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“Buying brains and experts”:

British Coal Owners, Regulatory Capture and Miners’ Health, 1918 – 1946

Abstract

This article examines British coal owners’ use of scientific knowledge of occupational lung diseases in the mining industry to resist regulatory changes between 1918 and 1946. It explores the strategies deployed by coal owners in response to debates over the hazard to workers’ health presented by dust, and legislation to compensate miners for pneumoconiosis and silicosis contracted in the nation’s collieries. It investigates coal owner deployment of the views of notable scientists, especially the eminent physiologist John Scott Haldane (1860-1936), who insisted on the harmlessness of coal dust, in order to avoid costly compensation payments, as well as capital investment in ameliorative measures to reduce miners’ exposure to such hazards. The article provides new insights by illustrating how coal owners influenced mining education programmes, deploying the arguments of Haldane and others, with direct implications for health and safety in British mines. This contributed to the mounting public health disaster wrought by coal dust on Britain’s mining communities. The process is viewed as part of the broader political activities of the coal owners – and their industry body, the Mining Association of Great Britain (MAGB) – in its attempts

to influence the regulatory process in period of dramatic change in the political economy of coal.

Introduction

Addressing the annual conference of the Miners' Federation of Great Britain (MFGB) in 1934, James Griffiths, president of the South Wales Miners' Federation (SWMF), launched an impassioned attack on Britain's coal owners. Griffiths accused them of, "buying brains and experts in order to confuse counsel and the government", with the explicit intention of thwarting the attempts by miners, who had developed silicosis, to claim for compensation under the existing regulations.¹

In Britain, silicosis was first recognised as an occupational disease under the Workmen's Compensation (Silicosis) Act, 1918. After a concerted campaign conducted by the MFGB, and particularly by the SWMF, the legislation was extended to cover coal miners in 1928 under the Various Industries Scheme. Revised in 1931 to include all grades of underground workers and to encompass retrospective awards, the regulations still placed the onus on claimants to prove that they had worked in the vicinity of rock containing a minimum fifty per cent of free silica. A further amendment in 1934, prompted by the actions of the Trades Union Congress (TUC) and the MFGB, extended the scheme by withdrawing the free silica threshold. However, coal miners' pneumoconiosis (CWP) was not legally recognised as an occupational disease by the Home Office until 1943.²

The contests over the recognition of silicosis and pneumoconiosis, as officially prescribed occupational diseases have received attention in the historiography of medicine, as have the role of trade unions and regulators.³ In contrast, the role of the coal owners has been fleeting. This article examines the strategies of coal owners in

responding to the introduction of the silicosis regulations. Specifically, it explores the relationship between the coal owners and scientists, and the deployment of selected findings over the aetiology and pathology of occupational diseases to limit knowledge of workplace hazards and combat compensation claims. It breaks fresh ground in uncovering coal owners' influence over mining education, and their insistence on promoting the views of sceptics of the harmfulness of coal dust. This process contributed both to the forestalling of essential health and safety measures that could have protected the health of the industry's workforce, and masked the scale of the threat posed by dust. The effects of this were starkly revealed by the mortality rates for CWP after its prescription, with incubation rates typically of between fifteen and twenty years; in 1951, deaths from CWP reached 900. At its peak, between the early 1950s and late 1960s, it was claiming the lives of 1,600 miners a year across the British coalfields. If the National Coal Board (NCB), which took over management of the industry in 1947, in partnership with the National Union of Mineworkers (NUM) and the Medical Research Council's Pneumoconiosis Research Unit, took strident steps to combat the problem with some success by the 1950s, then the legacy of the neglect of the issue by coal owners continued to be felt in mining communities in post-war Britain.⁴

The strategy of controlling and containing knowledge of CWP was most evident in the education received by colliery managers who had statutory responsibility for health and safety in mines; the effect being that officials operated within a narrow understanding of the risks posed, what psychologists would refer to as, "bounded rationality".⁵ With a few exceptions, mining officials have remained marginalised actors in the historiography of coal.⁶ This article goes some way to redressing this imbalance and offers insights into a neglected aspect of industrial relations and the

regulation of health and safety in the nation's collieries. It provides an example of what would be understood now as "corporate political activity"; specifically, through the ways in which coal owners sought to "capture" regulatory frameworks, control the dissemination of scientific knowledge, dissemble the risks to miners' health and reduce compensation payments.⁷

The politics of coal, 1918 – 1946

The decade preceding the extension of the silicosis regulations had been a turbulent one for the coal industry. The aftermath of the First World War had left many export-reliant districts bereft of international markets. Debates over whether to nationalise the industry under the auspices of the Royal Commission on the Coal Mining Industry (hereafter, the Sankey Commission) over the course of 1919-20, were followed by major disputes in 1921 and 1926. Though coal owners were still distinguished by their differences, the prerogatives of the years since the First World War had necessitated a more united front. The leaders of the MAGB emerged as, "battle-hardened veterans of the wars over wages, hours and nationalization".⁸ The crisis over the Sankey Commission prompted a major reorganization of the body, including the constitution of a strong executive, and standing committees including one responsible for "propaganda".⁹ By 1921 the MAGB had a highly effective leadership, epitomised by its president, Evan Williams, and vice-president Sir Adam Nimmo, who determined the direction of the body over the next two decades. Both Williams and Nimmo had shown themselves adept, through the parliamentary coal lobby and relations with individual government ministers, at "regulatory capture". However, Williams and Nimmo's successes in putting "nationalisation to sleep", through their performances on the Sankey Commission, and reorganising the MAGB, were short-lived. The same pugnacious style and intransigence that had served the

MAGB so well in 1919 and 1921 increasingly made the coal owners a political liability in 1926. While Nimmo and Williams' belligerent stance won them admiration from within their own ranks, it did the MAGB few favours in Whitehall. The mine owners famously earned the moniker of the "stupidest men in England" for their approach during the lockout from the notoriously hawkish Secretary of State for India, Lord Birkenhead, while the liberal deputy secretary to the Cabinet Tom Jones famously regarded Nimmo as, "one of the greatest stumbling-blocks to peace".¹⁰ The Minister of Labour, Sir Arthur Steel-Maitland, attempted to foment a coup within the MAGB to oust Williams and Nimmo. The rest of the Cabinet also started to lose patience with the intransigence of the owners. President of the Board of Trade, Sir Phillip Cunliffe-Lister – perhaps influenced by his shares in mining concerns – accused them of being "unreasonable", and Winston Churchill contemplated legislation to force the owners into a national agreement.¹¹

Their political stock was not aided by the failure of the industry to regulate sales and to reorganise in the face of contracting markets. The colliery companies' undermining of statutory attempts at both, through the Coal Mines Act 1930, further inflamed the Department of Mines and lost them political support in the House of Commons. Equally, the coal lobby's ability to block initiatives for hydroelectric schemes in the Scottish Highlands in the late 1930s won them few allies amongst other segments of British business. This shows the effectiveness of the MAGB in pursuing the short-term interests of the owners, while serving to underline the industry's inability to legislate for its own actions. If the coal owners managed to rally effectively over major challenges to their direction of the industry, they remained ostensibly divided by parochialism and distrust of one another.¹² As Outram and Supple note, they were a disparate group. On the one hand, the aristocratic colliery

owner (inured in classical governance), alongside corporatist capitalists like Sir Alfred Mond, were identifiable as the elite of entrepreneurial capitalists – with the “capacity to be an organiser of society in general” – and on the other, the parochial and fiercely independent bulk of coal owners, little known outside their own districts.¹³ The coal owners pursued myopic strategies to maintain profit with little thought to the future of the industry. There were a few exceptions to the rule – such as the Fife Coal Company (FCC) and the Ashington Coal Company – who invested heavily in underground infrastructure, sales and marketing functions, and in the professionalization of their management personnel.¹⁴

Coal owner preference for local bargaining characterized their responses to the silicosis regulations and campaigns over CWP. These strategies essentially evolved from earlier skirmishes over the policing of health and safety in the industry. Coal owners had opposed the Workman’s Compensation Acts of 1897 and 1906.¹⁵ The east of Scotland coal owner and founder of the explicitly anti-socialist Liberty and Property Defence League, the Earl of Weymss lobbied hard against the legislation. His efforts on behalf of the Wemyss Coal Company, reveal traces of those discernible in the tactics used by other colliery companies after the extension of the silicosis regulations. Following the advice of the Edinburgh physician Archibald McKendrick in his 1912 book, *Malingering and its detection under the Workmen’s compensation and other acts*, the company attempted unsuccessfully to attribute workplace injuries to pre-existing conditions and workers’ negligence, to avoid paying compensation. While monitoring accidents, they were careful not to inform miners about the compensation scheme. For one miner seriously injured in 1923, the result was the deferment of his compensation until 1941. Similarly, in the face of the impending legislation, the coal owners of north Wales contemplated terminating the contracts of

all miners aged over 65, “keen to remove employees who presented a bad insurance risk”.¹⁶ They too referred a growing number of cases to medical referees after the passing of the 1906 Act.¹⁷ As such, the role of the “expert”, and ownership and deployment of scientific evidence, was established as critical to the contests over compensation.

