

History of the Royal Polytechnic Institution 1838–1881

The Education of the Eye

Brenda Weeden



The History of the University of Westminster
Part One



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Chancellor's foreword

I was installed as the University of Westminster's Chancellor in 2006, but I had been aware of the history of this great institution for many years before that moment. My home while I am in London is very close to the site that has been the location of the University's headquarters at 309 Regent Street since its inception as the first Polytechnic Institution in 1838. The current building, with its listed marble foyer, is not the same one that housed the first Institution all those years ago, but the sense of history that pervades the existing structure provides us with a wonderful feeling of continuity.

Although the importance of the Polytechnic to London is clear, when reading this fascinating new study of the early years of the Institution I was struck by the fact that it quickly developed an international reputation. Travelling around the world on business and as a member of the House of Lords, I still encounter people who fondly remember the 'Regent Street Poly'. This international awareness first came about because of the pioneering efforts of the Polytechnic's founding fathers to help people to understand the inventions and discoveries that were shaping their lives, not only in the United Kingdom but all over the globe. Today we benefit too from our students working abroad or emigrating, and from the students who come from across the globe to study here.

Indeed, as someone born in India, I was particularly interested to read about the experiences of two gentlemen from that subcontinent who visited the Polytechnic in the 1840s. Jehangeer Nowrojee and Hirjeebhoy Merwanjee were naval architects who visited 309 Regent Street and remarked: 'We have given a very long account of the visits we paid to the Polytechnic Institution because we saw nothing in London, – nothing in England, half so good.'

As I continue to find out more about fascinating areas of research and teaching at the modern University of Westminster, I can endorse fully my fellow countrymen's sentiments.

Lord Paul of Marylebone
Chancellor



Vice-Chancellor's foreword

Reading this comprehensive history of the early years of the University of Westminster's forerunner, the Polytechnic, I noticed immediately several themes that have endured strongly throughout the many years of change to our great institution.

Putting aside the obvious link to the past in our location at 309 Regent Street, I was struck by the fact that from its earliest days the Institution placed great emphasis on showcasing new and innovative technology. It created a community of scientists who were concerned with the practical applications of their science. For instance, the Polytechnic Institution housed Europe's first photographic studio on its roof in 1841. And arguably the world's first permanent 'optical theatre' was also set up at Regent Street, providing a unique combination of projection and illusion.

This popularisation of the applications of science – in the form of lectures and demonstrations to the public – is something that we continue to do today. Indeed, the Polytechnic's mission to make the practical application of science available to as wide an audience as possible can perhaps be seen as the precursor to modern government policies of 'knowledge transfer' between higher education and the local community.

As well as this showcase for new technologies, the Polytechnic Institution pioneered evening classes for young working men and women in London. In 1856 the Institution entered candidates for Society of Arts examinations, the first public examinations to be held in the UK. This drive to widen participation in higher education among non-traditional groups in London and the south east is one that still forms an important part of our mission here at the University of Westminster.

I cannot end this foreword without mentioning the vision of my predecessor as Vice-Chancellor, Dr Geoffrey Copland, in commissioning this history project. He recognised that the story of the Polytechnic is one that up to now has not been fully told. The following account, which is based on research in the University's own archives as well as a range of external sources, throws much new light on this intriguing early period in the Institution's history.

I hope you enjoy reading it as much as I did.

Professor Geoff Petts
Vice-Chancellor and Rector



Acknowledgements

This book grew out of discussions in the autumn of 2004 between Dr Geoffrey Copland CBE, then Vice-Chancellor, Suzanne Enright, Director of Information Systems and Library Services, and me, then University Archivist. The work has been part-funded by the Quintin Hogg Trust, which supports the University of Westminster in furtherance of its educational activities, and by the University itself. Both Geoffrey and Suzanne continued to give active and committed support as members of the History Project Board, which Suzanne chaired.

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The quotation from Jerry White, *London in the Nineteenth Century* (London: Jonathan Cape, 2007) on page *vii* is reprinted with permission of The Random House Group Ltd.

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Finally I should like to thank members of the Magic Lantern Society, whose publications and performances do so much to keep the memory of the Royal Polytechnic Institution alive, for their continued enthusiasm and support.

Any errors which remain are my own.

Brenda Weeden

Conventions

A note on money

Sums of money have been left in imperial currency – pounds, shillings and pence. There were twelve pence in a shilling and twenty shillings in a pound.

Various indexes and tables are available which calculate the relative value of wages and prices at different dates. These need to be used with care, and are for the specialist. Jerry White's advice in *London in the Nineteenth Century* may be followed here: 'I believe readers will not go far wrong if they think of a nineteenth-century pound as equivalent to £100 now. That holds broadly true for the century as a whole.'

