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SCIENCE IN THE PITS: MICHAEL FARADAY, CHARLES LYELL AND THE HOME OFFICE ENQUIRY INTO THE EXPLOSION AT HASWELL COLLIERY, COUNTY DURHAM, IN 1844*

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Abstract: The explosion at Haswell colliery in September 1844 in which ninety five men and boys were killed has attracted considerable historical attention. This is in some measure due to Michael Faraday and Charles Lyell taking part in the inquest and writing a subsequent report on the cause of the explosion and how to prevent such explosions in the future. Using evidence not used before, this paper examines the context in which the explosion occurred, the inquest process, the political pressure which led to the involvement of Faraday and Lyell, their role at the inquest, their subsequent report and the way in which it was dealt with by the Government of Robert Peel.

INTRODUCTION

The explosion at Haswell colliery, County Durham, on the afternoon of Saturday 28 September 1844, in which ninety five men and boys died, including three aged ten years, has attracted much more interest from historians than other comparable disasters. The main reason for this interest is the unusual, and possibly unprecedented role, played by Michael Faraday (1791–1867) and Charles Lyell (1797–1875) together with Samuel Stutchbury (1798–1859) in the

Coroner's Inquest and in the subsequent report on the disaster written by Faraday and Lyell. Indeed their role attracted the interest of commentators almost immediately; it was referred to by the political philosopher Friedrich Engels (1820–1895) in his *De Lage der arbeitenden Klasse in England*, published the following year, as a welcomed move. However, none of the authors of even fairly recent accounts of the explosion and its consequences used, or even seem to be aware of, all the evidence available, especially in the Londonderry papers in the Durham County Record Office and the Home Office papers in the Public Record Office.¹ Before ourselves,² the most recent account was that by Morris Berman in *Social Change and Scientific Organization: The Royal Institution, 1799–1844*.³ His discussion occurs in his chapter on Faraday which, due to his there relying heavily on secondary sources, was the weakest of what was and is widely regarded as a strong book.⁴ Berman, who does not cite most of the evidence given below, and indeed stated that "there are very few sources for the story of Faraday's investigation",⁵ argued that Faraday, as the willing tool of the government, was used to cover up the culpable negligence of the owners of the Haswell colliery. Using only the sources Berman used, it is easy to draw these conclusions. Upon detailed investigation of all the available evidence, however, it becomes apparent that there were two clear issues: the inquest and the subsequent report, and that Faraday and Lyell clearly identified them and dealt with them as two separate issues. Thus, as we shall see, the government, embarrassed by the outcome of the enquiry, had to resort to a political manoeuvre to avoid serious political consequences.

THE MINING BACKGROUND

During the first half of the nineteenth century, the number of collieries in the Northumberland and Durham coalfield had increased markedly.⁶ Not only had the number of pits increased, but also the depth and extent of workings in the mines. It was widely recognised that this expansion had added to the dangers and risks.⁷ Ironically, there had been a greater loss of life since the introduction of the Davy safety lamp, which enabled miners to work at greater depths. The use of the lamp was considered by many to give miners a false sense of security and therefore increased the risk of explosions.⁸ As the depth and extent of workings increased, serious accidents became

more frequent and explosions more violent with increased fatalities.⁹ As the viewer (that is a mining engineer / colliery manager) Matthias Dunn observed, "By such frequent explosions the public sympathy is excited for a short time, but there the matter rests, until the recurrence of some fresh catastrophe".¹⁰

Prior to 1844 several attempts had been made to investigate the causes of accidents in coal mines, especially explosions, and it was through these enquiries that public attention had been drawn to conditions in coal mines. In 1842 the South Shields Committee¹¹ had published its report¹² which covered the use of safety lamps; the various systems of ventilation; employment of women and children; education; and government inspection. The report strongly recommended inspection of mines and the perceived advantage of this had steadily been gaining favour and support among elements of the mining fraternity and the general public. The majority of mineowners, and especially Charles Vane, 3rd Marquis of Londonderry (1778–1854), the most dominant individual mineowner in County Durham, strongly objected to any suggestion of government inspection of their mines. As a matter of principle Londonderry would take a close interest in anything that affected mining irrespective of whether or not he had a direct financial interest. Largely as a result of opposition from mineowners, a bill proposed by the Tory MP for Dorset, Anthony Ashley Cooper, Lord Ashley (1801–1885), had been amended, the result of which was a 'moderate' piece of legislation: the Coal Mines Act of 1842.¹³ Although it did provide for the appointment of an inspector of mines, his functions were restricted to regulations regarding the employment of women and children, and the payment of wages. His brief did not include matters relating to mine safety which was one among a number of issues of contention between the mineowners and their employees.

