are rare. ~~When I come to speak of Rheumatism & gout with~~ ~~Consumer great acidity of urine, I shall have to mention~~ ~~kidney diseases again~~

Accidents.

In connection with work in pits one naturally thinks of these as the first and most important work of the Surgeon. But I have found that accidents are not nearly so common as one would suppose. The conditions of the workings at Parkfield are favourable to the occurrence of accidents; and yet accidents are by no means common events. The condition of the roof is very uncertain; and this has led to most, if not all the unavoidable accidents, occurring in my time. Experience teaches ~~them~~ both employers & managers how to avoid accidents, and regulations are made as stringent in each pit, and so accurately fitting to the circumstances, that if they were always carried out faithfully by the workmen, an accident is almost impossible. I can confidently assert that if each workman carried out faithfully & to the full the rules drawn up for their safety, there is no more danger in a mine than upon the surface of the ground. And I can also assert that the rules are not usually broken through ignorance, but through sheer wilfulness & foolhardiness. Take as examples the following. A man 60 years of age, used to pit work all his life, got a severe injury to his head, including fracture of the outer ~~of the orbit~~ table of the frontal sinus, by a fall from the roof. He took out one prop to put it in nearer to the face, because it was nearly time to stop, and he would set another prop when he went up. Laziness in this case was the sole cause of this misfortune, and yet he knew, if found out, he would be fined. Another old man lost his life through going into a place before it was pronounced safe by the overseer. Another boy lost his life through attempting to go through an old unused passage which was known to be dangerous, & was warned by a notice-board not to go there. I could multiply examples of accidents both great & small caused simply by non-observance of regulations which are signed by the employees before they are allowed to enter the works.

There are many curious accidents happening in mines; and a collection of them on a large scale might be instructive. But that would be beside my purpose. Simple fractures are commonly caused by direct violence, and contusion of soft parts is general. But they unite kindly & well. Comminuted fractures are not uncommon, & with care in adjustment of parts & absence of meddling they do well. Compound fractures are difficult to deal with; for the wounds are dirty; and the soft parts are in them cases severely injured. But antiseptic dressings are nevertheless often successful. Nothing surprises me more than the success attending the antiseptic treatment of compound fractures. I rigorously adhere to the principles I was taught at Edinburgh varying the detail as required. I still use the old-fashioned Carbolic acid, both for cleansing wounds, for dressings, & in spray. And I do not know that any surgeon can produce better results. Of 13 compound fractures in all among colliers I have had perfect bony union in every one. Three were just above the wrist, four above the ankle, one of the humerus, the others of fingers & metacarpus. I mean therefore to adhere to the use of this old antiseptic & its old-fashioned method of use, till I have acquired more confidence in the use of the newer ones. It is quite possible that sheer ignorance of dangers enabled me to act fearlessly & confidently; but at any rate I did what I was taught to do.

What I have said as to compound fractures applies to the treatment of the usual dirty wounds of soft parts. But in many of them cases destruction of tissue supervenes & separation; and the wounds are long in healing.

Somehow or other I got imbued at Edinburgh with the idea that miners nystagmus was a common ailment amongst class: but as I have had only three cases of the disease I have been disabused of that erroneous impression. Every one of these cases worked on coal in a recumbent position with a candle light: and every one has completely lost the nystagmus after six months rest in the free open light above ground. I have not observed that any treatment ~~was~~ benefited the patient beyond change of circumstance & rest. Each one of the three has gone back to pit, but not to work on coal. I am of opinion that the position of the workman is an important element in causation: And I am also of opinion that Change of circumstances is the only remedy ~~thing~~ that will benefit the patient. While speaking so positively I must exclude any complication with brain disease. I have at present under charge a miner who has nystagmus complicated with a brain lesion - probably cerebellar. The nystagmus has continued over ten months in the same condition. I am not prepared to state in these circumstances whether or no the brain lesion has any causal relation to the nystagmus. But I quite believe that the phenomena of nystagmus are induced by working in an imperfect light in the recumbent position and that if taken in time the ~~phen~~ effects will cease on change of circumstances. The sight has remained good, and the muscular tremors have entirely ceased after rest alone. It seems to me that there is a great deal of superfluous talk upon this subject. I have just met with an Edinburgh graduate from a mining practice in Durham who says it is comparatively rare; and that the cases are invariably cured, if taken in time, & given rest in the open air & light