Coal owners and officials regularly presented a case against state intervention and downplayed the dangers of mining in the pages of the *Colliery Guardian*. In 1919 a letter from a colliery official formed a response to a report in the *Daily Express* highlighting the “harrowing” conditions in the mines of South Wales: “the miners occupation is one of the least of the many dangerous occupations ... and hysterical screaming or sensational distortion of facts will only leave the public as cold as the absence of coal is doing”.¹⁸ Similarly, in 1926, the owners countered the emerging view that the length of shifts underground led to a greater rate of accidents by claiming that “workmen finish an eight hours shift with minds and bodies fresher”.¹⁹

In the battle over silicosis and CWP, scientific and technical knowledge became essential weapons. At the centre of this contest over occupational lung diseases was one of the world’s foremost physiologists, John Scott Haldane.

Constructing orthodoxy

Buften and Melling have characterised the debate over the effects of coal dust on miners’ lungs as a contest between, “‘practical’ scientists aligned with the British Coal Masters’ Research Association (BCORA), led by Haldane, and... medical specialists associated with Lyle Cummins and the Medical Research Council (MRC).”²⁰ Haldane’s views were highly influential in shaping orthodoxy about occupational lung diseases. Coal owners consistently used Haldane to counter the

claims of miners' leaders and their supporters on the harmfulness of dust. An editorial in the *Colliery Guardian* in 1920 is illustrative of this process: "much talk of the sloppy sentimental order has been heard of late as to the prevalence of disease amongst miners ... Haldane and others have shown that the miner actually holds a position materially better in this respect than the average member of the community".²¹ Haldane's acclaim meant that employers in other sectors also consulted him about silicosis compensation cases. In one particular case, his engagement by Reckitt & Sons (manufacturers of starch, and black lead and metal polishes) who had been attracted by his work on coal dust, ended equally tragically. Haldane assured them in 1923 that the graphite dust used in their works was harmless, but in May 1927 Reckitt & Sons were back in contact to say that three of their employees working with the dust had developed TB and an independent investigation revealed that the dust was in fact harmful; six months later all of the men died, with a post-mortem on two revealing silicosis.²²

Haldane's position on the effects of coal dust on miners was first set out in a paper to the Institution of Mining Engineers (IME) in 1916:

The excess in bronchitis among old coal-miners has been attributed to the breathing of dust... But it is very difficult to see why, if dust is the cause, there has been so great a diminution in the bronchitis mortality in recent years. Coalmines have... become drier and more dusty with increasing depth and better ventilation; and, if dust were the cause, one would have expected the bronchitis to increase, whereas it has greatly diminished.²³

On the basis of research on animals by Professor J. M. Seattle and Dr A. Mavrogordato, Haldane concluded that coal (and shale) dust were “relatively harmless”, because they “are readily eliminated by the agency of living cells, which collect the dust and then wander out with it into the bronchial tubes, whence it is swept upwards by the action of the ciliated epithelium which lines the air-passage.”²⁴ If Haldane was forced to modify his views on the harmful effects of miners’ exposure to silica as a result of challenges from his audiences, he remained “hostile [...] to revisionist ideas on lung disease”, declaring (in response to the growing body of evidence on CWP emerging from the south Wales’ coalfield): “As regards the anthracite district in which they are so common [...] they are, I believe, primarily cases of bronchitis, but aggravated by the secondary collection in the lungs of coal and other dust.”²⁵ In 1932, Haldane publicly criticised the Silicosis Medical Board and its medical advisers for issuing compensation certificates on the basis of what he perceived to be weak clinical findings. He also used his position on the Health Advisory Committee (HAC) of the Department of Mines to launch attacks on south Wales medics, engaged in challenging the orthodoxy of Haldane and others based on their experiences amongst anthracite miners.²⁶ Despite slightly adjusting his views over silicosis in the face of overwhelming evidence, Haldane refused to modify his position on coal dust pneumoconiosis right up to his death in 1936. Indeed Melling suggests that by the 1930s, “Haldane appeared more complacent than some anthracite mine masters who funded his research...”²⁷

Though lacking in substantive knowledge of silicosis, Haldane’s impressive body of work extending back into the 1880s on health and safety in coal and metalliferous mines, as well as his physiological work on environmental conditions on Royal Navy warships, and his social connections lent him considerable prestige. As well as

serving on several Royal Commissions, departmental committees for the Board of Trade and the Department of Mines, he was also called upon by various bodies internationally for advice on health and safety in mining and lung diseases. On the basis of his evidence to them, the Sankey Commission concluded: “miners are a virile class”.²⁸ This was part of a wider strategy by the coal owners to undermine evidence presented by miners’ advocates. For example, Alfred Lewis, the General Secretary of the National Association of Colliery Managers used the pages of the *Colliery Guardian* to attack Sidney Webb’s evidence on the dangers of mining by claiming it was “a vile slander on the colliery managers of our country”.²⁹

Haldane was also not a lone “merchant of doubt”.³⁰ Other sceptics included Dr Edgar Collis, the Home Office’s Medical Factory Inspector. Like Haldane, Collis’ views on occupational lung diseases in mining enjoyed considerable popularity in much of the English-speaking world. As Derickson has illustrated, Collis’ views were to prove influential in debates over “black lung” in the United States; Collis declaring to an assembled audience at the American Institute of Mining and Metallurgical Engineers in 1927 that: “coal dust does not in itself appear to exert any particularly harmful effect on the lungs”.³¹ Such views were shared by the medical adviser to the TUC, Dr Thomas Legge, as well as the former Chief Inspector of Mines (1908-20) and chairman of the board for mining examinations (1912-50), Sir Richard Redmayne.³²

Another significant figure in rebutting the coalfield evidence was the first Medical Inspector of Mines, Dr Sydney Fisher, appointed in 1927, with the sceptics viewing Fisher as a safe pair of hands. Haldane and Collis were instrumental in persuading the coal owners and the Department of Mines that Fisher’s appointment “did not represent a threat to their interests”.³³ As late as 1936, Fisher declared to a

group of mining engineers that coal dust was harmless if the lungs were healthy. In 1934, Fisher expressed similar views to the Royal Commission on Safety in Coal Mines (the Rockley Commission), influencing their recommendations on dust prevention and suppression, prompting them to declare that coal dust was essentially “innocuous”.³⁴

Nevertheless, as Haldane admitted by early 1935, there were differences amongst medical experts over the risks posed by silica. The Silicosis Medical Board (SMB) and the MRC’s Industrial Pulmonary Diseases Committee (IPDC) was already concluding that another threat existed: “amongst South Wales coal-miners a type of pulmonary disease which is disabling but which does not come within the radiographic definition of silicosis.”³⁵ On this basis, the MRC launched a major study of the disease in south Wales. This research would be crucial to establishing CWP as a prescribed industrial disease. However, the Home Office rejected the MRC’s request that in the intervening period the silicosis legislation be changed to allow for claims from miners with this condition. Haldane’s views persisted through his acolytes and associates, notably the assistant director at the British Colliery Masters’ Research Laboratory (BCORL), J. Ivon Graham.³⁶ As late as 1975, the former Chief Inspector of Mines, Sir Andrew Bryan – who had a good record in promoting improved health and safety – allowed Haldane some grace for his views on coal dust on the grounds that, “the death-rate from pulmonary tuberculosis among coal miners were below average.”³⁷ Twenty-seven years earlier, the director of the MRC’s newly established Pneumoconiosis Research Unit was less forgiving of Haldane, Collis and fellow sceptics: “It must be admitted that medical men by their ill-informed complacency have a heavy load of responsibility to bear for the present high incidence, of pneumoconiosis among coal miners.”³⁸ Such scorn was unsurprising

given the challenges by local doctors and “lay epidemiology” emerging from the mining communities led by the SWMF. In 1928, an inquest into the death of miner David Isaacs reported a verdict of death “following from acute pneumonia, following silicosis and anthracosis [CWP arising from ingestion of anthracite coal dust]”; a view that was partly informed by the judgement of the senior pathologist at Cardiff Royal Infirmary who certified the mine driver’s death as resulting from both conditions.³⁹

Deploying “brains and experts”: coal owner responses to legislation

The views of Haldane and his fellow sceptics formed a scientific orthodoxy on the effects of dust on miners’ health. The MAGB deployed Haldane’s views to great effect, reactively opposing the changes in the 1931 Act, arguing that it was “putting legislation too far in advance of scientific knowledge.”⁴⁰ Colliery companies also used such orthodoxy in an attempt to limit payments and retrospective awards, by questioning the scientific foundation of compensation certificates. The campaign for compensation and contests over scientific knowledge were played out at a national and district level. The skirmishes over Haldane’s orthodoxy were fought out around the “Five Fatal Valleys” of south Wales, so-called because of the high rates of advanced occupational lung diseases amongst miners. Here Haldane’s views on coal-dust, combined with his findings on the low silica content of the south Wales coalfield, were fought over with tenacity. Behind the scenes, the coal owners had acknowledged that they could not stop the extension to the Silicosis Act (conceding defeat in 1934), but focused their attentions on limiting the scope of those extensions and consequently compensation; Sir Evan Williams, in his capacity as chair of the Monmouthshire and South Wales Coal Masters’ Association, declaring:

