

The North of England Institute of Mining Engineers and the establishment of the College of Physical Science at Newcastle upon Tyne

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This paper deals with the events which led to the formation of the North of England Institute of Mining Engineers and establishing the College of Physical Science at Newcastle on Tyne .

During the early part of the 19th century the many disasters which occurred in coal mines with the accompanying heavy death roll had drawn most strongly the attention of the public to the dangers of the miner's life.

In the North of England at this time, the coal industry was more fully developed than elsewhere, the shallower seams were becoming exhausted and coal had to be exploited from greater depths. The increased depth brought with it greater amounts of inflammable gas and greatly increased sinking costs, and larger areas of coal had to be worked from the shafts in order to make the operation profitable. This trend of producing greater outputs from greater deeper and more extensive mines meant that larger teams of men were engaged underground and this resulted in a larger number of casualties when an explosion occurred.

The terrible explosion at Felling Colliery, which took place on 25th May 1812 causing the death of 92 men and boys, attracted a good deal of attention from the public and led to the formation of the famous Sunderland Society for the prevention of accidents in coal mines. This society secured the services of Sir Humphry Davy, who devised the wire gauze safety lamp. This invention proved to be so momentous and valuable that the Sunderland Society disbanded and disbanded themselves on the ground that the object of its formation had been achieved.

At a later date the enterprise of private persons was again to help on the cause of reform. The explosion at St. Hilda Colliery in 1839 when 52 lives were lost, led to the formation of the South Shields Committee, who also set themselves to investigate the causes of accidents in mines. Their report, the result of three years' concentrated work, was a most thorough and valuable treatise. Important recommendations made in the work included: the compulsory registration of mine plans, the institution of a system of government inspection of mines, the prohibition of the employment of women and children below ground, and the better scientific education of mining engineers. (1)

They recommended that mining engineers should complete their professional education by attending a course of practical engineering and mining in some fitting institution in the heart of a coal field. They go on to say that such already exists, namely the University of Durham , which by extension and increase of academic staff would be capable of carrying out this function.

The South Shields Committee had discussions with the University and include in their report an extract of a letter from Professor Chavalier, Registrar of the University, which gave the

prevailing position. He states 'The class of students in civil engineering and mining was opened in January 1838. The full course of study occupies three years; but certificates of competency in particular subjects may be obtained after a shorter time.' The University estimated that if the South Shields Committee's desires were to be met, then an important addition to the academic staff would be required in the form of a Professor of Practical Engineering and Mining, with an endowment sufficient to ensure the services of a person of experience and high scientific attainments.

The Committee hoped the scheme would be financed by the Government. In this they were to be disappointed, and lack of funds for mining education was to be a constantly recurring difficulty which caused considerable delay and frustration for the next quarter of a century.

The miners themselves also pressed for improved ventilation and inspection of mines by the State. During the same period, select Committees of both Houses of Parliament collected evidence and issued reports dealing with accidents, explosions, ventilation and safety. Many of these Committees, together with newspaper correspondents and others, put forward suggestions for increasing safety which, to prove their value, required lengthy and expensive full scale tests in the mines. The most obvious people to assess the value of these suggestions and to make the necessary tests were the mining engineers or viewers in charge of the mine.

Opinion in the country at this time was setting more strongly in favour of Government inspection and eventually an act was passed which received the Royal Assent on 14th August, 1850, which established that Inspectors were to be appointed; mine plans were to be kept and produced to the Inspectors when required; notice of every fatal accident was to be given immediately to the Home Office.

The effect of this combined action on the part of the public and of the Government, was to cause some of the leading members of the coal trade to consider that further efforts on their part were imperative to improve both the theoretical and practical departments on mining technology. Disasters were found to occur even in the best managed collieries and it began to be recognised by mining engineers that research, co-operation, mutual help and a pooling of ideas and resources were necessary if the dreaded explosions were to be prevented. This need for a corporate gathering of mining engineers, where they could discuss practice and principles, had long been felt, but as yet no action had been taken to make the idea a reality. However, this situation was soon to change.