I come now to the rare diseases which are difficult to group owing to imperfect knowledge. The first I will mention is goitre. Swelling of the thyroid gland is common, though one would not say prevalent. As a rule they are not large, they affect the whole thyroid and occur almost all in one district where the water contains much lime & magnesia. In all cases, some members of the same family suffer from rheumatism, others from chorea. The few cases of exophthalmic goitre I have seen also occurred in the same district, but there only involved one lobe of the gland, or one lobe & the isthmus, and never reached any notable size. I am quite aware of the danger existing in too hasty generalisations. But the observation of a few facts always occurring together is apt to lead to an impression, correct or otherwise, and if not to a conclusion, the impression points to the necessity of further inquiry. I have mentioned in the above group four diseases which are not usually all considered to be related to each other. The last three, however, have a decided predilection to affect the heart, two of them the endocardium, and two of them the nervous structures, more especially. Of the group of four we have two affecting the structure of the thyroid, and both more prone to occur in families of a rheumatic diathesis; and the whole of them occurring in a district supplied with hard water. I cannot see that soil has or ground air has much to do with the production of these diseases, for the soil varies, & the subsoil still more so, but in all cases it is damp; and as the rock is not in any case far below, the ground water level is one to vary with rain & season. I am quite aware that the relation of hard water to goitre has been denied; but, so far as I know, those who assert the connection have taken more trouble to obtain possession of positive facts, than those who deny it. But I do not know that exophthalmic goitre has any thing like a constant connection

with the custom of drinking hard water. So far my cases have all occurred in such a district, and they have all occurred in rheumatic families. Mental distress & worry in each case preceded the development of the palpitation, which I always find the earliest of the three main symptoms to arise. In two cases slight mental alienation (acute melancholia) preceded the palpitation; and on the development of the latter, the former disappeared. In connection with these two cases (two females - sisters-in-law - one 24 years, the other 37, at death) I observed that with the stoppage of menstruation, involution of the external organs of generation to some extent occurred, & the hair from the pubis entirely disappeared. I did not observe the same in the males; but in each case unfruitfulness existed. However I am departing from my subject; and I should not have mentioned the matter, but I do not believe in an isolated fact, and I would like to know the connection between these facts & goitre. I should also point out here, that I am convinced there is a more or less pronounced family connection between goitre, Graves disease, & chorea and that the rheumatic diathesis has something to do with the nervous instability underlying them. And this is proved to some extent by the fact that arsenic & strophanthus combined have had in my experience a better influence on the duration & course of these diseases than any other drugs. Lifting them into other surroundings & the use of soft pure water have seemed to do some good in all these diseases. I will leave the matter here at present; but I mean, as opportunity occurs, to investigate it and either prove or disprove my present position.

In speaking of hard waters it might be thought that calculi of the kidney & bladder would be common; but such is not the case; and among the miners I have not had one single case. The amount of fluid they take may have something to do with that.

The three worms, taenia solium, oxyuris vermicularis & ascaris lumbricoides used to be very common, but since the introduction of water-supply other than the old well they are less common than before. However even now they are more prevalent than I ever saw them in Scotland. Partially cooked red meat is very much relished; but it seems to me the use of well-water had more to do with their prevalence than the meat. Taenia nedio cancellata is not so common.

Of skin diseases the most common are itch and eczema. Only the dirty get the latter among miners, and they are few. Of the few obstinate & more general cases, probably constitutional in origin, the Bath mineral waters have made much improvement, and cured most. When itch arises in a mine, it takes a long time to completely eradicate it. It smoulders, because owing to the efficient & daily general ablution of the whole body it is never allowed to assume prominence and does not come under treatment.

Impetigo of an infectious nature is sometimes seen among the dirty but cleanliness and antiseptic ointment soon stops its spread.

Venereal diseases are not common, as miners usually marry young; and syphilis, with its sequelae and results are seldom seen. Possibly early retirement & early rising, being the rule, leaves little time for the after-dark orgies indulged in by young men; and the condition of excitement of the nervous system induced by alcohol & opportunity is absent.

There is a great deal more to mention in connection with the lives of such a body of men as Parkfield miners; and I have no doubt a good deal I have said has been modified by other experience in the neighbourhood. And rather than try to

I sum up what I have written, I would ~~not~~ leave my impressions as they are. But in conclusion I would point to a fact which must have become apparent to any one reading this thesis. The Parkfield miner is a man on a higher moral level than the average miner; and therefore his physical condition is better. Now this is due largely to the influence of Mr Cookham the late owner, who lived for many years amongst the men. He was a man of strong religious convictions, and a staunch teetotaller. Moreover he was a fine platform speaker - quite an orator. For many years he used the influence of his position & of his convictions to ameliorate the condition of his employees; and he soon had an army of sincere workers helping him amongst the men themselves. If other owners would take the trouble to do likewise as it is their duty to do, I have little hesitation in stating that the collier would be a self-respecting man, would attend to his family & home, would be more contented with his position and would be easily influenced to avoid the strikes which strike hard on the success of the industries of the Country. While the owners keep aloof, the men know them not, and, suspecting them of pandering to self-interest alone, cannot believe in any just statement they may make. If the owners would keep in close touch with the men, both would be benefitted morally, physically & economically; and the demagogue leaders of trades-unions would find their occupation gone. This applies all round; but such a millennium of industry is yet, I am afraid, far off; and will not arrive, except as part of the general hygienic millennium, of which I hope it is pardonable to dream.