Abbreviations used in footnotes

BL British Library

JSA Journal of the Society of Arts

ODNB *The Oxford Dictionary of National Biography*, edited by H.G.C. Matthew and Brian Harrison, 60 vols. (Oxford: Oxford University Press, 2004). The *Dictionary* is also available online at www.oxforddnb.com

TNA The National Archives

UWA The University of Westminster Archive

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Name changes

- 1838 **Polytechnic Institution** opens.
- 1841 **Royal Polytechnic Institution.** Name changes when Prince Albert becomes patron.
- 1859 Royal Polytechnic Institution wound up.
- 1860 **Polytechnic Institution Ltd.** A new company buys 309 Regent Street.
- 1863 **Royal Polytechnic Institution.** Name changes when Prince of Wales (later King Edward VII) becomes patron.
- 1881 Royal Polytechnic Institution wound up.
- 1882 **Young Men's Christian Institute.** The Institute founded by Quintin Hogg moves into 309 Regent Street and gradually becomes known as the Polytechnic.
- 1891 **Regent Street Polytechnic.** The Charity Commission Scheme of Administration establishes the governing body, and begins the transition from private to public institution. Regent Street Polytechnic becomes the official name, but the institution continues to describe itself as 'the Polytechnic'.
- 1970 **Polytechnic of Central London (PCL).** PCL is designated on 1 May 1970 as a result of the White Paper 'A Plan for Polytechnics and Other Colleges' (Cmd 3006) published in 1966. This outlines the arrangements for implementing the government's policy for a dual system of higher education, in which the public and private sectors are divided by the 'binary line'. PCL is the result of a merger of Regent Street Polytechnic with Holborn College of Law, Languages and Commerce.
- 1992 **University of Westminster.** PCL is redesignated the University of Westminster following the Higher and Further Education Act (1992), which created a single funding council, the Higher Education Funding Council for England, and abolished the remaining distinctions between polytechnics and universities.

Prologue

In 1843 the comic journal *Punch* published a characteristically satirical article:

THE PEOPLE'S HAND-BOOK TO THE POLYTECHNIC INSTITUTION

The Polytechnic Institution is founded for the exhibition of objects of art among its curiosities, and occasional objects of nature among its visitors. It is best approached from Regent-street, by the grand postern, outside which are displayed the banners of the establishment. The passage is guarded by a retainer, who lies in ambush upon the right as you enter, and who is empowered to exact the toll of one shilling from all travellers. In exchange for this you receive a bone medal, which is meant to act as a check upon your further progress, until you have undergone a rigid examination by another sentinel upon the left, at the entrance to the HALL OF MANUFACTURES ...

People of weak nerves should venture very cautiously into the Polytechnic Institution. For, at first entrance, there is such a whirlwind of machinery in full action – wonderful things going up, and coming down, and turning round all at once, that the mere view of them, acting through the retina, might well addle the brains of ordinary visitors.

The article goes on to describe the visitor's journey from the Hall of Manufactures into the Great Hall with its variety of exhibits, past the canals and the diving bell, finally coming into the optical theatre on the first floor, where they are 'regaled with microscopes and dissolving views' while listening to a lecturer who is invisible in the darkened room:

At the end ... the lecturer becomes nearly as exhausted as the receivers of his own air-pump, and a band of music supplies his place, to illustrate the dissolving views, or the art of phantasmagoric evaporation; at the conclusion of which the lamps are turned on, the oxyhydrogen turned off, the visitors turned out, their heads somewhat turned round with what they have seen, and the turn-up bedstead of the resident man-of-all-work turned down for his own especial solace and refreshment, as he turns in for the night. And having come to the end of the exhibition, to which we may someday possibly once more allude,

we will ourselves turn to another subject with the hope that we have done a good one to the Polytechnic by thus describing it with such a perfect '*couleur de rose*'.¹

This description captures the energy and excitement in London at the beginning of a new age. The young Queen Victoria came to the throne in 1837, the Polytechnic opened in 1838, and the first issue of *Punch* was published in 1841. During the Queen's long reign, London grew dramatically to become the world's largest city. Its population was growing faster than that of the rest of the country, and the capital dominated national life. It was the centre of government and finance, a major port, and the largest manufacturing city in the country. As the century progressed, Britain emerged as the world's first industrial nation and greatest industrial power.

London's cultural map was also changing as wealth and fashion began to move westwards. The expanding West End became the home to many new places of entertainment in the early part of the century. Exhibitions of all kinds – panoramas, dioramas, waxworks and freak shows – attracted large crowds in search of novelty. Exhibitions attracted more visitors than the theatre, and were widely reported in the press.² Two new exhibition buildings were built in Regent's Park as part of the grand redevelopment of the area in the 1820s. The most spectacular was the Colosseum, a large dome-shaped building designed by Decimus Burton to house an enormous panorama painting of London; its other attractions included fountains and a sculpture gallery. The Diorama, in Park Square East, was modelled on the original in Paris, designed for the display of elaborately lit paintings of architectural and romantic subjects.

In 1832 a new type of exhibition, described as a Gallery of Practical Science, but popularly known as the Adelaide Gallery, opened in the Lowther Arcade off the Strand. The Adelaide gave inventors and engineers – increasingly important to the industrial life of the nation – the opportunity to demonstrate their work in public. It continued to feed the popular taste for visual and pictorial novelty, but its exhibitions were designed to educate as well as to entertain. The Polytechnic was closely modelled on the Adelaide; for a time the two were close rivals, competing for audiences in a volatile market.