On 9th June, 1852, an explosion occurred at Seaton Colliery, County Durham, which caused the death of six men and a boy. This colliery had only one shaft which was fourteen feet in diameter and was divided into two compartments by a vertical wooden partition or brattice. The ventilating air passed from the atmosphere down one compartment and the used air from the workings was heated by a furnace and returned up the other compartment. One of the first of the rescuers to descend the shaft after the accident was William Spencer, a young mining engineer attached to the colliery (2). Whilst he and his party were underground another small explosion occurred which set fire to the wooden brattice. Spencer and his colleagues managed to put this fire out with water. He said the risk to them would have been great had the fire continued as the shaft was 510 yards deep, and the ventilation system would doubtless have been destroyed.

The inquest which followed upon the Seaton Colliery accident took place on 23rd June, 1852. Many leading viewers and mining experts were present at the inquest, they included Nicholas Wood, E.F.Boyd, T.E.Forster, Matthias Dunn, T.C.Maynard, G.B.Forster, George Elliot, Edward Sinclair and some few others. After the inquest they assembled together and

were discussing the cause of these terrible explosions and the best means of preventing them, when it was proposed by Mr. T.E.Forster and seconded by Mr. George Elliot that the advantages they were deriving from such a discussion should be extended to the rest of the North of England and that they should form a recognised society, working under fixed rules, and with aims which should be clearly defined. (3)

This promising beginning was soon followed up by a meeting of some forty-four coal-owners, viewers and others interested in the Coal Trade, which was held in the Coal trade Offices, Newcastle-upon-Tyne on Saturday, 3rd July, 1852. Mr. William Anderson occupied the chair. This meeting decided to form a Society to meet at fixed times to discuss the means for the ventilation of collieries, for preventing accidents and for general purposes connected with the winning and working of collieries. The Society to be called 'The North of England Society for the Prevention of Accidents, and for other purposes connected with mining.'

A committee was appointed to draw up the rules for the regulation of the society and Mr. Edward Sinclair, viewer at Seaton Colliery, was appointed Honorary Secretary. At a second meeting the title of the society was changed to 'The North of England Institute of Mining Engineers' a much shorter and more expressive description of what the new society eventually became. The Institute was formally commenced in August 1852, when the eminent mining and civil engineer Nicholas Wood (1795-1865) was elected its first President.

The foregoing gives some indication of the situation existing in the coalfield at the middle of the 19th Century and the events which triggered off the formation of the North of England Institute of Mining Engineers. In 1870, the Institute opened its doors to mechanical engineers and changed its title to the North of England Institute of Mining and Mechanical Engineers. The Institute obtained its Royal Charter in 1876.

In his Inaugural Address, delivered on 3rd September 1852, Nicholas Wood outlined the objects and aims of the Institute, these included efforts 'to devise measures which may avert or alleviate those dreadful calamities, which have so frequently produced such destruction of life and property and which are always attended with such misery and distress to the mining population' and 'Secondly, to establish a Literary Institution... applicable to the theory, art and practice of mining.' (4)

He also outlined various topics which he thought the members should investigate and research upon, these included:- lighting, ventilation, shaft sinking and methods of working. Regarding the education of mining engineers he said 'we must not neglect a most important branch, indeed, the mainspring of the Society, that of the advancement of the science of mining, or the cultivation of those branches of science which more particularly appertain to our profession. The study of geology... mineralogy, chemistry, mechanical philosophy, pneumatics and mechanics, are all subjects which would occupy the time and attention of members...very usefully and practically.' He then went on to outline his interest into the founding of a School of Mines. He said 'I have already, on a recent occasion, in an inaugural address on the establishment of a School of Mines ventured to point out that all these sciences ought to enter into the education of a mining engineer'. (4)

The address mentioned above had been given in connection with a College of Practical Science and School of Medicine, situated at Rye Hill. It appears there were at this time two medical Schools in Newcastle, the one mentioned above and another connected since 1852 with the University of Durham, and which took the title of College of medicine in 1870. For the next few years at each meeting of the Mining Institute, the progress of the struggle to found a College of Physical Science was reported and discussed. The President exhibited tremendous interest and expended much time and energy on this particular project. He

discussed the problems associated with establishing a college with those persons conversant with such subjects, these included Dr. Lyon Playfair and Archdeacon Thorpe, the Warden of the University of Durham . (5)

An outline of a suitable course of study was drawn up which was to be of a purely practical or industrial character and was to extend for three years.