The antagonism between the members of the Northumberland and Durham Miners' Association, and their employers culminated in what became known as 'the Great Strike of 1844'.¹⁴ It began on 5 April 1844 and continued until mid August of that year. The feud created much bitterness and animosity, with the striking miners suffering great hardships. The mineowners were unyielding and resorted to evicting miners and their families from colliery cottages usually in order to accommodate the labour which had been brought in from other parts of the country. Haswell, as other collieries, had experienced disturbances, as mineowners attempted to

keep mines working for as long as possible with blackleg labour. Most of the incidents at Haswell had been minor, but in one, seven strikers had been arrested and sentenced to imprisonment following "intimidation".¹⁵

In their actions against the strikers and their Association, the mineowners had the support of the government. James Graham (1792–1861), the Home Secretary in the Conservative government of Robert Peel (1788–1850), wrote to his close friend Londonderry¹⁶ in the latter's capacity as Lord Lieutenant of Durham that "the Association is a serious Evil, and is a proof of a deep-seated malignant malady in the heart of the Nation; but it must be treated with great caution, and with some forbearance ... I can assure you that the Queen's advisors are quite alive to their ... duty, and they do not view with indifference the proceedings of this body".¹⁷

Following the return to work, many miners were blacklisted by colliery management and former blackleg workers and their families were victimised within the mining communities. Certainly such incidents were not easily forgotten and created additional tensions and animosity. At the time of the Haswell explosion, these incidents were still very much in focus and brought additional antagonism and enmity to the proceedings surrounding the disaster.

The strike was well documented in the national press and had aroused much public sympathy for the miners. Engels, writing shortly afterwards, believed that the long drawn-out strike had forced the general public to take some notice of the condition of the coal miners.¹⁸ A disaster such as that at Haswell, following so closely upon the embittered and long struggle, inevitably demanded attention. There can be little doubt that the timing of the Haswell explosion contributed significantly to the debate regarding conditions in coal mines.

Several matters had been at issue during the strike, largely concerning the bond system, financial arrangements and hours of work. Safety in collieries, however, had also featured in the miners' demands.¹⁹ The Chartist newspaper the *Northern Star* pointed out that its readers could not have forgotten that one of the principal points raised by the striking miners was the dangerous nature of their employment.²⁰ When such an appalling disaster followed so soon after their return to work, it was inevitable that the situation would command attention and aggravate tensions within the mining industry.

BURIAL AND INQUEST

The burial of the victims, thirty three of whom were heads of households, took place on the Monday following the explosion that is 30 September. According to reports, thousands attended the funeral²¹ which is depicted in Fig. 1. Many mourners had travelled substantial distances to pay their respects to the bereaved families; the gathering also appeared to be a show of solidarity for the mineworkers and their Association. Burials took place at several villages; the two main places of interment being at Easington Village church (the parish church for Haswell) and South Hetton, a neighbouring mining village, where fifty four victims were buried. An address was made by a member of the Miners' Association, a solemn hymn was sung and then the procession, which was estimated to be over a mile long, made its way to the various places of interment.²² National and local press reported details of the funerals describing how "the village of Haswell presented a scene of mourning that will



HASWELL COLLIERY EXPLOSION. BURIAL OF THE DEAD.

Fig. 1 The funeral of those killed in the Haswell colliery explosion, from the *Illustrated London News*, October 1844.

not be easily erased from the memory of those that witnessed it; nearly the whole of the day being occupied in conveying the dead to their last resting place".²³

The inquest was convened by the coroner for the Easington Ward, Thomas Christopher Maynard, at the Railway Tavern in Haswell on 30 September, the same day as the funeral. Maynard was a solicitor working in Durham City, who, at the 1837 election had acted as agent in the Conservative interest for Londonderry.²⁴ Though in 1841 Maynard ceased acting as Londonderry's agent following a disagreement over his handling of election affairs,²⁵ he nevertheless remained loyal to the "Conservative cause".²⁶

The well known Chartist, trade union leader and lawyer William Prowting Roberts²⁷ represented the families of the deceased at the inquest. Roberts, who had been active in the miners' strike in the Northumberland and Durham coalfields, was described by Engels as "a terror to the mine owners".²⁸ The Miners' Association, with Roberts acting on their behalf, felt that the Haswell inquest would offer them the opportunity to advance their cause, by exposing the unsafe conditions within mines and highlighting the need for legislation and government interference. It was within this atmosphere that the inquest opened.

It was expected that the inquest would follow the standard pattern with the jury of farmers and shopkeepers,²⁹ who were closely connected with the mineowners, returning verdicts of accidental death and thus exonerate the mineowners from any responsibility. Although this was indeed the result, two factors allowed Roberts to force the inquest away from taking a straightforward path to this outcome. First, Haswell colliery was a relatively new mine and was widely regarded as safe. It was one of the newer so called 'mushroom' collieries and had begun working in 1835. It was owned by the Haswell Coal Company, a joint stock company whose major share holders were Hugh Taylor (1817-1868), Matthew Plummer and Clarke. The mine had been described in 1842 as having one of the most efficient air courses and was considered to be one of the best ventilated collieries in the country.³⁰ Many were quick to point out, however, that it was curious that whenever a major explosion occurred, it did so at a pit which was often described as the best ventilated and best managed. The *Northern Star* in its reporting of the Haswell disaster reflected that, "Verily it is strange that all the 'best ventilated' and 'best managed' pits should be the first to explode".³¹ If such a disaster could occur here what about other mines which *de facto* were

considered less safe?³² The second factor which moved the inquest away from the standard pattern was the strike in the coalfield which had come to an end only a month or so before the explosion at Haswell. The procedures adopted during the strike to keep the mine in production might have compromised its safety. These two factors gave Roberts sufficient leverage to upset the routine of the inquest.