Industrialisation – encompassing the emergence of cheap paper, mechanised printing and improved distribution – created an explosion in the number of newspapers, magazines and journals available during the Victorian era. Current estimates reckon that approximately 125,000 new titles directed at diverse sections of an increasingly literate public were produced. Publicity was vital to the Polytechnic, which was dependent for its income on visitors' shillings and needed to use all available means to reach potential audiences. The Polytechnic's innovative use of the contemporary press contributed to its success; the resultant coverage also provides the major source for the history of the Institution. The business records – the minutes, accounts, reports and correspondence which would have shown how it operated from day to day –

1 *Punch*, 1843, p. 91.

2 For a comprehensive review, see Richard D. Altick, *The Shows of London: a Panoramic History of Exhibitions, 1600–1862* (Cambridge MA: Harvard University Press, 1978).

have disappeared almost entirely. Isolated survivals of the Polytechnic's own publicity material – programmes and catalogues, posters and handbills – have become widely dispersed. Without the evidence from the press, this account could not have been written.

There are limitations in being so dependent on a single source. At its best – as in the passage from *Punch* – contemporary journalism enables us to see how the Polytechnic appeared to Victorian eyes. Some reviews, however, are bland and uncritical, suggesting a heavy reliance on the Institution's own press releases. John Henry Pepper, who dominated the management of the Polytechnic during the 1850s and 1860s, was particularly skilful in his handling of the press. In reading about the Polytechnic in his time in particular, we sometimes feel manipulated, seeing what he intended us to see, and there is no alternative means of finding out what was going on behind the scenes.

Children loved the Polytechnic from its earliest days, and by the 1860s there were journalists who recalled their own happy memories when sent to report on events in Regent Street. A reporter in *Fun* (Victorian journalism is almost invariably anonymous) in November 1870 began his story like this:

At the Polytechnic! 'Tis Monday evening, and I stand upon the pavement of Regent-street, gazing with all my eyes on the building which contains those wonderful triumphs of science and ingenuity, the diving-bell and the Zoëtrope, the dissolving views and the doubling-up perambulator. Yes, I gaze, and visions long since hidden in the past rise before me. Again I am a boy – a young boy – being led by one now long departed, to be electrified, horrified and charmed; years seem swept away by the magic of remembrance; I am no longer the heavy browed and bearded special, but resume once more the delicate frame and wistful eyes which distinguished me in days of yore.³

Such nostalgia helps to explain why some reporting remains benign even during the final troubled years.

Working through even a small sample of the mass of Victorian newspapers and periodicals by traditional means is slow and painstaking work, but twenty-first-century technology is beginning to revolutionise the process. *The Times Digital Archive* proved an invaluable resource for the preparation of this book. Searching for the Polytechnic revealed how regularly the Institution advertised on the front page of *The Times*, and the resultant details of attractions helped fill the many gaps in the surviving series of catalogues and programmes; it also brought to light further references in reviews, articles and correspondence. But some more unexpected hits also contributed to the growing picture. Many other advertisers, including local businesses such as J. Sparkes Hall, the royal boot-maker, at 308 Regent Street, defined their location in relation to the Polytechnic. When the Metropolitan Railway opened in 1886, it set up a 'special omnibus' link with 'Regent-circus station' (later renamed Oxford Circus) described as 'opposite the Polytechnic', revealing what a well-known landmark the Institution rapidly became.⁴ As more

³ *Fun*, 3 December 1870, p. 223.

⁴ *The Times*, 15 December 1866, p. 4.

such searchable resources become available on-line, further evidence should be discovered to increase our understanding of the role which the Institution occupied in the life of the capital.

Polytechnic activities which did not attract the attention of the press remain largely hidden from view. These include its innovative experiments in education. The flamboyant Pepper frequently appeared in the pages of the press, especially after the appearance of his famous ‘ghost illusion’, but his work in establishing evening classes for working men and women goes largely unreported.

The lack of easily accessible sources helps to explain why the Royal Polytechnic Institution has received little attention from historians, and also why there are many unanswered questions in the following account. This book represents the first attempt to tell the story from its opening in August 1838 to its closure at the end of 1881. The first decade was one of success and rapid growth, marked by expansion when the new theatre was added to the building in 1848. The opening of the theatre was followed by the arrival of the scientist and showman John Henry Pepper; he became sole manager of the Institution in 1854, but left in 1858 when this arrangement broke down. The story nearly comes to an abrupt end in 1859, when the aftermath of a fatal accident inside 309 Regent Street forced the Institution out of business. After a precarious period a rescue was achieved, and the Polytechnic reopened under new management in November 1860. Within a year Pepper was back in charge, and the 1860s saw the growth of the most spectacular of Polytechnic shows. When Pepper finally departed in 1872, the lectures and entertainments continued as usual, but there was growing dissension behind the scenes. This time no rescue was forthcoming, and the Royal Polytechnic closed its doors in 1881. The building was bought by the businessman and philanthropist Quintin Hogg, and the history of the Polytechnic began to move in a new direction.