The feelings of those who were supporting the enterprise appeared to favour an independent college not connected with any existing establishment and also separately financed. The President said that the parties with whom he had conferred had intimated that a connection with the University of Durham would be of great advantage and assistance. The Warden of the University had been most helpful and said his feelings toward the proposed college were that of 'strengthening it and doing it good'.

At a general meeting of the Institute held on 2nd February 1854 , Nicholas Wood reported on the position regarding the proposed College and stressed the need for a Mining School as being most essential for the proper education of those who would in future manage the mines. (6) He went on to say that 'mining was every day becoming more difficult.' Mines were being sunk deeper and new difficulties were in consequence being encountered. 'Other districts', he said, 'were drafting away from here, man after man, to take the management of their mines, and he believed, at this moment, there was a scarcity of properly educated persons to take the management of this district.' (6)

The Council and Special Committee of the Institute continued to explore every path which they thought would facilitate the formation of a College of Physical science . All parties who were likely to have an interest in the project were consulted, these included the Corporation of Newcastle, the local and national coal trade interests, the lead mining interests, and the manufacturing firms of the district.

Although the wants of the mining interests were considered paramount, it was considered that the college to be successful must be generally useful. It would have to be adapted to the manufacturing interests as well as to the mining population.

On 1st November 1855 , at a general meeting of the Institute, the Special Committee appointed to consider the proposed College of Mining and Manufacturing Science presented their Report and Prospectus. (7) This document gave the names of the Committee, which included representatives of the Coal Trade of Great Britain. It also explained why such a college was desired and named Newcastle as the most suitable site for such a foundation.

The annual expenditure, including salaries was estimated to require a revenue in the region of £3,000. The capital cost of a suitable building, teaching apparatus and endowments for the Professors was estimated at £35,000. The subjects to be taught were set out and it was estimated that at least five Professors would be required. (7)

The next problem was to raise the necessary finance and it was decided first of all to make an approach to the Duke of Northumberland, before the general public was approached. The result of this approach brought forward a munificent offer from the Duke over the name of Hugh Taylor, the Duke's Commissioner, which was to the effect that 'if £15,000, be raised for the endowment he will contribute £5,000, making £20,000 and if £30,000 be raised he will subscribe £10,000, making £40,000 for the like purpose'. (8)

Another important point in the Duke's reply showed his concern that the most favourable location be chosen for the long term future of the college; he wrote, 'as regards the particular

locality of the proposed college, and the expediency or otherwise of appending it to, or connecting it with, any existing establishment; the Duke would recommend that these subjects should receive most mature and dispassionate consideration, as the success and permanency of the intended Institution may greatly depend upon the decision.' (8) A reference no doubt to the discussion of the competing claims of the rival locations of Durham and Newcastle .

The response to this magnificent lead by the Duke was most disappointing and at a meeting of the Institute on 5th August 1858, Nicholas Wood said, 'the Duke of Northumberland came forward in the most princely manner, by offering a large sum as an endowment; on one condition only, which has proved fatal to the scheme, namely that we shall provide a certain other amount... I regret that the Coal Trade did not follow up on that proposition of His Grace in the manner, which in my opinion they ought to have done,.. whether it was that the trade not being in a good state was the cause or not, we did not get the money, not even the promise of it, and therefore we could not fulfil the conditions proposed by His Grace.' (9)

The prospects of establishing an independent College now appeared to be extremely remote and it was decided to explore the possibility of having an association with the University of Durham . The Special Committee for the establishment of a Mining College was requested to confer with the University, the Government and Coal Owners on the subject. They reported on 20th May 1859 , that they had held several interviews with the University of Durham and that a provisional arrangement had been sketched out in consultation with the Warden and Senate. Some of the more important heads or points included were as follows: (10)

- A College of Mining and Engineering shall be established at Durham , in connection with the University of Durham .
- The University shall provide two Professors, namely a Mathematics Professor and a Professor of Natural Philosophy and Applied Mechanics.
- The Mining and Engineering College shall provide three Professors viz: a Professor of Chemistry, a Professor of Geology and Mine Working, and a Professor of Surveying, Plan Drawing and Practical Engineering.
- Students in Mining and Civil Engineering shall be of two classes, matriculated and non-matriculated. Matriculated students shall be admissible to the academic rank of Mining Engineer and Civil Engineer, according to the regulations passed by the University in January, 1855.