At the end of the first day, Roberts applied for an adjournment so that the mine could be inspected by a viewer on behalf of the bereaved families.³³ When this was declined, he made a further application for adjournment so that representatives of the government could be sent to observe the proceedings.³⁴ This also was refused by the coroner. At the end of the third day of the inquest, however, it was adjourned so that two mine viewers could inspect the mine.³⁵ This adjournment caused some concern to George Hunter, a mine viewer employed by Londonderry. He reported to his master that "I am afraid this will be a bad case, in as much as it may lead to further investigation and probably end in Government Inspections".³⁶ This letter is the earliest evidence found that Londonderry was taking an interest in the proceedings at Haswell, though he did not have a financial interest in the mine.

Taking advantage of the break, Roberts travelled to London and thence to Brighton where he petitioned the Prime Minister, Peel,³⁷ that government representatives should be sent to the inquest. This request was based on the recommendation of the 1835 report of the Commons Committee into mining disasters which suggested that the Home Secretary should appoint suitable experts to assist the coroner and jury at the inquests into fatal mining explosions.³⁸ Peel's rapid assent to Roberts's request should be seen in terms of the massive press coverage that the Haswell explosion was receiving. National as well as local press reported the events and carried verbatim reports of the inquest. The *Northern Star* described the accident provocatively in its headline as "The Haswell Murder".³⁹ The *Mining Journal* condemned the apathy of the government, the legislature and those whom they considered responsible for the protection of the coal miner.⁴⁰ The *Economist* suggested that mine workers should have all the protection of "science yet known".⁴¹ Roberts must have left Peel with very little choice but to agree. Peel initially suggested that Michael Faraday, the Fullerian Professor of Chemistry at the Royal Institution,⁴² and Charles Babbage (1791–1871) be appointed.⁴³ He presumably proposed Babbage on

the grounds of his general scientific knowledge and his interest in its application to practical problems. Peel's suggestion of Faraday was more obvious: he had a strong record of providing advice to the government and its agencies and had the previous year undertaken the enquiry, on behalf of the Ordnance Office, into the explosion at the Waltham Abbey gunpowder factory.⁴⁴ Furthermore Faraday had at the Royal Institution one of the best equipped laboratories in the country for undertaking this kind of work.

As a result of these suggestions, the Permanent Secretary of the Home Office, Samuel March Phillipps (1780–1862), visited Babbage on Sunday 6 October, but Babbage evidently declined the commission and later wrote to Phillipps suggesting the geologist Charles Lyell.⁴⁵ On the seventh, Phillipps, after showing Babbage's letter to Peel, called on Lyell who, after some persuasion, agreed to attend the inquest.⁴⁶ Lyell expressed some reluctance to attend without Babbage, but was persuaded by Phillipps who said that "his Eminent Scientific knowledge of the nature and qualities of mines" made him "peculiarly fitted to be appointed to attend such an inquiry".⁴⁷ Though there is no direct evidence, presumably Phillipps also called on Faraday since by Monday 7 October, he had agreed to the commission as Phillipps told Lyell when the latter went to collect geological maps of County Durham.⁴⁸

According to Lyell's recollection, over twenty years later, Faraday accepted the task with considerable reluctance.⁴⁹ Although there is no contemporary evidence for this reluctance, it would not have been too surprising in view of the general poor state of his health and his recent return from an arduous trip to York (where he had attended the meeting of the British Association at the end of September). In the same recollection Lyell also said that he had initially felt some misgivings about Faraday's appointment due to what Lyell mistakenly viewed as Faraday's lack of experience in such matters.

On 7 October Phillipps wrote to them jointly expressing the satisfaction of the Home Secretary, James Graham, that they had agreed to go.⁵⁰ He also enclosed a copy of the letter he had written to Maynard outlining the reasons for their attending the inquest.⁵¹ In this letter Phillipps more than somewhat anticipated the outcome of the inquest by twice referring to the explosion as an "accident". Furthermore, he made it clear to Maynard that one of the functions of the presence of Faraday and Lyell was to ensure that the "verdict would be delivered under the best possible recommendation and with the highest sanction". In other words the government were

expecting to use the high scientific reputations of Faraday and Lyell to legitimate the verdict (which was clearly assumed would be that of accidental death). By sending a copy of his letter to Maynard to Faraday and Lyell, Phillipps was telling them of the government's expectations. But there is no evidence to suggest that the government expected that Faraday and Lyell should cover up any negligence of the mineowners that might be found. They were, after all, being sent at the request of Roberts, though evidently the government was attempting to take advantage of the situation for their own purposes.

On Tuesday 8 October Faraday and Lyell travelled by train to Haswell and were joined by Samuel Stutchbury, who was a mine viewer from the Duchy of Cornwall. Stutchbury's presence was due to Lyell's insistence that he and Faraday must have a practical man to help them with their work.⁵² After the week long adjournment, the inquest resumed on 9 October with Faraday and Lyell present. Maynard announced that Faraday and Lyell "had been sent down by the government to assist in the investigation".⁵³ Lyell, who had originally trained as a lawyer, later recounted that "Faraday began, after a few minutes, being seated next the coroner, to cross-examine the witnesses with as much tact, skill, and self-possession as if he had been an old practitioner at the Bar".⁵⁴ This recollection is supported by contemporary accounts of the inquest where Faraday, and to a lesser extent Lyell, played a major role in the proceedings.⁵⁵ Faraday's notes of the evidence that day concentrated on the state of some of the safety lamps recovered from the mine, the state of the mine immediately before the explosion and the rate of air passage through the mine.⁵⁶