The most influential historical view of the Royal Polytechnic has been that advanced by Richard Altick in his monumental work *The Shows of London: a Panoramic History of Exhibitions, 1600–1862*, published in 1978. Altick argued that the Polytechnic, like its predecessor the Adelaide, was bound to fail because it could not combine its lofty ideals with its need to generate sufficient income; science would have to be sacrificed to profit and education to entertainment. Ultimately this view is indisputable because the Polytechnic was bankrupt by 1881. Nevertheless, for most of its life-time – the Institution survived for much longer than its main competitors – the argument can be reversed. The Polytechnic was remarkably – even surprisingly – successful in a difficult environment because it knew its business, it appealed to a variety of audiences, and it was prepared to adapt to changes in public taste without abandoning its original vision. When the Polytechnic was at its best, education and entertainment were fused.

Such was the public affection for the Institution that its name lived on. Quintin Hogg bought 309 Regent Street as a home for the Young Men’s

Christian Institute, which very soon became popularly known as the Polytechnic. With the advent of the first public funding in 1891, the name changed to Regent Street Polytechnic to distinguish it from other London polytechnics founded on Hogg's model. The name had entered the educational system and continued in use for the next hundred years, until all polytechnics became universities in 1992.

There is a world of difference between the Royal Polytechnic Institution and the University of Westminster, but there are intriguing continuities between the two. There is much to celebrate, and much more to discover, in the history of the University. If this introductory account encourages others to explore further, it will have achieved its aim.

The beginning

THE POLYTECHNIC VISION

When the Polytechnic Institution at 309 Regent Street opened its doors in August 1838, first to ‘supporters of science’ for a private view on Friday 3 August, and then to paying visitors on Monday 6 August, *The Times* reported the event and hoped that ‘the establishment will merit and receive the support of the public’.¹ All those involved in the opening – directors, shareholders, exhibitors and staff – would have shared in that hope, because the new Institution was entering a competitive market and its success would depend on its ability to attract sufficient numbers of that public through its doors.

The Polytechnic’s aim was to help its visitors to understand the inventions and discoveries which were changing their lives, their city and their society; it planned to achieve that aim through display and demonstration. This philosophy is expressed in the following extract from an early catalogue, which also illustrates that the Polytechnic intended to encompass both science and the arts:

The education of the eye is, undeniably, the most important object in elementary instruction. A child will pass many years before he can be made thoroughly to understand, by *unassisted* description, the cause of motion in a Steam Engine, but a brief acquaintance with the sectional and working models of the Institution will teach him a lesson he can never forget. In like manner, the powers of Galvanism, the properties of Electricity, the mysteries of Chemistry, the laws of Mechanics, the theory of Light, the developments of the Microscope, the wonders of Optics, the beauty of Sculpture, the construction of Ships, with various other matters in Science and Art, are made palpable by exhibition; and thus instruction is rapidly and pleasurably communicated in awakening curiosity, excitement and attention, and by such means leaving behind a valuable and durable impression.

But in offering facilities for obtaining that knowledge which Lord Bacon has justly denominated ‘power’, the Directors of the Polytechnic Institution have not been unmindful of the inducement which a path of flowers opens to its acquisition. They have, therefore, surrounded the visitor with much to delight as well as to instruct.²

1 *The Times*, 3 August 1838, p. 6.

2 UWA RPI R45/7, pp. 5–6.

As well as instructing and delighting the general visitor, the Polytechnic intended also to provide 'a convenient place of social resort for the lovers of Practical Science'.³ The term 'scientist' was a new one, introduced by William Whewell at the annual meeting of the British Association for the Advancement of Science in 1833. 'Practical scientists' – instrument-makers, experimenters, mechanics – were different from the gentlemen 'natural philosophers' of the previous generation. The Polytechnic encouraged inventors to display and promote their work, and provided equipment, laboratory space, advice and instruction (at a price) for anybody who needed them. Its aim was both to showcase new technologies and to help these first professionals to make a living from science.



Fig. 1

This engraving accompanied an early press report about the new Polytechnic. The statue of Minerva above the pediment was by Edward George Papworth. It disappeared when the front of the building was demolished in 1910.

3 UWA RPI R9, p. 1.

Responses to the opening were encouraging; the *Mirror of Literature* published an engraving of the building's façade, accompanied by a detailed description of the various exhibits. Its report ended:

The Institution was opened to the public on Monday, August 6th, 1838, since which time it has been visited by vast numbers of persons, it being found an intellectual treat.