It is inevitable that there will be some extension of the regulations, and the masters must try and ensure these extensions are as small as possible. Silicosis affects South Wales more than any other district ... and medical examination might prove many men to be suffering from silicosis who were not previously aware of it. And resultant claims for compensation would be inevitable.⁴¹

As one south Wales medic observed, this was an especially cynical ploy given that: “the standards imposed upon the diagnosis of pensionable dust disease almost preclude the diagnosis being made at all by the doctors concerned.”⁴² The defence mounted by Cardiff Collieries – for which Sir Evan Williams was a director – illustrates one of the ploys used. The “Scourge of the Rand” tactic – citing coal miners prior service in mines in the Transvaal (long associated with silicosis) – saw coal masters attempting to export the problem.⁴³ This illustrates the legitimacy attached to Haldane’s views, and their use by coal owners. In this instance, the secretary of the Cardiff Collieries, G. D. Budge, drew on a paper that Haldane had given to the Institution of Mining Engineers in 1931, in which he posited that exposure to coal dust actually had an ameliorative effect on damaged lungs (acting with the body to remove some of the silica dust).⁴⁴ Budge cited this study in correspondence relating to the case of a sixty-one year old collier, who having been advised by authorities in South Africa that his lungs were “lightly affected” as a result of his eight years’ service in the mines of the Transvaal. While Budge acknowledged that in the preceding three to four years, the collier’s condition had started to deteriorate to the extent that “he is pretty badly affected”, he concluded that his case illustrated the persuasiveness of Haldane’s hypothesis: “He does ... suffer from the effects of the South African dust, but the fact remains that he has worked 16 years in

coal mines since he contracted Silicosis, and even although that Silicosis was not in an advanced stage when he left gold mining, the evidence seems to confirm Dr. Haldane's view that coal dust enables some of the silica dust to be removed from the lungs."⁴⁵ Alongside the district Medical Officer's, Budge used this case to identify silicosis with the Rand gold mines, and endorse the view that there was "no sign of any increase in the death rate from this cause [coal dust inhalation]."⁴⁶

Over time, the use of such tactics was further encouraged by the rise in compensation paid out by the coal companies under the silicosis orders, especially in south Wales, where ninety per cent of Britain's newly diagnosed cases were located. One example was at Mond's Amalgamated Anthracite Colliery Company (AACC), which operated Ammanford Colliery at the epicentre of the unfurling public health tragedy of CWP in the anthracite coalfields. Amalgamated Anthracite claimed that compensation payments to silicotic miners had reached £80,000 per annum in 1936 and 1937, rising to £100,000 by 1938. Under these conditions, AACC sought to offset the costs to the company by calling for a "national charge," on the basis that, "the employer is obviously paying for a disability which originated 20, 30, or more years ago, when the disease was unknown to coalmining."⁴⁷ The pressing financial case for companies of finding a solution prompted further research into dust suppression, with the AACC setting up its own laboratory to investigate means of tackling silicosis but ostensibly to refute emerging evidence about CWP. This was a deliberate attempt to sustain a body of knowledge – which exploited a measure of scientific uncertainty over harmful types of dust, and contested the categories and boundaries of admissible compensation cases – as a rear guard action in the face of acceptance of the overwhelming body of evidence mounting over the hazards of coal dust, as indicated by the MRC's commitment in 1936 to a major south Wales study.⁴⁸

In north Wales, the owners of Llay Main colliery wrote to Haldane in desperation over the case of a miner seeking compensation under the regulations, after the company's doctor and appointed radiologist, along with the worker's own physician, and the district certifying surgeon and TB officer, confirmed the initial diagnosis.⁴⁹ As the company secretary acknowledged to Haldane: "In view of these reports it has not been possible for us to refer the matter to the medical referee, there being no dispute between the medical advisers for both sides. It would appear that we have nondefence (sic) from a medical point of view."⁵⁰ Unfortunately for this miner, his claim had been made two days short of changes to the silicosis scheme of 1931, which in theory dispensed with the fifty per cent rule applied under the 1928 Act. Providing Haldane with samples of rock from the area of the mine where the miner had worked, the company secretary, H. Ball, therefore sought his view on whether "it affords the Company any protection." Ball also lamented the loss of the prescriptions of the older silicosis regulations, under which, "less than 50% was a good defence," and confessed that: "From the analysis which we have made, it would appear that a large number of our workmen are working in places where they are exposed to the dust of silica rock and we are naturally anxious to protect our position."⁵¹ As in south Wales, the coal owners sought to elude culpability, by drawing on Haldane's advice to blur categorization and thus eligibility under the scheme.

In the Durham coalfield – where 422 miners were diagnosed as silicotic, or latterly pneumoconiotic, between 1933 and 1948, and there were 46 deaths, with one of the highest rates of CWP in the British coalfields by the late 1950s – the coal owners were slow to respond. It was not until the MAGB sent out a circular to the coalfields for a programme of investigation of dust levels, influenced more by discussions in the recent Rockley Commission about the effects of coal dust on

colliery explosions, that a district committee of investigation was appointed. The final report on dust levels published in 1939 revealed that suppression methods were sporadic. Durham coal owners' complacency over the issue was revealed in subsequent discussions arising from the request made by the Durham Miners' Association in 1940 that respirators be provided for those using compressed air drills. The Durham Coal Masters' Mutual Protection Association advised that coal owners should not bear the costs, and that they should consider charging workmen.⁵²

Scotland's coal owners adopted a multi-faceted approach: firstly claiming that silicosis was an English and Welsh problem; secondly blocking evidence gathering; and thirdly, as with other coalfields, restricting knowledge. In this, they were reassured by the observations of the Mines Inspectorate, who noted only nine cases of certified silicosis amongst miners in Scotland between 1930-8. Moreover E. H. Frazer, Inspector of Mines for Scotland between 1934-8, declared that: "Scottish mines are remarkably free from silicosis, possibly because wet conditions, unfavourable to dust, prevail in a large proportion of collieries."⁵³ This obliviousness to the threat represented by dust was obvious from Frazer's equally cavalier remarks in his 1936 report, in which he noted that the sporting of respirators by men working with coal cutters was, "not on account of the danger of silicosis... but because the amount of dust made by modern high speed coal-cutters is unpleasant to breathe."⁵⁴ Nevertheless, with the further extension of the Silicosis Orders in 1934, and the hearing of a case against the masters of Tirbach Colliery before the House of Lords brought by the SWMF, Scotland's coal owners were keen to guard against the eventuality of legal action. The Coal Owners of Scotland continued to oppose medical examination of miners, and made no perceivable effort to undertake research in the area until the 1938 MAGB circular. Owners opposed monitoring of the

existing workforce (to avoid the risk of any new cases surfacing), but arranged for examinations for all new recruits, to eliminate the potential for any future claims. In essence, these responses illustrated the confusion around occupational lung diseases in Scotland, while reflecting in equal measure the implicit view that this was an English and Welsh issue. This indifference was also seen in the approach to dust suppression. Where it was undertaken in Scotland, this was often on the grounds of eliminating discomfort rather than the risk to health. As with the Durham owners, this complacency and intransigence was ill-founded and wilfully negligent, as the figures for diagnosis of CWP after 1943 for the Scottish coalfields reveal, with over 300 miners diagnosed with pneumoconiosis in 1947, peaking at over 800 by 1953.⁵⁵ As across other parts of the British coalfields, Scottish coal owners' principal concern was not one of protecting the health of miners, but avoiding compensation claims and capital expenditure on ventilation and other safety measures to counteract the harmful effects of dust.⁵⁶

Peddling orthodoxy: coal owners, experts and mining education

The damaging effects of the views of Haldane and his fellow sceptics were further compounded by their perpetuation in the mining curriculum, and consequently the knowledge of mining officials responsible for the day-to-day management of mines. This contributed, along with the lack of capital investment in ventilation and dust suppression to the mounting public health disaster. Mining officials prior to nationalization in 1947 were comparatively poorly-paid, and had a basic level of education. Nearly all were drawn from the ranks of miners; “colliers with a collar on”, as one mining engineer, referred to his fellow officials.⁵⁷ Despite the introduction of legislation (in 1872, 1887, and 1911) requiring all managers of coal mines to hold certificates of competency, with the examination system approved by

the Home Office from 1911 onwards, one mining lecturer was still moved to observe in 1916:

The State sets up the standard of the examination for first-class certificates, but no curriculum of education; hence, if the candidate produces evidence of his having had so many years' experience, and that he is of good character, he may pay his fee, sit and pass his examination, and become a first-class certificated colliery manager. It is possible ... to have passed under such a system certificated men who would be a positive danger if they were entrusted with charge of a colliery.⁵⁸