On 10 October Faraday, Lyell and Stutchbury spent seven or eight hours examining the mine, where they experienced a rock fall.⁵⁷ They investigated the air flow in the mine and identified some laxity in the safety procedures. Thus, much to his consternation, Faraday found that he was sitting on a bag of gunpowder while a naked candle was in use: "He sprung up on his feet, and, in a most animated and expressive style, expostulated with them for their carelessness".⁵⁸ In a slightly different version of events, Faraday later related to Lyon Playfair (1818–1898) "that of all the delicate and responsible experiments which he had ever made, the raising of that candle ... was the most anxious one".⁵⁹ While owners could and were criticised for the system of working the mines, the miners (who were responsible for the use and storage of gunpowder) were

themselves often guilty of careless practice and dangerous actions. It was not unknown for miners to expose the flame of their Davy lamps so that they had a brighter light to work by, or even to light a pipe in order to smoke. This practice was, of course, forbidden, but nevertheless it was one in which many engaged.⁶⁰ Such practices suggest that the uneducated condition of the miners (an issue later identified by Lyell) was such that they did not appreciate the dangers to which they exposed themselves. This latter point is borne out by Lyell's recollection of the conflicting statements made by the miners to them "as to the methods and precautions commonly adopted in the ventilation and management of coal mines".⁶¹

On the next and final day of the inquest Faraday noted the evidence of Londonderry's employee, George Hunter, who suggested that one of the miners might have lit a pipe from a safety lamp. Stutchbury then gave his account of the previous day's visit to the mine⁶² which Faraday did not note. Stutchbury's evidence was enough for the jury to say that they had heard sufficient for them to come to a verdict. After retiring for ten minutes the jury returned verdicts of accidental death which Faraday noted with the comment "Fully agree with them".⁶³ Both Faraday and Lyell expressed this view in their initial report to Phillipps.⁶⁴ After generously contributing £5 each to the subscription fund for the widows and orphans,⁶⁵ Faraday and Lyell returned to London the following day, Saturday 12 October.

The agreement of Faraday and Lyell with the verdict of the jury needs to be understood in terms of the specific circumstances in which they attended. Faraday and Lyell had not been present for the first three days of the inquest when Maynard had displayed his biased handling of the case by, for example, repeatedly refusing Roberts's request for viewers to inspect the mine on behalf of the families. Judging by the reports of the inquest, it is clear that Maynard, with Faraday and Lyell present, was much more restrained in his dealings with Roberts than he had been on the first three days. Faraday and Lyell on the days they attended heard no evidence which suggested that the mineowners were at fault; all but two (and one of those was Stutchbury) of the witnesses had been produced by the mineowners. The reluctance of other witnesses to testify can be attributed to the intimidation and hardships endured during and after the strike and it would seem unlikely that Faraday and Lyell would have been aware of these local undercurrents. Thus, when the jury returned their verdict of accidental death, it

would have been perverse of Faraday and Lyell to disagree with it. However, the experience of conditions in the mine showed Faraday and Lyell that something was seriously amiss in mining safety and they would quickly turn their attention to this issue.

The legal process was over and Lyell and Faraday had fulfilled, thus far, the government's expectations of them. By agreeing immediately to Roberts's request to appoint experts to attend the Haswell inquest, Peel was able to silence any potential trade union opposition to the coroner's verdict; the government had, after all, done what Roberts had requested. Indeed Roberts was not critical of either Faraday or Lyell though he did point out Stutchbury's shortcomings.⁶⁶ Graham in a letter to Londonderry made the point explicit, even though it is clear that Graham had very little to do with the original suggestion of sending Faraday and Lyell to the inquest:

I thought it prudent to satisfy the public mind by a searching Enquiry into the causes of the late fatal accident at Haswell: and the result clearly demonstrates the Policy of this course. Mr. Roberts cannot urge a single complaint against the impartiality and process of this investigation. The most able and scientific Assistants aided the Coroner and his Jury in this Enquiry; and this result has been a full acquittal of the Coal-Owners from the charge even of neglect.⁶⁷

Londonderry, writing to his agent on 29 October 1844 remarked, "It is quite clear this Explosion of Haswell has created a great public [sic] sensation".⁶⁸ Although, as mentioned earlier, Londonderry had no direct financial interest in the Haswell colliery, as County Durham's dominant mineowner, he was concerned that the consequences resulting from the Haswell explosion might involve government inspection or interference with mine management.⁶⁹

In a reply of 15 October 1844 that Graham wrote to a letter from Londonderry (not found, but evidently seeking assurances that no steps would be taken to enforce government inspection of mines) he assured Londonderry that "At present I contemplate no legislation measure on this subject".⁷⁰ Graham did qualify this statement, however, by stating that any proposal which may be made in Parliament which might give additional security to the lives of miners must be considered. Londonderry seemed far from satisfied with Graham's reply and wrote to his agent, requesting him to write to the Coal Trade Committee (that is the mineowners'

organisation) to suggest that, as it was more than probable that Parliament would turn their attention to coal mines, it would be prudent to call a "great meeting of all coal-owner's agents" to take the whole subject under serious deliberation in an attempt to deter government interference.⁷¹

THE REPORT

The matter might have rested with their letter to Phillipps, except that Faraday and Lyell added that they would draw up a report dealing with the cause of such accidents to which Phillipps replied that Graham would be glad to receive it.⁷² This decision would seem to stem from what appears to be the vague wording of the last part of the letter from Phillipps to Maynard of which they had been sent a copy: "important information also may be obtained by them [Faraday and Lyell] which possibly may contribute in some measure to the prevention of such fatal accidents".⁷³