The University offered to make appropriate lecture rooms available for the use of the College, there were also heads dealing with student accommodation, fees and other relevant matters.

With regard to the endowment of the proposed College, the University regretted that they were not enabled by their constitution to devote any further appropriation of their funds for the support of the College. They agreed to pay the salaries of two of the professors out of the five required on the ground that their services would be useful to both institutions. (10)

The adoption of this arrangement would have meant establishing the College at Durham instead of at Newcastle , which was considered to be the most advantageous venue.

There was also the difficulty of raising the necessary funds for the erection of such buildings as were not to be provided by the University and for the payment of professors and for current expenses. Nicholas Wood says he trusted that, 'the lessors of the vast coal mining districts of Northumberland and Durham and their lessees... will contribute towards the requisite funds.'

Every effort was made to obtain financial support for the venture but the results obtained were very disappointing. The time did not seem ripe for the success of such an undertaking, the Government offered no support and obviously considered that a College of this kind should be self-supporting.

This disappointing result caused this desirable project to be temporarily shelved or even abandoned. The apparent failure to realise one of the main objects which the Institute had set out to attain in 1852 must have caused great disappointment, especially to the President, Nicholas Wood, who had worked long and valiantly for this particular cause.

A few years later on 19th December 1865, Nicholas Wood died. His services to the Institute had been so highly regarded by the members that he was annually chosen President by a great majority of votes. He had held the office of President from August 1852 up to the day of his death.

The new President of the Institute, elected on 1st March 1866, was Mr. Thomas Emerson Forster. In his inaugural address he spoke of the late President's efforts to establish a College of Physical Science, but he continued, the project failed to get sufficient support and was eventually abandoned. He could not say 'whether the scheme will ever be revived and carried out'. No attempt to revive the project appears to have been made during Mr. Forster's two years of office.

The next President was Mr. (later Sir) George Elliot, who delivered his inaugural address on 7th November 1868. In it he said he had recently been in communication with the Senate of Durham University and (12) 'their efforts to promote the cause of scientific education merit the warmest thanks of mining engineers.' He lists the following members of staff engaged in scientific courses at the University: a Professor of Mathematics, a mathematical tutor, a lecturer in Mining and Civil Engineering and a lecturer in Chemistry. He said he looked forward to the time when a systematic course of instruction would grow up 'perhaps as practically useful as that given in the State schools of Paris and Freiberg.' He said there was still much to do before the projected connection between the University and the Institute became stable and defined. (12)

This was the start of a new initiative which was to be successfully developed by the succeeding President of the Institute, Mr. Edward Fenwick Boyd, who was installed on 7th August 1869.

Mr. Boyd, who was mineral agent to the Dean and Chapter of Durham, had been concerned with Nicholas Wood and Mr. Thomas John Taylor in the previous negotiations with Archdeacon Thorpe, Warden of the University. These talks had been unproductive, due mainly to disagreement 'on the relative merits of Durham and Newcastle as the proper sites.' (13) However, during his Presidency 'there was at that time a conjuncture of favourable circumstances. The trade of the district was in a flourishing condition. There was a strong and well-sustained demand for young men of ability and energy to manage the industries of the district.' The new Dean of Durham, Dr. William Charles Lake, was installed Warden of the University. Mr. Boyd called on him soon after he had arrived in Durham in 1869, and laid the case for a College of Physical science at Newcastle before him. The Dean listened favourably and asked for further confirmation of these views. This was supplied by Mr. (later Sir) Isaac Lothian Bell 'whose scientific attainments well qualified him to give assurance on the subject.' The Dean afterwards wrote 'It was owing to their advice that it was determined to found the College at Newcastle, and not as some wished at Durham.' (13)

The stage was now set for a remarkable change of fortune for the Science College project.