Prompted by concerns over the competency of officials, a committee was appointed by the Secretary of State for Mines to inquire into standards. The Holland Committee's report of 1929 laid bare the shortcomings of the system, with wide variations across the country in the training and qualifications of junior officials and managers, with the pass rate for examinations being as low as nineteen per cent in 1928, and seventy per cent of those who did not already hold a mining diploma or degree failing the competency exams. This educational and social background was very similar to that of superintendents in US bituminous coal mines, but markedly different to the far more structured professional development ladder in the coalfields of the Ruhr and Limburg in Belgium.⁵⁹ While a number of modernising coal companies, such as the Ashington Coal Company, offered financial support for officials to pursue formal mining qualifications and provided more formal apprenticeship, they were in the minority. It might have been the aspiration of some within the MAGB, "to raise the profession of mining engineers to a level at least equal to that of any other scientific and technical profession," but the reality for many managers within the industry was far removed from this aspiration. One of the main reasons for this reluctance on the part of many owners to fund education for officials

was to limit officials' labour mobility and power. In essence, colliery managers were "simultaneously exploited by capital," as well as being, "exploiters of workers".⁶⁰ In reality, many also lacked control over the day-to-day operations of collieries.⁶¹

For those able to access formal mining education at one of the technical colleges or university mining departments, owners still exerted considerable control over the curriculum and the appointment of staff. Even with grant funding from central government, and after 1923 from the Miners' Welfare Committee, mining schools were heavily reliant on donations from companies. An examination of the two main higher education mining schools in Scotland – Glasgow and West of Scotland Technical College (GWSTC) on the west coast, and Heriot Watt College (HWC) in Edinburgh, on the eastern seaboard – are illustrative. Crucially GWSTC and Heriot Watt also approved courses for mining officials at all of Scotland's technical colleges on behalf of the Home Office. Companies provided grant funding for laboratories and equipment at both institutions. West of Scotland coal owner James Dixon funded a joint Chair of Mining at GWSTC and the University of Glasgow to the tune of £15000, while east coast colliery magnate James A. Hood, financed a professorial chair at the HWC (subsequently covered by the Lothian Coal Masters' Association). This funding bought coal owner representation on the curriculum boards and selection committees for both institutions.⁶² Crucially, Hood was appointed as Heriot Watt's internal adjudicator in selecting appointments to the National Joint Committee on Preliminary Mining Education, which decided upon the content of the mining curriculum. As one FFC Executive remarked in 1929, after donating £1000 to Heriot Watt's new mining laboratory: "the hands of future Governors should not be unduly tied... [he] would have no hesitation in bringing before the Governors any personal wish that might occur to him".⁶³ The Fife Coal

Company's Chairman, Augustus Carlow, as well as the Fife and Clackmannanshire Coal Owners' Association, also made substantial donations to the mining schools in the Fife coalfield.⁶⁴

The importance of this as far as the dissemination of Haldane's views on the harmlessness of coal dust was concerned was underlined by the fact that the holders of both the Dixon and Hood Chairs during the 1920s and 1930s were adherents to his view. Professor R. W. Dron, Dixon Chair of Mining (1923 – 1932), and committee member of the Mining Institute of Scotland Committee on Ventilation (which considered dust related occupational lung diseases), acknowledged his gratitude to Haldane on the "actual pathological effects of coal dust".⁶⁵ In 1921 at James Hood's behest, the Governors at Heriot Watt College invited Haldane to speak to students about the "physiology of breathing".⁶⁶ Scarcely less damaging was the invitation extended by the West of Scotland Mining Students' Association at GWSTC to Sydney Fisher, the Medical Inspector of Mines, in 1934, in which he expounded the view that coal dust was essentially harmless if the lungs were healthy.⁶⁷ Equally perturbing was the fact that three years previously, Fisher had declared in a lecture to the annual conference of mining teachers at the Safety in Mines Research Board experimental station at Buxton that coal dust "is believed to be harmless".⁶⁸ Moreover, with advocates of Haldane's view like Redmayne, chairing the central body overseeing mining curriculum, and Fisher, as Medical Inspector of Mines, it is evident how such views became entrenched amongst mining engineers and the Department of Mines. As such, suggestions that official recognition of CWP, and earlier changes to the silicosis regulations, were the result of diligent and persistent lobbying by the miners' unions seem well founded.⁶⁹

Notwithstanding the weight of these opinions, mining engineers and managers (as well as the miners' unions and local physicians) did challenge the views of Haldane and others, as Fisher found out to his cost when expounding upon his views of the harmlessness of coal dust both at Buxton in 1933, and to an IME audience in 1936. At the latter, one plucky engineer proceeded to question Fisher's views on the basis of his observations of autopsies on miners who had died of occupational lung diseases and the accompanying remarks of the attendant pathologist. Disconcertingly, the majority of the audience that day accepted and endorsed Fisher's views. However, other mining engineers were starting to voice their disquiet and frustration too, one suggesting in 1935 that medical opinion be disregarded and that attention be focused on eliminating all dust in mines, whether siliceous or not. Nevertheless, the general climate of complacency that this inured in even the more progressive, and safety conscious of companies, was indicated by the comments made by one of FCC's senior managers (and a future senior NCB director) Dr William Reid in the late 1930s. Reid observed of the Company's provision of free respirators that these had been introduced for the comfort of the workers.⁷⁰

Haldane's orthodoxy was sustained locally through its promotion at mining schools and by figures within the mining inspectorate, and nationally through his public declarations and on national committees within the Department of Mines. Though officials had statutory responsibility for health and safety in coal mines, they were disenfranchised, beholden to their employers and their knowledge of health risks was largely "bounded". Nevertheless, some critical voices amongst officials, informed by "lay epidemiology", could be heard, alongside those of union leaders, miners, and dissenting medics. The control exercised by coal owners and scientific

sceptics over mining provision and curriculum further ensured that knowledge of the risk to human health of sustained exposure to coal dust was suppressed.

The science and class location of J. S. Haldane

Melling observes of Haldane and his colleagues at BCORL, that they were shaped by a common introduction to research into mining which underpinned their outlook:

“Scientists specializing in mining research ... learned early in their careers that the management culture of the extractive industries gauged the value of scientific work in terms of its ‘practical’ understanding of mining and that a good working relationship with masters depended on an appreciation of hard economic as well as welfare concerns.”⁷¹ Certainly Haldane’s opinion was deployed regularly by coal owners and his public criticisms of bodies like the SMB and individual physicians buttressed their position. Haldane was also on good terms with owners and a number of prominent mining engineers like Redmayne. He was director of the Doncaster Coal Masters’ Research Laboratory (subsequently BCORL, carrying with it an annual salary of £500) between 1912 and his death in 1936, and was the first non-mining engineer to be appointed an honorary president of the IME for three years in a row between 1924 and 1927.⁷² On the face of it, Haldane would appear to have allowed his social background and professional associations to cloud his scientific judgement.

Haldane certainly shared the coal owners’ antipathy to nationalization of the industry, noting to the Sankey Commission in 1919: “I share the general British distrust of too much bureaucratic control, and I think that, so far as public health and safety are concerned, it would hardly be possible to nationalize coalmining without legally stifling initiative and the sense of individual responsibility.”⁷³ Haldane’s “distrust of too much bureaucratic control” was also made apparent to the Samuel

Commission in 1925: “If I took orders from the Government I should have done nothing whatever in this world.”⁷⁴ His views can be ascribed to what the radical Liberal John Hobson perceived to be the “class sympathies and reverences” of “intellectuals”, “sensitive to the approval and disapproval of rulers and other authorities ... [Their] personal sympathies are engaged in keeping the good opinion of successful practical men.”⁷⁵

Haldane was born into the gentry, nurtured within a privileged social milieu and immensely socially well connected. His brother, John Burdon Haldane, was a prominent Liberal (and later Labour) Party MP and government minister. He counted amongst his friends Andrew Carnegie, and the maverick Liberal MP and coal owner Sir Arthur Markham. His own views on relations between capital and labour were essentially patrician and expounded in his inaugural presidential address to the IME in 1924:

As regards workmen’s organizations ... much has been done for the good of the mining industry, and the country as a whole, which never could have been done without them ... it is both the right and the duty of all connected with the mining industry to contribute such constructive ideas and actions as they can. When these ideas and actions are contributed in the spirit of comradeship we can receive them in the same spirit; but when they are not contributed in that spirit then we must just fight them as we fight deleterious gases, coal-dust... ⁷⁶

For Haldane then “comradeship” within the confines of social stratification, could lead to progressive improvements. His liberal paternalism shared much in common with his old friend Markham, as epitomized by the latter’s comments to a sceptical mining engineer:

Why should you think it inevitable that colliers should live in a state of filth and piggery? If you try and make good clean homes and help social work, this tends to make better men....⁷⁷

Notwithstanding Haldane's class "location" and allegiances his behaviour can also be attributed to his philosophical beliefs and spiritualism.⁷⁸ Sturdy suggests that Haldane's views were formed by "biological 'holism' ", and the subordination of the interests of the individual "to the higher ethical experience of common interest apparent in such sentiments as comradeship and patriotism," through "the intellectual project to establish the political primacy of moral sensibilities... over the pursuit of particular social policies."⁷⁹ Considered in such a way, Haldane's "idealists' ethical world view", and his rejection of "individualistic and materialistic utilitarian theory," suggests that rather than simply being beholden to capital, his philosophical predilections framed his outlook. Similarly, his belief in a "functional" "vitalism" and "holism", which led him to believe that the organism regulated itself, may well have coloured his judgements as to the hazards presented by coal dust.⁸⁰ This belief in the ability of the body to regulate itself was evident in his address to a Royal Army Medical Corps audience in 1919: "the body is no mere machine, but a living organism... and it is of the "nature" of a living organism to cure itself."⁸¹ Work by the pathologist, James Beattie, on the negligible effects of shale and other dusts on guinea pigs, allowed him to extend this hypothesis to miners, supporting his contentions about the body's ability to regulate itself.⁸²