While they were writing this report, it became apparent that the possibilities of using legislation to improve safety were severely limited. On 19 October 1844 Lyell reported a conversation with Francis Baring (1796–1866), who had been Chancellor of the Exchequer in the Whig government from 1839 to 1841, in which Baring had expressed his horror at legislative interference in the mining industry.⁷⁴ Nevertheless, on 21 October 1844, Faraday and Lyell submitted their report. The report made a number of recommendations to actively improve mining safety and contained the novel observation that the coal dust had played a major role in the explosion.⁷⁵ The recommendations were mainly concerned with fire damp (methane) and included the suggestion that the fire damp should be drawn away from the mine by specially made conduits.⁷⁶ They also recommended, and this seems to have been Lyell's main contribution to the report, that miners should be better educated.⁷⁷ The government initially reacted favourably to the report. The following day Graham wrote to Londonderry saying that "I intend to send this report to the Lord Lieutenants of the mining Counties with a letter recommending them to use their influence to ensure a fair Trial to the means recommended by the Commissioners [Faraday and Lyell] as a precaution for carrying off the foul air".⁷⁸ Thus the government published the Report as a pamphlet⁷⁹ and distributed it widely.⁸⁰

One of the recipients of the Report was, of course, the Coroner, Maynard. It was he who first raised objections to the conclusions that Faraday and Lyell had reached. In February 1845 he wrote to Faraday suggesting, from evidence recently gathered at Haswell, that gas was not to be found as a matter of course in coal mines, but only under certain circumstances.⁸¹ The next objection to the Report came from the Coal Trade Committee in a report published in March 1845. In this, for instance, they claimed it would cost £21,000 to ventilate the mine according to the methods suggested by Lyell and Faraday.⁸² Graham sent Faraday and Lyell a copy⁸³ as did the mineowners. Faraday replied to the latter with a non sequitur of a letter saying that it would be worthwhile to establish and maintain records of mines.⁸⁴

The publication of the Coal Trade Report led to Thomas Duncombe (1796–1861), the Chartist MP, presumably at the suggestion of Roberts, to ask Graham in the House of Commons on 12 March 1845 what the government intended to do about improving the ventilation in mines. Graham replied that he had forwarded the Coal Trade Report to Lyell and Faraday for their rejoinder.⁸⁵ This reply came as something of a surprise to Faraday who wrote to Lyell saying that he was not aware that Graham had referred the report to them, but asking Lyell to check what Graham had said in his covering letter⁸⁶ which he had sent with the report.⁸⁷ In the House of Lords the following week on 18 March, Londonderry asked the same question though no doubt with different ends in mind. His former commanding officer, Arthur Wellesley, Duke of Wellington (1769–1852) answered for the government as Minister without Portfolio. He gave essentially the same response as Graham had done in the House of Commons. Yet it was not until another week had passed that Phillipps wrote on 24 March asking Faraday, on Graham's behalf, whether he had any comments on the Coal Trade Report.⁸⁸ Lyell and Faraday responded three days later with a letter generally critical of the Coal Trade Report. They remade Faraday's point about the keeping of mining records and commented that ventilation such as they proposed would cost about £136.⁸⁹

The government clearly wished to avoid explicitly answering the question about the implementation of the report and therefore initially resorted to stalling tactics. To have supported the mineowners by rejecting the report would have antagonised a considerable section of public opinion concerned about the conditions in the mines. To have supported the miners would have annoyed the

mineowners, such as Londonderry who carried considerable political weight within Parliament.⁹⁰ The result was a piece of finesse by the government who tabled the report in the House of Commons on Thursday 17 April 1845⁹¹ during the debate on the second reading of the highly contentious Maynooth Endowment Bill. This measure was intended to give government funding to the Roman Catholic Seminary near Dublin.⁹² It thus aroused the wrath of Protestant members of Parliament who opposed the bill with all the means at their disposal. The Government's manoeuvre of placing Faraday and Lyell's report on the table during the debate ensured that no further notice was paid to the contents of the report, including the discovery that coal dust was an explosive agent, which was rediscovered later in the century.⁹³ Whatever the rights and wrongs of this complex story, its ending did not bear out the hopes of Roberts, though Engels was unaware of this.⁹⁴

CONCLUSION

2 August 1845	Merthyr Tydvil	28 deaths
21 September 1845	Jarrow	39 deaths
14 January 1845	Risca	35 deaths
5 March 1847	Oaks	70 deaths
28 October 1848	Whinnyhill	30 deaths
5 June 1849	Hebburn	33 deaths
11 August 1849	Lletty Shenkin	52 deaths
11 November 1850	Houghton	26 deaths
15 March 1851	Nitshill	61 deaths
18 August 1851	Washington	35 deaths
21 December 1851	Rawmarsh	52 deaths
10 May 1852	Duffryn	64 deaths
10 May 1852	Gwendraeth	27 deaths
20 May 1852	Downbrow	35 deaths
25 March 1853	Arley	58 deaths
18 February 1854	Arley	89 deaths

Collieries where more than twenty lives were lost as the result of an explosion in the decade following Haswell (source: Joseph Irving, *The Annals of our Time*, London, 1890)

The stalling and finessing that the government had to undertake as a result of Faraday and Lyell's Report does not support Berman's

view that they were the willing tools of the government to suppress the complaints of mineworkers – though that may have been the government's intention. Faraday and Lyell's Report presented the government with a difficult problem (which willing tools would surely not have done) and this had to be resolved through the normal means of political expediency. Whether Faraday and Lyell were aware of the political implications and manoeuvrings surrounding their report is not clear. However, they appear not to have held any grievance against Peel for they both presented him with copies of their next major publications with suitably flattering letters.⁹⁵

Problems such as this will always arise when the advice that the government has requested does not fit in with other elements of policy. This tension between scientific advice and government policy has always existed from the time that such advice was first sought or given. It further illustrates the complex relations that subsist between society and its science. But more importantly, in this case, lives were at stake by the deliberate inaction of the government on Faraday and Lyell's Report. As the above table indicates, the final losers were the men and boys killed in the large number of explosions in the ensuing decade.