On 9th November 1869 , a Committee was formally appointed by the Mining Institute to confer with the Principals of Durham University. Many private conferences took place in 1870 between Dr. Lake, Mr. E.F. Boyd, Mr. I. Lothian Bell and others and a basis of agreement was reached.

At a public meeting in Newcastle on 25th March 1871, at which Dr. Lake put forward the proposals which had been previously formulated, they were enthusiastically received and unanimously adopted. The project then developed rapidly and the Constitution of the College was passed on 19th June 1871 . The proposals put forward by Dr. Lake on 25th March 1871 , were that the (14) University of Durham was prepared to give £1,000 per annum for six years towards the expenses of establishing a College of Physical Science at Newcastle , provided that a similar sum for the like term of years could be guaranteed from other sources. This offer was unanimously accepted and an Executive Committee of twenty people was appointed to carry out the details. The University had intimated that the promised aid would be made permanent if a capital sum sufficient to secure the continuance of the support could be obtained.

The Committee found that much more support was forthcoming than was sufficient to provide for the six years experiment. Hence, it was decided to appeal to the public for £30,000, which it was hoped could be raised in a few months. Already, £21,460 had been promised together with three yearly subscriptions of £100 each. Thus encouraged, the Committee were desirous that the College should be open at the earliest opportunity and if possible in October 1871. To this end, applications were invited for the various Chairs and the Committee secured the services of the following gentlemen as the first Professors of the College.

As Professor of Mathematics - Mr. W. Steadman Aldis of Trinity College, Cambridge, Senior Wrangler in 1861 (appointed by the Dean of Durham).

As Professor of Geology - Dr. David Page, Hon. LLD of the University of St. Andrews and F.R.S.

As Professor of Chemistry - Mr. A. Freire Marreco, M.A., for 12 years Reader in Chemistry to the University of Durham .

As Professor of Experimental Physics - Mr. Alex S. Herschel, late scholar of Trinity College , Cambridge, and lecturer in Physics in Anderson's University in Glasgow . (Appointed by the Dean of Durham .)

The Committee had been impressed by the high quality of the candidates they were able to attract and it was felt that these distinguished holders of the first chairs would guarantee the high standard of the teaching which was essential to the success of the College.

A constitution for the College was agreed by the Executive Committee and the President of the Mining Institute was made a permanent member of the Governing body.

Accommodation for the College in which to commence teaching was secured in the group of buildings occupied by the Institute, the Literary and Philosophical Society, the Medical College and the Natural History Society, which had adjoining situations in the same area of Neville Street and Orchard Street . The College remained there for the first seventeen years of its existence.

The first session of 1871-72 began with a teaching staff of eight and a total of 173 students. Instruction was offered in the four subjects: Mathematics, Physics, Chemistry and Geology. The Report of the Council for the Session 1872-73 gave the number of students as 188, and the number of classes had been augmented from 4 to 11, and now included English, History and Literature, Latin Greek, French, Mechanical Drawing and Natural Philosophy.

Each year more subjects were added to the curriculum and Professors, Lecturers and students increased in numbers. The college rapidly outgrew its temporary accommodation and demands for better quarters soon began to be made. The resources of the College were still limited but the search for a new site was begun. The search ended by the purchase of six acres of ground known as Lax's Gardens, situated between Barras Bridge and Leazes Common for £16,000. The foundation stone of the first building on this site was laid by Sir William Armstrong in June 1887, and the Building was opened on 5th November 1888, by Her Royal Highness Princess Louise.

The decision to build a new wing to be devoted mainly to engineering and mining was decided upon in 1891, but the expansion of teaching and research in these subjects has continually demanded increased accommodation and the Mining Engineering department is now housed in a separate building which was opened by the Prince of Wales in May 1929. (15) This building was financed mainly by grants from the central Committee of the Miners Welfare Fund, who made a generous grant of £20,000, the Northumberland District Committee gave £10,000, nearly £5,000 was donated anonymously, leaving a further £15,000 to be found for completion. This building was supplemented by a specially equipped Rock Mechanics research laboratory in 1955 in Haymarket Lane. Extension of rock mechanics research and teaching has since merited a move to larger quarters situated in the lower ground and ground floor areas of the Porter Building in St. Thomas Street. (16)