It would be idle to dwell on the importance of an Institution of this kind and magnitude; its vast utility being so universally acknowledged. There is sufficient room in London for two establishments; the above and the Adelaide Gallery; the situations, too, are so wide apart that it is not likely their interests can clash; and if they should do so, in a small degree, it must urge them to greater exertions.⁴

The 'vast number' of visitors continued, and the Polytechnic embarked on a decade of remarkable success, culminating in a major expansion ten years after the opening. This success resulted from careful planning; the central location, the purpose-designed building, the range and variety of the exhibits and the expertise of the staff all contributed. But the journey from inception to opening had been fraught with difficulties. The directors presumably presented a united front as they welcomed press and invited visitors and the public into the splendid new building. All appeared well on the surface, but behind the scenes the future of the Polytechnic was by no means secure. Major issues of ownership and management remained to be resolved, and there was considerable tension between the directors. Exceptionally, enough archival evidence, in the form of papers held by the Polytechnic solicitors, has survived to throw some light on the process by which the Institution was established.⁵

FOUNDATION

The name of the distinguished inventor Sir George Cayley has been most frequently associated with the early Polytechnic, but in fact it owed its foundation to three men. The contributions of Charles Payne and William Mountford Nurse need to be acknowledged together with that of Cayley.

The idea for the new Institution came from Charles Payne. Very little is known about him, except that he was the manager of the innovative Adelaide Gallery, the model for the Polytechnic. The success of the Adelaide – it attracted 80,375 paying visitors in 1835 – prompted Payne to develop plans to reach a wider audience by opening a larger gallery in the West End. Early in 1837 a site became available which was so ideal for his purpose that Payne resigned from his post to devote himself to putting his plans into practice.

The property for sale was Lord Bentinck's mansion house at 5 Cavendish Square. Payne saw the potential not just of the house but also of the stable block behind it. A gallery built on part of this site (which occupied the space

4 *Mirror of Literature, Amusement, and Instruction*, 1 September 1838, p. 1.

5 UWA RPI R9–R39.

between nos. 295 and 311) would have an entrance in Regent Street, newly developed by the architect John Nash for the Crown Estates. The opportunity to acquire a fashionable location, in the same area as such popular visitor attractions as the Colosseum and the Diorama, was too good to miss.

Payne prepared a design for the proposed building and a business plan for the new gallery, but he did not have the resources to finance the scheme himself. He planned to raise the capital by forming a company and selling shares, but this proved too slow and he was in danger of losing the property. He did however attract the interest of William Mountford Nurse, who lived during this period at 5 Langham Place, very close to the proposed site. Nurse is also a shadowy figure. He was described as a 'speculative builder', and had certainly profited by his involvement in the Regent's Park developments, being responsible for Cumberland Terrace and other properties.

It soon became clear that Nurse did not intend to be a sleeping partner. His enthusiasm for Payne's scheme was such that he not only bought the lease on the property himself, but offered to begin constructing the gallery, which he would sell to the company when it was formed. Payne had no option but to accept this arrangement. Building at 309 Regent Street started in the spring of 1837. The main structure was completed by the end of the year. Nurse employed James Thomson, his architect from the Regent's Park developments, to design the building along the lines suggested by Payne.⁶

Payne continued with his efforts to form the company, which he hoped would employ him as manager. His chances of success were greatly improved in the summer of 1837 when he secured the support of Sir George Cayley. Both men had been involved in setting up the Adelaide Gallery. Cayley agreed to be chair of the provisional committee, taking on the task of setting



Fig. 2

Part of the arcaded stable block seen behind the carriage belonged to 5 Cavendish Square and became the site of the Polytechnic. All Souls' Church was opened in 1824.

6 Campbell Dodgson, 'James Thomson (1800–1883)', rev. by M. Slocombe, *ODNB*.

Fig. 3
Sir George Cayley, chairman of
the Polytechnic Institution.



up the company which would own and manage the new Institution. As a landed gentleman Cayley had no need to earn his own living, but nevertheless his interests and sympathies were much more with the ‘practical men of science’ than with the scientific élite.

Sir George Cayley, sixth baronet, divided his time between his family estates at Brompton near Scarborough in north Yorkshire and his town house at 20 Hertford Street, Mayfair. Widely described as a man of shyness and charm, he took his responsibilities seriously but was a somewhat reluctant public figure, serving only briefly as MP for Scarborough from 1832 to 1834. He spent his long life experimenting, building machines and applying his remarkable combination of scientific imagination and mechanical ability to a range of practical problems. His early work on aerial navigation, culminating in a two-part paper published in *Nicholson’s Journal* in 1809–10, means that his