Notes

*We wish to thank the following for permission to work on papers in their possession: Durham County Record Office (DCRO), the Public Record Office (PRO), the British Library (BL), the Institution of Electrical Engineers (IEE) and Northumberland Record Office (NRO).

1. Especially PRO HO45/631.
2. Margaret Ray, *The Haswell Colliery Explosion 1844: Just Another Mining Disaster?*, University of Durham BA dissertation, 1994 and Frank A.J.L. James, "Faraday in the Pits, Faraday at Sea: The Role of the Royal Institution in Changing the Practice of Science and Technology in Nineteenth Century Britain", *Proc. Roy. Inst.*, 1997, 68: 277–301, pp. 284–8.
3. Morris Berman, *Social Change and Scientific Organization: The Royal Institution, 1799–1844*, London, 1978, pp. 177–85. The other major discussion of the explosion is Robert L. Galloway, *Annals of Coal Mining and the Coal Trade*, 2 volumes, London, 1898–1904, 2: 181–98. The explosion is also discussed in Geoffrey Cantor, *Michael Faraday: Sandemanian and Scientist: A Study of Science and Religion in the Nineteenth Century*, London, 1991, pp. 157–9 and in R. Challinor and B. Ripley, *The Miners' Association – A Trade Union in the Age of Chartists*, Whitley Bay, 1990, pp. 204–7.
4. See, for example, David Gooding's review in *Arch. Int. Hist. Sci.*, 1981, 31: 227–30.
5. Berman, *op.cit.* (3), 177.
6. M. Sill, "Landownership and Industry: the East Durham Coalfield in the nineteenth century", *Northern Hist.*, 1984, 20: 146–66, pp. 146–7. See also R. Nelson Boyd, *Coal Mines Inspection. Its History and Results*, London, 1879, p. 25.
7. *Ibid.*, 25.

8. *Ibid.*, 31 and R. Fynes, *The Miners of Northumberland and Durham*, Newcastle, 1986, pp. 146–7. First published 1873.
9. *Ibid.*, 146–53 provides comparative statistics on this and P.E.H. Hair, "Mortality from Violence in British Coalfields 1800–1850", *Econ. Hist. Rev.*, 1968, 21: 545–61, especially pp. 549 and 554.
10. M. Dunn, *A Treatise on the Winning and Working of Collieries*, Newcastle, 1848, p. 290.
11. The South Shields Committee was appointed following the explosion at the South Shields Colliery in 1839. James Mather was Secretary to the Committee. For details of the Committee see Fynes, *op.cit.* (8), 162–3. E. Welbourne, *The Miners' Unions and Northumberland and Durham*, Cambridge, 1923, p. 85. R. Challinor and B. Ripley, *op.cit.* (3), p. 206.
12. *Report of the South Shield Committee for the Investigation of Accidents in Mines*, South Shields, 1842. James Mather, *The Coal Mines, their dangers and means of safety: to which is added the Report of the South Shields Committee appointed to investigate the causes of accidents in Coal Mines, with plans and appendix; together with extracts from the Minutes of Evidence taken before the Parliamentary Committee on Coal Mines, in 1852*, London, 1868.
13. Londonderry had called on the House of Lords to reject the Bill (*Hansard* 64, 541–2). See also A.J. Heesom, "The Coal Mines Act of 1842, Social Reform, and Social Control", *Hist. J.* 1981, 24: 69–88.
14. For an account of the Miners' Association and the 'Great Strike' see R. Challinor and B. Ripley, *op. cit.* (3).
15. *Durham Advertiser*, 7 June 1844.
16. For details of Londonderry's personal and political relationship with Graham and Peel see H. Montgomery Hyde, *The Londonderrys – A Family Portrait*, London, 1979, p. 37 *passim*.
17. Graham to Londonderry, 29 July 1844, DCRO, Londonderry papers, D/Lo/C 80 (34).
18. Friedrich Engels, *De Lage der arbeitenden Klasse in England*, Leipzig, 1845, p. 305.
19. W. Mitchell, "What do the Pitmen Want?", *British Labour Struggles: Contemporary Pamphlets 1727–1850*, New York, 1972, p. 4.
20. *Northern Star*, 12 October 1844, p. 5.
21. Undated cutting from *Miner's Advocate*, NRO 3410/Bell 16.
22. *Ill. Lond. News*, 5 October 1844, p. 223–4.
23. Unidentified and undated newspaper cutting, NRO WAT 1/29/3.
24. Londonderry papers, DCRO D/Lo/C 463 *passim*.
25. Maynard to Londonderry, 10 August 1841, Londonderry papers, DCRO D/Lo/C 132/2(12).
26. Maynard to Londonderry, 16 October 1841, Londonderry papers, DCRO D/Lo/C 132/2(15).
27. William Prowting Roberts (1806–1871). On his career see Raymond Challinor, *A Radical Lawyer in Victorian England: W P Roberts, and the Struggle for Workers' Rights*, London, 1990.
28. Engels, *op.cit.* (18), p. 305.
29. The occupations of the following jurors has been determined from the following sources: Slater's (*Late Pigot & Co's*), *Royal National Commercial Directory of the Northern Counties, Vol. 1. Comprises the Counties of Durham, Northumberland & Yorkshire*, London and Manchester, 1854; *Pigot & Co's National Commercial Directory in the Counties of Chester, Cumberland, Durham, Lancaster, Northumberland, Westmoreland and York*, London and Manchester 1834; Easington Parish Records, DCRO EP/Ea 1840–1852. They are Matthew Elliot (grocer and draper, jury foreman), Thomas Richardson (tailor), William Moody (farmer at Holy Cross Farm), George Humble (grocer and draper from Trimdon), Hugh Dryden (farmer), William Soulsby