Added to this was the nature of Haldane's affinity, and friendships, with mining engineers like Redmayne, as "practical men" concerned with scientific and technological contributions to social progress. This was reflected in Haldane's

youthful championing of what he perceived to be the superiority of the advanced applied science as practised at German universities over that of his native Scotland, after his brief period of studying at the University of Jena in 1879.⁸³

This was all compounded by Haldane's growing belief in spiritualism in his later years.⁸⁴ Haldane's capacity for self-sacrifice suggests a man who was genuinely affected by a deep devotion to public service and belief in his philosophical and scientific principles. He exposed himself to potentially lethal cocktails of poisonous gases during the First World War (while incurring the wrath of the Army for refusing to aid in the development of chemical weapons), and starved himself of oxygen to investigate the effects of deprivation of the gas on sailors and climbers. His ethics were also evident in the model of behaviour he passed down to and encouraged in his son, John Burdon Sanderson Haldane, the renowned Marxist biologist.⁸⁵ The "habitus" of his upbringing, formative experiences and social milieu evidently shaped him, as did the "field" of his philosophical deliberations and scientific investigations.⁸⁶

If Haldane's orthodoxy was largely uncontested in the 1920s, over the next two decades the growing recognition of CWP in some coalfields, in part as a result of the lobbying by the miners' unions (on the basis of "lay epidemiology") and partly with growing scientific evidence, made refutation harder to sustain. One further factor may also explain Haldane's apparent hubris in the face of mounting evidence challenging his views on coal dust, while other associates (such as Fisher) were showing signs of wavering. This was apparent from his *haute froideur* in his public exchanges with critics, such as W. R. "Serecite" Jones, the south Wales physician with whom Haldane sparred in the pages of the *Western Mail* in 1934. With Haldane's position increasingly "swimming against a tide of evidence" by the early

1930s, his “cultural authority” as an intellectual was being challenged and he was in danger of gaining unwanted “notoriety”. In the twilight of his years, his lifetime’s corpus and standing were threatened.⁸⁷ If Haldane’s views were affected by his social milieu and upbringing, with his hypothesis proving devastating in establishing the orthodoxy that it did, then his propagation of the harmlessness of coal dust to miners cannot be assumed to have resulted exclusively from his associations. His steadfast defence of this orthodoxy was clearly linked to his own deeply held views about physiology. In contrast, Britain’s coal owners found in Haldane’s views the means by which to stem compensation claims and block further legislative change.

Conclusion

The recognition of CWP by the government as a prescribed disease in 1943 was preceded by a number of important changes to the management of the industry. The wartime coalition government established a Medical Consultative Service (MCS) as part of the 1942 *White Paper on Coal*. This established a medical service at collieries and outside, and a thorough system for checking medical certificates and for health screening of employees. As an indication of how dramatically the tide had turned against Haldane’s orthodoxy, recommending the measures in the white paper to Parliament, the Parliamentary Secretary for the Ministry of Fuel and Power noted that a key function of the new MCS would be to screen for CWP.⁸⁸ Nationalization, and the ongoing work of the MRC’s Pneumoconiosis Research Unit, saw considerable improvements in diagnosis of the disease and dust suppression, as well as in the professional development of mine management personnel. The legacy of the latency in recognising of CWP, and combating it, was seen in the increase in mortalities attributed to the disease; between 1930 and 1990, 40,000 deaths from CWP were officially recorded. In part, these high figures reflected more effective diagnosis of the

condition, and partly its incubation. In their comprehensive study of CWP in the British coalfields, McIvor and Johnston suggest this is an under-estimate given that early cases were attributed to tuberculosis and silicosis, and that chronic bronchitis and emphysema did not become recorded as occupationally related diseases until 1993. The combination of NCB productivity drives and increased mechanization of coalface operations from the late 1950s compromised dust suppression campaigns, with worker's health risked to maintain increasingly unrealistic production targets in many coalfields.⁸⁹ Some measure of the full scale of this public health disaster may be gleaned from the 570,000 compensation claims made by miners and their families by the 2004 deadline for claims under the 1998 bronchitis and emphysema compensation schemes.⁹⁰

In Haldane, Britain's coal owners found a valuable ally in the contests over miners' health. The internationally renowned physiologist and "intellectual", with a respect for "practical men", conferred gravitas on their case. Though steeled by their pitched battles over nationalization and with the miners' unions, the coal owners were inherently divided. The same organization and leadership, which had brought them a victory of sorts in the public debates surrounding the Sankey Commission and in 1921 and 1926, had also lost them political capital. From the perspective of the "entrepreneurial elite", represented by figures such as Baldwin, Steel-Maitland and Cunliffe-Lister, where Sir Adam Nimmo and Evan Williams had provided a robust, dogged, and (at times) eloquent defence of private property, by the end of the miners' lockout of 1926, they appeared as intransigent belligerents who had invoked class warfare and threatened to destabilize existing social hierarchies. The inability of the industry, with a few exceptions, to adequately modernize, the almost suicidal competition for sales in some districts, and their obstruction of statutory attempts by

the Mines Department to reform the industry, won them few friends amongst politicians and the public. Their fate was further sealed in 1945 with the publication of the report of the technical advisory committee on coal mining, led by the prominent and well-respected mining engineer, Sir Charles Reid, which laid bare the technical shortcomings of private ownership.

Against this backdrop, for a large number of colliery concerns reeling from the effects of the loss of foreign trade after the First World War, Haldane was invaluable in delaying the inevitable. Indeed, this perhaps explains why the MAGB were not more vocal publicly about the silicosis orders and debates over CWP, sensing that their intervention might undermine Haldane's credibility and the considerable sway he held in a number of important quarters and with key figures. Yet the approach taken to the legislation, and the growing body of evidence of the dangers posed by dust to miners' health, also reflected that independence to which the districts held on so tenaciously. The approach of coal owners was governed by short-term financial ends, exhibiting a disregard for miners' health and the welfare of their dependents. The remarks of owners, such as Sir Evan Williams, Budge and the AACC, reflected the deliberate and cynical use of such scientific evidence to blur eligibility for compensation on the lines of categorization and location. Where a response was forthcoming, it was belated and prompted by the rising cost of compensation, as well as the threat of further legislation and fresh claims.

In some districts, such as Durham and Scotland, no sense of urgency was shown in addressing the implications; rather it was viewed as a foreign matter and met with a cavalier disregard. Admittedly this was not aided by the response of the Mines Inspectorate, and the influence exercised by Haldane and Collis through the HAC to Mines Department, and Fisher as Medical Inspector of Mines. Crucially, the

hegemony of the 'knowledge systems' advanced by Haldane and others pervaded mining education through the board of mining education to the mining schools (where the coal owners were able to exercise considerable influence). This exercised a profoundly damaging effect by limiting the knowledge of those few managers able to attend. While the majority did not have access to advanced technical education, and little real control over operations at their collieries. The effect was to breed a culture of complacency.

In his upbringing and formative experiences (his social and cultural capital) Haldane was of the bourgeoisie. Nevertheless to extrapolate from this that Haldane simply sold his professional integrity to the coal owners would be to disregard his lifetime's work – including a genuine commitment to improving health and safety in mines, often through risky practical investigations – and dismiss the influence of his complex and changing views on physiology. Haldane's apparent obduracy may also be explained by what he perceived to be a threat to his professional integrity. As such, his views may owe more to a confluence of all these factors. Nevertheless his views were profoundly damaging because of his standing both at home and abroad. His refusal to accept the body of emerging medical evidence undoubtedly delayed acceptance of the risks of coal dust on miners' health and the implementation of effective strategies for combating this.

Ultimately though, it was the owners' deployment of such expert opinion ('buying brains') that was underwritten by a cynical ploy to delay the inevitable flurry of compensation claims, in a climate of economic, and increasingly political uncertainty, which exposed miners (officials and managers) to greater risk and the families of those who could not work or were left behind to destitution. And while a "lay epidemiology" did emerge amongst miners, and some officials and managers,

combined with evidence emerging from medics in areas like south Wales – which ultimately convinced government, through the MRC, to pursue the mass epidemiological studies which were to prove so conclusive – they frequently and initially lacked status, power, and cultural authority to challenge the reigning orthodoxy.

¹ Quoted in Bufton and Melling, “‘A Mere Matter of Rock’”, 165; See Griffiths, *Pages from Memory*.

² Silicosis is a chronic occupational lung disease caused by exposure to silica particles. CWP is caused by prolonged exposure to coal dust. World Health Organization, *Silicosis*, Fact sheet no.238: <http://www.who.int/mediacentre/factsheets/fs238/en/>; McIvor and Johnston, *Miners’ Lung*, xvii.