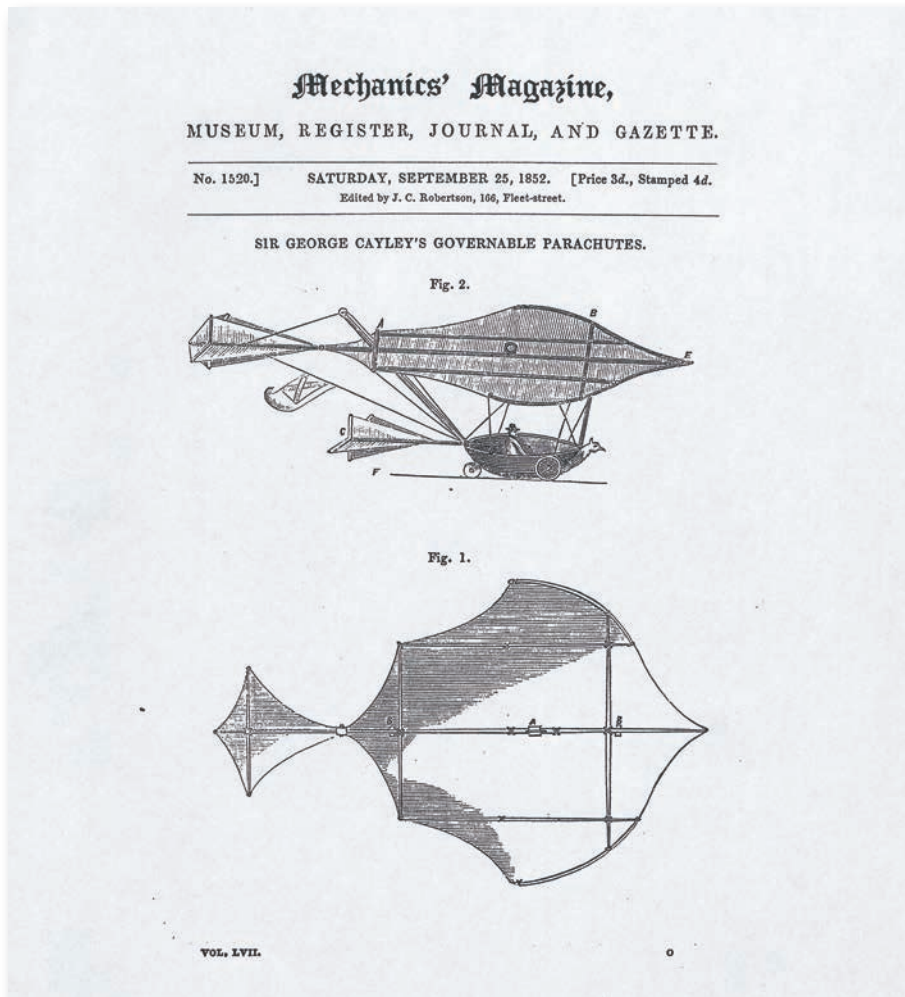


Fig. 4

These designs for gliders accompanied an article by Cayley. There is a famous but possibly apocryphal story that Cayley's coachman made a short flight in a glider at Brompton in the 1850s.

reputation as the founder of aeronautics is now assured.⁷ Cayley spent much of his time in his workshop at Brompton, keeping in touch with his wide range of scientific contacts by letter.

Cayley had also helped to found a number of societies for the promotion and dissemination of science. He was president of the York Mechanics' Institute from its foundation in 1827 and from that date he published his scientific articles in the *Mechanics' Magazine*. He became a founder member of the British Association for the Advancement of Science when it first met in York in 1831. He described his vision for the Polytechnic in a letter to his friend Charles Babbage in November 1839:

We have laid out a good round sum of money & the place by its laboratory, its theatre and its splendid Gallery is well adapted for the display of scientific discoveries & were it truly in scientific hands, so that scientific discoveries were thrown off here hot from the brain & before they had become public property by publication, sufficient novelty would be produced to excite public attention & to make it pay.⁸

⁷ For a recent scientific assessment, see J.A.D. Ackroyd, 'Sir George Cayley, the Father of Aeronautics, Part 1: The Invention of the Aeroplane' and 'Part 2: Cayley's Aeroplanes', *Notes & Records of the Royal Society of London*, 56 (2002), pp. 167–181, 333–348.

⁸ British Library Department of Manuscripts, Babbage Correspondence, Add 37191 F271.

The first problem which faced Cayley was that in the 1830s, before the development of the joint stock legislation, there was no easy route to forming a company. The Polytechnic shareholders wanted to limit their liability while retaining their right to distribute any profits as dividend. This gave the Polytechnic an anomalous status somewhere between a scientific institution and a trading company, and it took some time and a great deal of legal advice before an appropriate mechanism for regulating the company's affairs could be found. Finally Cayley applied for a royal charter of incorporation, which was granted on 23 August 1838, two weeks after the Polytechnic had opened to the public.

By the time the company was in a position to buy the lease and the property from Nurse, the complex financial arrangements gave rise to a series of bitterly contested disputes which were not finally settled until the end of 1839. At a meeting in December, ownership of the Polytechnic formally passed to the shareholders, and the first board of directors was elected. Cayley remained as chairman and the other five members of the provisional committee – James Alexander, Alexander Gordon, Renn Hampden, Thomas Moody and William Carpenter Rowe – became directors. Three new directors were added to the board, one of whom was William Mountford Nurse, the largest shareholder.