(tailor and draper from South Hetton), Simon Dryden (farmer), John Mason (Governor of Easington Workhouse and Returning Officer) and William Allison (blacksmith from Easington). The occupations of the other jurors (George Watson, William Miller, George Marston and William Williamson) have not been found.

30. "Children's Employment Commission. Appendix to First Report of Commissioners, Mines, Pt. 1", *Parliamentary Papers*, 1842 [381] 16, p. 541.
31. *Northern Star*, 12 October 1844, p. 5.
32. A point made implicitly in William Prowting Roberts, *The Haswell Colliery Explosion, 28th September, 1844*, Newcastle, 1844, p. 1.
33. *Ibid.*, 23-4.
34. *Ibid.*, 24.
35. *Ibid.*, 44-5.
36. Hunter to Londonderry, 3 October 1844, DCRO Londonderry papers, D/Lo/ C 149 (239).
37. Peel was on his way to Portsmouth for the start of the state visit of the King of France, Louis-Philippe (1773-1850).
38. *Parliamentary Papers*, 1835 (603) 5, p. ix.
39. *Northern Star*, 12 October 1844, p. 5.
40. Cutting from the *Mining Journal*, Records of the Institute of Mining and Mechanical Engineers, NRO 3410/Bell 16.
41. *Economist*, 5 October 1844, p. 1275.
42. The most recent study of Faraday is Geoffrey Cantor, David Gooding and Frank A.J.L. James, *Faraday*, London, 1991 (2nd ed published as *Michael Faraday*, Atlantic Highlands, 1996). Frank A.J.L. James, *The Correspondence of Michael Faraday*, 3 volumes and continuing, London, 1991-, will be cited as Faraday, *Correspondence*, followed by volume and letter number.
43. Lyell to Babbage, 7 October 1844, BL MS add 37193, f.122. This letter is printed in Charles Lyell, *Life, Letters and Journals of Sir Charles Lyell*, 2 volumes, London, 1881, 2, 89-90.
44. Faraday to Cockburn, 20 June 1843, Faraday, *Correspondence*, 3, 1502.
45. This letter has not been found, but see Phillipps to Babbage, 7 October 1844, BL MS add 37193, f.120 for its content.
46. Phillipps to Babbage, 7 October 1844, BL MS add 37193, f.120 and Lyell to Babbage, 7 October 1844, BL MS add 37193, f. 122.
47. Phillipps to Babbage, 7 October 1844, BL MS add 37193, f.120.
48. Lyell to Faraday, 7 October 1844, Faraday, *Correspondence*, 3, 1614.
49. Lyell to Bence Jones, April 1868, in Lyell, *op.cit.* (43), 2: 417-22, p. 418.
50. Phillipps to Lyell and Faraday, 7 October 1844, Faraday, *Correspondence*, 3, 1615.
51. Phillipps to Maynard, 7 October 1844, Faraday, *Correspondence*, 3, 1616.
52. See Phillipps to Lyell and Faraday, 7 October 1844, Faraday, *Correspondence*, 3, 1615 and Lyell to Babbage, 7 October 1844, BL MS add 37193, f.122.
53. Roberts, *op.cit.* (32), 45.
54. Lyell to Bence Jones, April 1868, in Lyell, *op.cit.* (43), 2: 417-22, p. 418.
55. Roberts, *op.cit.* (32), 45-65 and Anon, *Full & Authentic Particulars of the Dreadful Explosion at Haswell Colliery on Saturday, September 28th, 1844, by which Ninety-Five Lives were Lost; a verbatim Report of the Proceedings at the Coroner's Inquest; and a Correct Plan of that part of the Colliery in which the Accident Occured*, Sunderland, 1844, pp. 43-7.
56. Faraday's notes of the inquest in IEE MS SC 2 are printed in Henry Bence Jones, *The Life and Letters of Faraday*, 1st edition, 2 volumes, London, 1870, 2: 183-5.
57. *Ibid.*
58. Lyell to Bence Jones, April 1868, in Lyell, *op.cit.* (43), 2: 417-22, p. 419.