³ Ibid.; Bufton and Melling, “Coming Up”; Bloor, “The South Wales Miners’ Federation”; Idem, “No Longer Dying for a Living”; Bartrip, *The Home Office*; Morrison, *The Silicosis Experience*. For the nineteenth century: Mills, *Regulating Health and Safety*; Anney, “Death on the Warwickshire Coalfield”.

⁴ McIvor and Johnston, *Miners’ Lung*, 54-57.

⁵ Reason, *Human Error*, 37-9, 57, and 167.

⁶ Ackers, “Colliery Deputies”; Melling, “Safety, supervision and the politics of productivity”; Perchard, “The Mine Management Professions and the Dust Problem”; Idem, *The Mine Management Professions*.

⁷ Hillman et al., “Corporate Political Activity”. For examination of power relations in Appalachian coalfields, see Gaventa, *Power and Powerlessness*.

⁸ Outram, “Class Warriors,” 107; Church, *The History of the British Coal Industry*, vol.3 ; Supple, *The History of the British Coal Industry*, vol.4.

⁹ Coal owners had long waged an effective press and political campaign against reorganisation and nationalisation of the industry. For example see ‘anti-nationalisation’ editorial in the *Colliery Guardian*, 23 August 1912.

¹⁰ For Jones’ account see his *Whitehall Diary Vol. 1: 1916-25* and *Vol. 2: 1926-39*.

¹¹ Outram, “Class Warriors,” 107-111; McIlroy and Campbell, “Fighting the Legions of Hell”, 70-1; Supple, *The History of the British Coal Industry*, 70-111.

¹² Ibid., 410-1; National Registers of Scotland (NRS),CB7/1/7 Coal Owners of Scotland, Minutes, 26 December 1935; Payne, *The Hydro*, 5-7; For divergences in interests between colliery companies in Scotland, see: Perchard, *The Mine Management Professions*, 44-95.

¹³ Greenaway, “Mond family”; Outram, “Class Warriors”, 107-35.

¹⁴ Dintenfass, “Managing Industrial Decline”, 191 – 197; Perchard, *The Mine Management Professions*, 44-95.

¹⁵ See Benson, *Coal in Victorian Britain*.

¹⁶ For divergent attitudes of North Wales coal owners see Gildart, “Co-operation and Conflict”.

¹⁷ Leneman, ‘Workmen’s Compensation”, 43-55; Mills, *Regulating Health and Safety*; Bufton and Melling, “Coming Up”, 68; McIvor, *A History of Work in Britain*, 87, 121- 133; Bartrip, *The Home Office*, 5-8, 116-7.

¹⁸ *Colliery Guardian (CG)*, 21 February 1919.

¹⁹ *CG*, 17 December 1926.

²⁰ T. D. 'Spake' Jones was a mining engineer who refuted the hazards of coal dust: Bufton and Melling, "Coming Up", 77; McIvor and Johnston, *Miners' Lung*, 72-3.

²¹ *CG*, 2 July 1920.

²² National Library of Scotland (NLS), Edinburgh, Haldane of Cloan (HoC) Papers, Acc.10306/3, Letters from Reckitt & Sons Ltd. to Haldane, 25 February 1923, 20 May 1927, and 18 January 1928.

²³ Haldane, "The Health of Old Colliers"; Benson, *Coal in Victorian Britain*, 91-102.

²⁴ *Ibid.*

²⁵ Bufton and Melling, "Coming Up", 74; Melling, "Beyond a Shadow of a Doubt?", 425-8; McIvor and Johnston, *Miner's Lung*, 68-72.

²⁶ Melling, "Beyond a Shadow of a Doubt?", 445 and 448

²⁷ *Ibid.*, 457.

²⁸ NLS, HoC papers, Acc. 10306, fol. 3, Letter from G. C. Bateman, Secretary of the Ontario Mining Association, to J. S. Haldane, 30 July 1926, and Letter from S. Samson, Crown Mines, Kimberley, South Africa, to Haldane, 6 August 1929; *The Scotsman*, 16 March 1936; Graham, "John Scott Haldane"; Sturdy, "Haldane"; Goodman, *Suffer & Survive; Coal Industry Act, 1919*, (Cmd.210), 10.

²⁹ *CG*, 18 June 1919.

³⁰ Oreskes and Conway, *Merchants of Doubt*; Michaels, *Doubt is Their Product*.

³¹ For the influence of discussions in Britain on the US, see: Derickson, *Black Lung*, 48-53; For Collis's views: E. L. Collis, "The Coal Miner", 241-3; Rosner and Markowitz, *Deadly Dust*.

³² Redmayne, *Men, Mines, and Memories*. For correspondence between Haldane and Redmayne see 307-309.

³³ Bufton and Melling, "Coming Up", 74 and 76; Redmayne, *Men, Mines, and Memories*, 306-8; Bryan, "Redmayne".

³⁴ Fisher, "Observations on dust-related diseases in miners", 105; *Royal Commission on Safety in Coal Mines* [hereafter, *Rockley Commission*], Volume II: *Minutes of Evidence* (London, 1936), Qs. 22,407 – 22,410, 22,677-22,682; *Rockley Commission, Report*, 462-3.

³⁵ McIvor and Johnston, *Miners' Lung*, 83-4.

³⁶ *Ibid*; Graham and Lawrence, "The collection and analysis of air-borne dust", 1-18; Haldane et al., "Silicosis and its prevention", 40-82.

³⁷ Bryan, *The Evolution of Health and Safety*, 110; On Bryan, see Perchard, *The Mine Management Professions*.

³⁸ *British Medical Journal*, 1948, quoted in Bryan, *The Evolution of Health and Safety*, 110; For Fletcher's post-war CWP work in south Wales: McIvor and Johnston, *Miners' Lung*.

³⁹ *The Times*, 30 August 1928; Bloor, "The South Wales Miners' Federation" and "No Longer Dying"; Bufton and Melling, "A Mere Matter of Rock"; McIvor and Johnston, *Miners' Lung*.

⁴⁰ Bufton and Melling, “Coming Up”, 76, 79; McIvor and Johnston, *Miners’ Lung*, 71-2.

⁴¹ Melling, “Beyond a Shadow”, 448, 454; Bloor, “No Longer Dying”, 96.

⁴² Bufton and Melling, “A Mere Matter of Rock”, 171.

⁴³ The reference to the “Scourge of the Rand” comes from a letter from a mining engineer serving in the Royal Engineers on the western front to Haldane: NLS, HoC papers, Acc. 10306, fol.3, Letter from 2nd Lieutenant Stanley Nettleton to Haldane, 13 August 1918; *The Times*, 30 April 1904; Williams, *Capitalism, Community and Conflict*, 34.

⁴⁴ Haldane, “Silicosis and Coal Mining”, 226.

⁴⁵ NLS, HoC Papers, Acc.10306, fol.3, Letters from G. D. Budge, Cardiff Collieries, to J. S. Haldane, 1 April and 18 May 1931.

⁴⁶ Letter from Budge to Haldane, 18 May 1931.

⁴⁷ *The Times*, 9 April 1937, 13 April 1938, 4 May 1939, 17 April 1940; Hicks et al., *The relation between pneumoconiosis and environmental conditions*, v-vii; McIvor and Johnston, *Miners’ Lung*, 56; Williams, *Capitalism, Community and Conflict*, 34.

⁴⁸ Melling, “Beyond a Shadow,” 457.

⁴⁹ For history of Llay Main see Jones, *The Miners of Llay Main*.

⁵⁰ NLS, HoC Papers, Acc.10306, fol.3, Letter from H. Ball, Secretary, Llay Main Collieries Ltd., to Haldane, 25 June 1931; Gildart, *North Wales Miners*, 6, 17; Idem, “North Wales”, 157-172.

⁵¹ Letter from Ball to Haldane, 25 June 1931; The elimination of the fifty per cent rule could be harder to enforce, see: Bufton and Melling, “Coming Up”, 81.

⁵² Durham County Record Office (DCRO), Durham, Durham Coal Masters’ Association (DCOA), D/DCOA 55-56, Minutes, 1 April 1938, 7 December 1939, and 1 May 1940; McCallum and Newell, “Pneumoconiosis of coal-miners”, 178-187, Table 1; McIvor and Johnston, *Miners’ Lung*, Table 2.7.

⁵³ *Reports of HM Inspectorate of Mines, Scottish Division* (Hereafter, *HMIM SD*), 1933, 55; *HMIM SD*, 1934, p.63; *HMIM SD*, 1935, 65; *HMIM SD*, 1936, 69; *HMIM SD*, 1937, 68; *HMIM SD*, 1938, 81; Perchard, “The Mine Management Professions and the Dust Problem”, 90; Morrison, *The Silicosis Experience*, 145.

⁵⁴ *HMIM, SD*, 1936, 69.

⁵⁵ Perchard, “The Mine Management Professions and the Dust Problem”, 101.