Cayley was concerned that Nurse's controlling interest was a threat to the scientific purposes of the Polytechnic. A letter to Charles Babbage shows how strained relations between the two men had become:

I write to you in confidence upon the subject of our Polytechnic Institution which is now in the crisis of its fate. There is to be a meeting of the proprietors on or about the 3rd of Dec. which will take place in the same house, 5 Cavendish Square. Mr Nurse, the great Builder furnished the largest half of the capital & he & his friends (all for money, with science only the means), will have the main say at such a meeting.⁹

It is tempting, but perhaps too neat, to see Cayley and Nurse as opposites, representing the tension between science and profit which runs through the history of the Institution. Nurse certainly made a profit from his speculation on the building – the directors guessed of about £5,000 to £6,000 – but without him it might never have been built. He had been elected to membership of the Society for the Encouragement of Arts, Manufactures and Commerce (now the Royal Society of Arts) in 1812, and there is no hard evidence to suggest that he was not in sympathy with the Polytechnic's objectives. He did however use his power to dismiss Charles Payne from the position of secretary and appoint his own brother-in-law, Robert Longbottom, to the post.

Payne paid a heavy price for his deteriorating relationship with Nurse, failing to secure his own future in spite of the major role he had played in establishing the Institution. His replacement, Robert Longbottom, in fact became an active and successful secretary. He remained at the Polytechnic after Nurse's death in 1855, and became managing director at the end of

⁹ British Library Department of Manuscripts, Babbage Correspondence, Add 37191 F271.

1858. In later years, Nurse always claimed to have founded the Institution himself. Cayley was more gracious, recognising Payne as originator of both the Adelaide and the Polytechnic.

THE POLYTECHNIC BUILDING

The new gallery was built onto the back of the existing house at 5 Cavendish Square in the west, and opened onto Regent Street in the east. Its layout was designed to reflect the purposes of the building. Paying visitors came in through the 'handsome architectural entrance' of 309 Regent Street into a large foyer, which formed the first exhibition space and was known as the Hall of Manufactures. They immediately encountered the barrage of sights and sounds which *Punch* was concerned would 'addle the brains'. A wide variety of manufacturing processes were demonstrated by 'operatives' working at their machines; these included weaving on a power loom driven by Lord Dundonald's steam engine, the making of glass and of optical instruments, and also of coloured wax figures, busts, fruit and flowers by means of Corotti's 'curious process'. Mrs Corotti, meanwhile, made flowers, fruits and vegetables out of rice paper. Presumably these were among the many items visitors could buy as souvenirs of their visit to the Polytechnic.

Steam engines powered a variety of working models and machines throughout the building. By 1844, according to the catalogue for that year, a group of models 'on the elliptic counter' in the Great Hall were put in motion as follows:

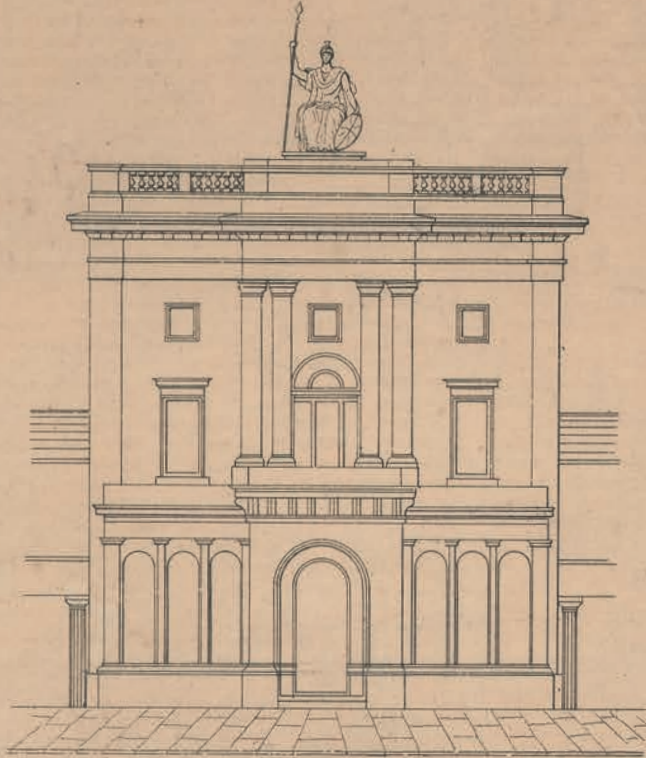
An air-pump of nine inches diameter, and a nine-inch stroke, is attached by a rod to the beam of the steam engine in the Hall of Manufactures, and a pipe is appended to it, and continues onwards to the under side of the counter, where it enters into the side of a strong wrought iron box, which is called the vacuum chamber. By the reciprocating motion of the engine a partial vacuum is formed, equal to about 8 lbs. or 10lbs. on the inch. This vacuum box is merely to keep a steady motion on the small models that work from it; as without it a jumping motion would be given at every stroke of the engine. From this box a pipe is attached which passes under the counter, and each model intended to be worked has a separate supply-pipe from it, furnished with a stop-cock to regulate the speed of the model.

This mode is adopted as a moving power for the models sent to the Institution, as great difficulty would be found in keeping the joints steam-tight in such miniature representations; also the escape of steam would much injure the models entrusted to the care of the Institution. The present method is cleanly, and in no way injurious.¹⁰

In the Polytechnic the visitors came very close to working machines, enabling them to glimpse the new industrial environment at first hand.