When the College of Physical Science began in 1871, mining engineering was not included as a separate subject. The prevailing opinion appeared to be that mining was an art which had to be learned by actual acquaintance in the pit. It was realised that a good general and scientific education was valuable in understanding mining phenomena, but extensive and prolonged practical experience in mines was said to be most essential. This attitude was no doubt encouraged by the lack of mining literature at that time, there being very few text books on the subject available. However, with the establishment of the North of England Institute of Mining Engineers, their Transactions became the main text book. Their papers and discussions were building the technology of mining engineering, and the bank of specialist knowledge was continually expanding. It is largely to the credit of the Mining Institutes that the modern mining engineer has a highly specialised body of knowledge at his disposal.

In 1879, the Mining Institute proposed that a Professor of Mining should be appointed. This was agreed to, and with financial aid from the Coal Trades of Northumberland and Durham, a Chair of Mining was founded in 1880. (17)

The first occupant of the Chair of Mining was Professor John Herman Merivale (1851-1916). His father Charles Merivale, was a distinguished classical scholar, who later became Dean of Ely, and was an old friend of Dr. Lake, Dean of Durham. The latter is said to have persuaded him to enter his son as literally the first student at the new College of Physical Science at Newcastle. (18) Thus, the first student of the College became the first Professor of Mining. Merivale took part in the management of mines and in other professional pursuits, he was author and joint author of several papers and wrote a text-book called *Notes and Formulae for Mining Students*. Merivale, in company with the other Professors at the College, was made an Honorary member of the Mining Institute, as was Dr. W.C. Lake, Dean of Durham.

In 1896, Professor Merivale vacated the Chair of Mining, and was followed by Professor Henry Louis (1855-1938), a distinguished mining engineer and metallurgist. Professor Louis was trained at the Royal School of Mines, and saw much service overseas before taking up the Chair of Mining at the College of Physical Science. Henry Louis was a prolific writer,

being author of several standard works, a fluent linguist and a celebrated applied scientist. He retired from the Chair in 1923. (19)

The next holder of the Mining Chair was Professor Granville Poole (1886-1962), who had already occupied the Chair of Mining at the University of Leeds for four years. He moved over and held the Newcastle Chair from 1923-1951. (20)

His experience after graduating at Birmingham University included some time spent as H.M. Senior Inspector of Mines and Secretary to the Chief Inspector of Mines. He was also a consultant mining engineer and director of colliery companies. He was the author of several papers and a text-book on mining.

The present holder of the Chair of Mining Engineering is Professor Edward L.J.Potts, who is an old student of the department of which he is now Head. His research work and publications on rock mechanics, strata control, coal ploughing and mine ventilation have received international acclaim. His professional services are sought in most of the major mining countries of the world and his contribution to mining technology is still in full flow.

The above four thumb-nail sketches of the successive occupants of the Chair of Mining at Newcastle upon Tyne do not do justice to the records of these distinguished men. They all in turn worked closely with the Mining Institute and each have occupied the Presidential Chair.

CONCLUSION

The North of England Institute of Mining and Mechanical Engineers was undoubtedly a very important influence in the establishment and subsequent development of the College of Physical Science and therefore of its successors, Armstrong College, King's College and the University of Newcastle upon Tyne .

Leading men in the coal trade and the Mining Institute made long and strenuous efforts to establish Engineering and Scientific education in Newcastle upon Tyne .

In the early days of its existence when the College was housed in the Institute and associated buildings, the staff of the College took a keen and lively interest in the Institute's activities. They contributed papers of great value and were prominent in discussions thereby further enhancing the reputation of this famous north country Institute. The help and co-operation of the Professors was commented upon by many of the Institute's Presidents.

John Marley, in his Presidential Address delivered on the 8th December, 1888, said 'whilst claiming this College as the offering of this Institute and as one of our great objects practically accomplished, I take this opportunity of acknowledging much valuable assistance received by this Institute from the Professors of the College'. (21)

This close connection between the two bodies is still maintained. This applies particularly to the University Department of Mining Engineering, which continues to give mutual aid to the mining industry and the Institute, and by the high quality of its research and publications enhances its own and the Institute's reputation.

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