59. Thomas Wemyss Reid, *Memoirs and Correspondence of Lyon Playfair*, London, 1899, p. 95.
60. Ray, *op.cit.* (2), 41.
61. Lyell to Bence Jones, April 1868, in Lyell, *op.cit.* (43), 2: 417-22, p. 420.
62. Roberts, *op.cit.* (32), 66-7 and Anon, *op.cit.* (55), 46-7.
63. Faraday's notes of the inquest, Bence Jones, *op.cit.* (56), 2: 183-5. This comment of Faraday's is on p. 185.
64. Lyell and Faraday to Phillipps, 14 October 1844, Faraday, *Correspondence*, 3, 1617.
65. Lyell to Bence Jones, April 1868, in Lyell *op.cit.* (43), 2: 417-22, p. 420. For the amount see *Local Collections; or Records of Remarkable Events, Connected with the Borough of Gateshead, 1844*, Gateshead, 1845, p. 112.
66. Roberts, *op.cit.* (32), 71-2.
67. Graham to Londonderry, 14 October 1844, Londonderry papers, DCRO, D/Lo/C 326 (46).
68. Londonderry to Hindhaugh, 29 October 1844, Londonderry papers, DCRO D/Lo/C 148 (110).
69. For Londonderry's attitude to government inspection and interference see A.J. Heesom, "Entrepreneurial Paternalism: The Third Lord Londonderry (1778-1854) and the Coal Trade", *Durham Univ. J.*, 1974, 25: 238-56.
70. Graham to Londonderry, 15 October 1844, Londonderry papers, DCRO D/Lo/C 326 (45). It should be pointed out, however, that this was one topic amongst a number discussed.
71. Londonderry to Hindhaugh, 28 October 1844, DCRO D/ Lo/ C 326 (54).
72. Phillipps to Lyell and Faraday, 15 October 1844, Faraday, *Correspondence*, 3, 1618.
73. Phillipps to Maynard, 7 October 1844, Faraday, *Correspondence*, 3, 1616.
74. Lyell to Faraday, 19 October 1844, Faraday, *Correspondence*, 3, 1622.
75. Charles Lyell and Michael Faraday, *Report... on the subject of the explosion at the Haswell Collieries and on the means of preventing similar accidents*, London, 1844, 12-3. On the role of coal dust see James McQuaid, "Safety's Debt to Davy and Faraday", *Proc. Roy. Inst.*, 1997, 68: 177-208, pp. 200-6. Berman, *op.cit.* (3), 182 appears not to have realised the significance of this discovery: "Faraday and Lyell had discovered nothing, and what 'science' had to do with their investigation... remains unclear".
76. Lyell and Faraday, *op.cit.* (72), 14.
77. *Ibid.*, 18-20. See Lyell to Faraday, 19 October 1844, Faraday, *Correspondence*, 3, 1622 for his views on their respective contributions to the Report.
78. Graham to Londonderry, 22 November 1844, Londonderry papers, DCRO D/Lo/C 326 (63).
79. Lyell and Faraday, *op.cit.* (75).
80. Faraday to Phillipps, 18 November 1844, Faraday, *Correspondence*, 3, 1652 lists Faraday's suggestions for the distribution of 1250 copies. 1500 copies of the lithographs were ordered by the Home Office. See Phillipps to Standidge, 23 November 1844, PRO HO43/68, p. 95.
81. Maynard to Faraday, 7 February 1845, Faraday, *Correspondence*, 3, 1681.
82. George Johnson, *Report addressed to the United Committee of the Coal Trade, by the special committee appointed to take into consideration the Report from Messrs. Lyell and Faraday, to the Secretary of State for the Home Department, "On the subject of the explosion at the Haswell Collieries, and on the means of preventing similar accidents"*, Durham, 1845, p. 12.
83. Graham to Lyell and Faraday, 10 March 1845, Faraday, *Correspondence*, 3, 1692.
84. Faraday to Taylor, 11 March 1845, Faraday, *Correspondence*, 3, 1693.
85. *Times*, 13 March 1845, p. 2, col. e.
86. Graham to Lyell and Faraday, 10 March 1845, Faraday, *Correspondence*, 3, 1692.
87. Faraday to Lyell, 15 March 1845, Faraday, *Correspondence*, 3, 1696.

88. Phillipps to Faraday, 24 March 1845, Faraday, *Correspondence*, 3, 1701.
89. Faraday and Lyell to Phillipps, 27 March 1845, Faraday, *Correspondence*, 3, 1704.
90. Ray, *op.cit.* (2), 14.
91. *Commons Journals*, 1845, 100: 277.
92. On the controversial debate on this bill see *Ann. Reg.*, 1845, 101-30.
93. See Galloway, *op.cit.* (3), 2: 193-6.
94. Engels, *op.cit.* (18), 309-10. His preface was dated 15 March 1845, p. 5.
95. Lyell to Peel, 2 July 1845, BL add MS 40570, f.78 presented Charles Lyell, *Travels in North America; with Geological Observations on the United States, Canada, and Nova Scotia*, 2 volumes, London, 1845 and Faraday to Peel, 16 March 1846, Faraday, *Correspondence*, 3, 1840 sent Michael Faraday, "Experimental researches in Electricity. - Nineteenth Series. On the magnetization of light and the illumination of magnetic lines of force", *Phil. Trans.* 1846, 136: 1-20, "Experimental Researches in Electricity. - Twentieth Series. On new magnetic actions, and on the magnetic condition of all matter", *ibid.*, 21-40 and "Experimental Researches in Electricity. - Twenty-first Series. On new magnetic actions, and on the magnetic condition of all matter - continued", *ibid.*, 41-62.