⁵⁶ NRS, Edinburgh, Minutes of the Coal Owners of Scotland, CB7/1/7, 3 February, 11 September, and 30 October 1936; Glasgow University Archives Service (GUAS), Glasgow, Lanarkshire Coal Masters’ Association, Minute book no. 18, UGD 159/1/18, 26 November 1934; Perchard, “The Mine Management Professions and the Dust Problem”, 89-91.

⁵⁷ Gemmell, “Presidential Address”, 36; McIvor and Johnston, *Miners’ Lung*; Perchard, *The Mine Management Professions*, 67-137.

⁵⁸ Gibson, “Some notes on the education of the colliery manager”, 165-171.

⁵⁹ Mines Department, *Report to the Secretary for Mines*; University of Strathclyde Archives (UoSA), Glasgow, OF/34/1/91, George Hibberd, "The growth of mining

education”, 1957; Idem, “The qualifications of colliery officials – II” *The Colliery Guardian*, 12 September 1930, 959; Fishback, *Soft Coal, Hard Choices*, 49; Delbroek, “*Porions and Conducteurs*”, 191-216.

⁶⁰ DCRO, DCOA, Minutes, D/DCOA 28, 23 February and 4 June 1918; Outram, “Class Warriors”, 117; Perchar, *The Mine Management Professions*, 42-4; Erik Olin Wright, “Rethinking, Once Again”, 41-71.

⁶¹ Perchar, *The Mine Management Professions*, 23-137; Benney, *Charity Main*; Zweiniger-Bargielowska, “Colliery Managers and Nationalisation”, 59-78.

⁶² GWSTC changed to the Royal Technical College, and after 1964 the University of Strathclyde, with HWC became Heriot Watt University in 1966: UoSA, Records of the Department of Petroleum and Mining Engineering, E11/8/1, Letter from Sir A. Nimmo to Sir D. MacAlistair, Vice Principal, University of Glasgow, 17 April 1920, and letter from Nimmo to Professor R. W. Dron, Department of Mining, University of Glasgow, 7 March 1929; GUAS, LCMA, UGD 159/1/17-18, Minutes, 12 December 1930, 24 June 1931, 28 September 1937; UoSA, OE 1/14/2, Minutes of the Engineering Committee of the Board of Governors, Glasgow and West of Scotland Technical College, 14 June 1912, 9 October 1916, 11 March 1922, 20 November 1923, and 17 March 1924; Heriot Watt University (HWU), Edinburgh, Mary Burton Archive (MBA), HWC 1/2/27A, 33A, 37A, 39A, and 41A, Minutes of meetings of Governors, George Heriot’s Trust, 26 November 1912, 25 March 1919, 30 April 1923, 2 May 1924, 23 June 1925, 1 April 1927; HWU, MBA, HWC1/2/29A, Statement of revenue and expenditure, 1 January to 31 December 1915, George Heriot’s Trust.

⁶³ HWU, MBA, HWC 1/2/43A, Minutes of meetings of the Governors, George Heriot's Trust, 4 January 1929.

⁶⁴ Perchard, "The Mine Management Professions and the Dust Problem", 91.

⁶⁵ Dron, "Presidential Address", 7; Briggs, "Physical Work and the Human Machine", 160-168; UoSA, OF 34/1/9/1, Professor G. Hibberd, "The Development of Mining Education in Scotland".

⁶⁶ HWU, MBA, HWC 1/2/35A, Minutes of the meetings of Governors, George Heriot's Trust, 2 December 1921.

⁶⁷ *HMIM, SD*, 1934, 63-4.

⁶⁸ NLS, HoC Papers, Acc. 10306/3, Report on the annual conference of mining teachers at the Safety in Mines Research Board Experimental Station, Buxton, 8 – 10 September 1933.

⁶⁹ Bufton and Melling, "A Mere Matter of Rock", 163; Bloor, "The South Wales Miners' Federation".

⁷⁰ Report on the annual conference of mining teachers, 1933; Fisher, "Observations on dust-related diseases in miners", 105-6; Reid, "A Modern Campaign for Greater Safety, 51; McIvor and Johnston, *Miners' Lung*, 75.

⁷¹ Melling, "Beyond a Shadow", 444-5.

⁷² *Ibid.*, 445 and 448; Bufton and Melling, "Coming Up", 76 and 79; McIvor and Johnston, *Miners' Lung*, 71-2; Graham, "Haldane"; Sturdy, "Haldane"; Goodman, *Suffer & Survive*.

⁷³ *The Times*, 15 May 1919.

⁷⁴ *The Scotsman*, 10 December 1925.

⁷⁵ Quoted in Collini, *Absent Minds*, 32.

⁷⁶ Haldane, “Presidential Address”, 362; Fox, *History and Heritage*, 3; McKibbin, *Classes and Cultures*, 44-105; Cannadine, *The Decline and Fall*, 278 and 349.

⁷⁷ Quoted in Goodman, *Suffer & Survive*, 256.

⁷⁸ Wright, “Rethinking, Once Again”, 59-61.

⁷⁹ Sturdy, “Biology as Social Theory”, 315-340.

⁸⁰ *Ibid.*

⁸¹ *RAMC Journal*, 33 (1919), 507 quoted in Goodman, *Suffer & Survive*, 307.

⁸² Haldane, “Physiological problems in mining”, 43; This supports Mills’ and Bryan’s impression that Beattie’s views were pivotal to forming Haldane’s on coal dust inhalation, *Regulating Health and Safety*, 210.

⁸³ Quoted in Goodman, *Suffer & Survive*, 67-8.

⁸⁴ Redmayne also had spiritualist sympathies. For connection between science and the supernatural see Oppenheim, *The Other World*.

⁸⁵ *Ibid.*, pp.364-6; Sturdy, “Biology as Social Theory”, 338; Werskey, *The Visible College*, 52-60; *Idem*, “The Visible College Revisited”, 305 – 319.

⁸⁶ Bourdieu, *Pascalian Meditations*, 111 and 123; *Idem*, *Outline of a theory of practice*.

⁸⁷ McIvor and Johnston, *Miners’ Lung*, 71-3; Bufton and Melling, “Coming Up”, 77-8.

⁸⁸ *White Paper on Coal*, 1942 (C. 1279); NRS, Coal Masters of Scotland, CB7/1/20, “Emergency Measures and General Medical Service for the Coal Industry”, 1942; *Hansard*, 1 October 1942, Cols 1031-1037.

⁸⁹ For a more contemporary analysis of the dangers of coal mining see Labour Research Department, *The Hazards of Coal Mining*.

⁹⁰ McIvor and Johnston, *Miners’ Lung*; Perchard, *The Mine Management Professions*; Idem, “The Mine Management Professions and the Dust Problem”.

References:

Ackers, Peter. “Colliery Deputies in the British Coal Industry Before Nationalization.” *International Review of Social History* 39, Issue 3 (1994): 383 – 414. doi: 10.1017/S002085900011274X.

Anney, T G. “Death on the Warwickshire Coalfield: An examination of the contribution of miners, coalowners and the state to the decline in mining fatalities in the British coal industry in the period of expansion 1840-1914.” PhD Diss., University of Wolverhampton, 2013.

Bartrip, Peter W J. *The Home Office and the dangerous trades: regulating occupational disease in Victorian and Edwardian Britain*. Amsterdam: Rodopi, 2002.

Benney, Mark. *Charity Main. A Coalfield Chronicle*. Wakefield: George Allen & Unwin, 1978.

Benson, John, ed. *Coal in Victorian Britain Vol. 5: Health and Accidents*. London: Pickering and Chatto, 2012.

Bloor, Michael. “The South Wales Miners’ Federation, miners’ lung and the instrumental use of expertise, 1900 – 1950.” *Social Studies of Science* 30, No.1 (2000): 125 – 140. doi: 10.1177/030631200030001005.

----. “No Longer Dying for a Living: Collective Responses to Injury Risks in South Wales Mining Communities, 1900 – 1947.” *Sociology* 36, No.1 (2002): 89 – 105. doi: 10.1177/0038038502036001005.

-
- Bourdieu, Pierre. *Pascalian Meditations*. Stanford: Polity Press, 2000.
- . *Outline of a theory of practice*, this edition. Cambridge: Cambridge University Press (CUP), 2006.
- Bryan, Andrew. *The Evolution of Health and Safety in Mines*. Letchworth: Mines and Quarries, 1975.
- “Redmayne, Sir Richard Augustine Studdert (1865 – 1955).” *Oxford Dictionary of National Biography*. Oxford: Oxford University Press (OUP), 2004.
<http://www.oxforddnb.com/index/35/101035701/>.
- Buften, Mark W, and Melling, Joseph. “‘A Mere Matter of Rock’: Organized Labour, Scientific Evidence and British Government Schemes for Compensation of Silicosis and Pneumoconiosis among Coalminers, 1926 – 1940.” *Medical History* 49, Issue 2 (2005): 155-178. doi:10.1017/S0025727300008553.
- “Coming Up for Air: Experts, Employers, and Workers in Campaigns to Compensate Silicosis Sufferers in Britain, 1918 – 1939.” *Social History of Medicine* 18, No.1 (2005): 63-86. doi:10.1093/sochis/hki007.
- Cannadine, David. *The Decline and Fall of the British Aristocracy*. London: Penguin, 2005.
- Church, Roy. *The History of the British Coal Industry*, vol.3: *Victorian Preeminence*. Oxford: OUP, 1986.
- Collini, Stefan. *Absent Minds: Intellectuals in Britain*. Oxford: OUP, 2006.
- Collis, Edgar L. “The Coal Miner: his Health, Diseases and General Welfare.” *Journal of Industrial Hygiene* 7 (1925): 241-3.
- Delbroek, Bart. “*Porions and Conducteurs*: Supervisory Functions in the Belgian Limburg Coal-Mining Industry (1917 – 1939).” In *Supervision and Authority in Industry: Western European Experiences, 1830 – 1939*, edited by Patricia Van den Eeckhout, 191-216. New York: Berghahn, 2009.
- Derickson, Alan. *Black Lung: Anatomy of a Public Health Disaster*. Ithaca: Cornell University Press, 1998.

Dintenfass, Michael. "Managing Industrial Decline: Four British Coal Companies Between the War." *Business and Economic History* 16, 2nd series (1987): 191 – 197.
<http://www.thebhc.org/sites/default/files/beh/BEHprint/v016/p0191-p0198.pdf>

Fishback Price V. *Soft Coal, Hard Choices. The Economic Welfare of Bituminous Coal Miners, 1890 – 1930*. New York: OUP, 1992.

Fox, Alan. *History and Heritage: The Social Origins of the British Industrial Relations System*. London: Allen & Unwin, 1985.

Gaventa, John. *Power and Powerlessness in an Appalachian Valley*. Urbana: University of Illinois Press, 1980.

Gibson, John. "Some notes on the education of the colliery manager." *Transactions of the Mining Institute of Scotland* XXIX (1916-1917): 165-171.

Gildart, Keith. *North Wales Miners: A Fragile Unity, 1945-1996*. Cardiff: University of Wales Press (UWP), 2001.

----. "Co-operation and Conflict: Episodes from the North Wales Coalfield, 1925-1935." *Historical Studies in Industrial Relations* 0, No.12 (2001): 27-56. doi: 10.3828/hsir.2001.12.2.

----. "North Wales." In *Industrial Politics and the 1926 Mining Lockout*, edited by John McIlroy, Alan Campbell and Keith Gildart, 157-172. Cardiff: UWP, 2004.

Goodman, Martin. *Suffer & Survive. Gas Attacks, Miners' Canaries, Spacesuits and the Bends*. Simon & Schuster: London, 2007.

Graham, J Ivon. "John Scott Haldane 1860 – 1936." *Institution of Mining Engineers* 120 (1960-1): 147-152.

Graham, J Ivon and Lawrence, F. "The collection and analysis of air-borne dust during the driving of hard headings." *Institution of Mining Engineers* XCIL (1936-7): 1-18.

Greenaway, Frank. "Mond family (*per.* 1867–1973)." In *Oxford Dictionary of National Biography*, Oxford: OUP, 2004.

<http://www.oxforddnb.com/view/article/51124>.

Griffiths, James. *Pages from Memory*. London: Littlehampton Book Services, 1969.

Haldane, John S. "The Health of Old Colliers." *Transactions of the Institution of Mining Engineers* 49 (1915-1916). <http://www.scottishmining.co.uk/431.html>

Haldane, John S., Haynes, F., Shaw, A. and Graham, J. Ivon. "Silicosis and its prevention." *Institution of Mining Engineers* XCVII (1938-9): 40-82.

Hicks, D., Fay, J.W., Ashford, J.R. and Rae, S. *The relation between pneumoconiosis and environmental conditions. And analysis of the results of the first series of X-ray surveys in the National Coal Board's Pneumoconiosis Field Research*. London: NCB/MRC, 1962.

Hillman, Amy J., Keim, Gerald D., Schuler, Douglas. "Corporate Political Activity: A Review and Research Agenda." *Journal of Management* 30, No.6 (2004): 837-57.
doi: 10.1016/j.jm.2004.06.003.

Jones, Thomas. *Whitehall Diary Vol. 1: 1916-25*. Oxford: OUP, 1969.
----. *Whitehall Diary Vol. 2: 1926-39*. Oxford: OUP, 1969.

Jones, Vic-Tyler. *The Miners of Llay Main*. Wrexham: Bridge Books, 2011.

Labour Research Department. *The Hazards of Coal Mining*. London: Labour Research Department, 1989.

Leneman, Leah. "Workmen's Compensation at the Weymss Coal Company, 1906 – 1924." *Scottish Economic & Social History* 13, No.1. (1993): 43-55.

McCallum, R. I. and Newell, D. J. "Pneumoconiosis of coal-miners in three Northumbrian collieries." *British Journal of Industrial Medicine* 15 (1958): 178-187.

McIlroy, John, and Campbell, Alan. "Fighting the Legions of Hell." In *Industrial Politics and the 1926 Mining Lockout: The Struggle for Dignity*, edited by John McIlroy, Alan Campbell and Keith Gildart, 49-106. Cardiff: UWP, 2004.

McIvor, Arthur J. *A History of Work in Britain, 1880 – 1950*. Basingstoke: Palgrave, 2001.

McIvor, Arthur, and Johnston, Ronald. *Miners' Lung: A History of Dust Disease in British Coal Mining*. Aldershot: Ashgate, 2007.

McKibbin, Ross. *Classes and Cultures: England, 1918 – 1951*. Oxford: OUP, 1998.

Melling, Joseph. "Safety, supervision and the politics of productivity in the British coalmining industry, 1900 – 1960." In *Management, labour, and industrial politics in Modern Europe: the quest for productivity*, edited by Joseph Melling and Alan McKinlay, 145-173. Cheltenham: Edward Elgar, 1996.

Michaels, David. *Doubt is Their Product: How Industry's Assault on Science Threatens your Health*. Oxford: OUP, 2008.

Mills, Catherine. *Regulating Health and Safety in the British Mining Industries, 1800-1914*. Aldershot: Ashgate, 2010.

Mines Department. *Report to the Secretary for Mines of the Committee Appointed by him to Inquire into the Qualifications and Recruitment of Officials of Mines*. London: HMSO, 1929.

Morrison, Susan. *The Silicosis Experience in Scotland: Causality, Recognition and the Impact of Legislation during the Twentieth Century*. Saarbrücken: Lambert Academic, 2010.

Oppenheim, Janet. *The Other World: Spiritualism and Psychological Research in England, 1859-1914*. New York: CUP, 1985.

Oreskes, Naomi and Conway, Eric M. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. London: Bloomsbury, 2012.

Outram, Quentin. "Class Warriors: The Coal Masters." In *Industrial Politics and the 1926 Mining Lockout: The Struggle for Dignity*, edited by John McIlroy, Alan Campbell and Keith Gildart, 107-136. Cardiff: UWP, 2004.

Payne, Peter L. *The Hydro: A study of the development of the major hydro-electric schemes undertaken by the North of Scotland Hydro-Electric Board*. Aberdeen: Aberdeen University Press, 1988.

Perchard, Andrew. "The Mine Management Professions and the Dust Problem in the Scottish Coal Mining Industry, c. 1930 – 1966." *Scottish Labour History* 40 (2005): 87 – 109.

----. *The Mine Management Professions in the Twentieth Century Scottish Coal-Mining Industry*. Lampeter and Lewiston, NY: The Edwin Mellen Press, 2007.

Reason, James. *Human Error*. Cambridge, Cambridge University Press, 1990.

Redmayne, Richard A.S. *Men, Mines, and Memories*. London: Eyre and Spottiswoode, 1942.

Rosner, David and Markowitz, Gerald. *Deadly Dust: Silicosis and the On-Going Struggle to Protect Workers' Health*. Ann Arbor: University of Michigan Press, 2006.

Sturdy, Steve. "Haldane, John Scott (1860 – 1936)." In *Oxford Dictionary of National Biography*. Oxford: OUP, 2004. <http://www.oxforddnb.com/view/article/33642>

----. "Biology as Social Theory: John Scott Haldane and Physiological Regulation." *The British Journal for the History of Science* 21, Issue 3 (1988), 315-340. doi: 10.1017/S0007087400025012.

Supple, Barry. *The History of the British Coal Industry, vol.4: 1913-1946, The Political Economy of Decline*. Oxford, OUP, 1987.

Werskey, Gary. *The Visible College: A collective biography of British scientists and socialists of the 1930s*. London: Viking, 1978.

----. "The Visible College Revisited: Second Opinions on the Red Scientists of the 1930s." *Minerva* 45, Issue 3 (2007): 305 – 319. doi: 10.1007/s11024-007-9047-x.

Williams, Chris. *Capitalism, Community and Conflict: The South Wales Coalfield 1898 – 1947*. Cardiff: UWP, 1998.

Wright, Erik Olin. "Rethinking, Once Again, the Concept of Class Structure." In *Reworking Class* edited by John R. Hall, 41-71. Ithaca: Cornell University Press, 1997.

Zweiniger-Bargielowska, Ina. "Colliery Managers and Nationalisation: The Experience in South Wales." *Business History* 34, Issue 4 (1992): 59-78. doi: 10.1080/00076799200000117.