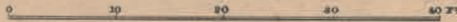
Fig. 5, facing page
*Elevation, section and floor plan
of the Polytechnic Institution
from the Civil Engineer and
Architects' Journal, 1840.*

*The Polytechnic Institution,
Regent Street.*

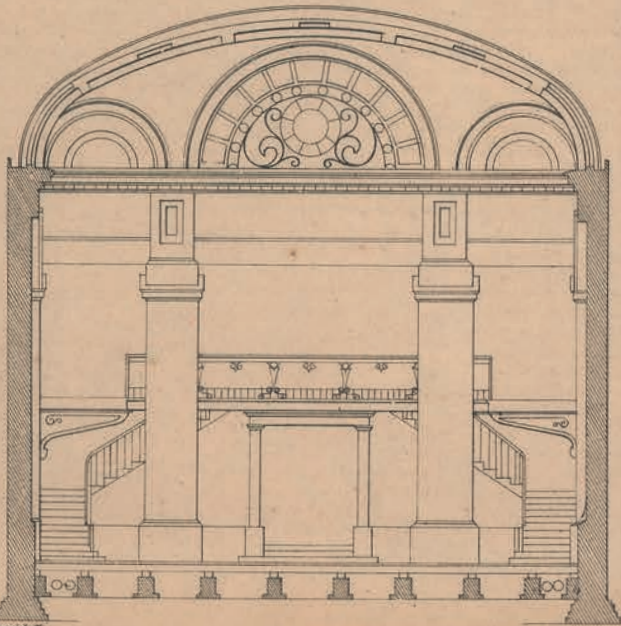


Depth... 320 Ft
Height... 40 Ft
Width... 44 Ft

ELEVATION



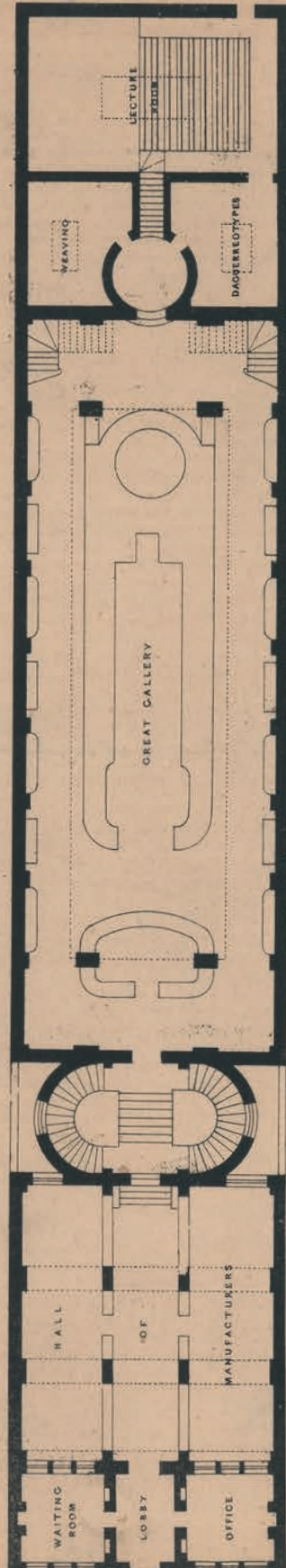
TRANSVERSE SECTION OF THE GREAT GALLERY



Length... 120 Ft
Width... 40 Ft
Height... 36 Ft

J. R. Johnson Litho. Worcester Ct

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From the Hall of Manufactures visitors moved into the heart of the building, the Great Hall. Surviving illustrations show how closely the interior was modelled on the Adelaide, though on a much grander scale. The hall was 120 feet long, 40 feet wide and 40 feet high (37 × 12 × 12 m), top lit by glass panels in the curved roof. A balcony ran around the room. There were built-in glass cases and display shelves on both levels.

The Great Hall was originally designed to provide the setting for demonstrating aspects of the shipping industry which underpinned Britain's growing commercial, industrial and naval power. Two canals were built into the floor, together with a model dockyard and a series of locks and waterwheels. At the junction of the canals was a large circular tank of water. A diving bell manufactured by Cottam & Hallen, a local firm of ironmongers, for the considerable sum of £400 was installed over the tank.¹¹ A diver in full diving dress was to work alongside the bell, demonstrating his ability to work underwater. Diving technology had come to the attention of Londoners during the protracted and dangerous engineering project by the French engineer Marc Brunel and his son Isambard to build the first tunnel under the Thames. Isambard went down in a diving bell to repair the tunnel after the disastrous flooding of 1827. The Polytechnic not only demonstrated the uses of diving, but also gave visitors the opportunity to be submerged in the bell. The diving bell embodied the Institution's mission to educate and instruct, and it became the most enduring symbol of the Polytechnic in the public mind.

Above the Hall of Manufactures on the first floor was a lecture theatre which seated 500 people. Payne commissioned an oxyhydrogen microscope for the lecture theatre from the firm of Cary & Cooper. The demonstration of their first machine, in 1833, had attracted a great deal of attention in the scientific world. The Polytechnic claimed its new microscope was the largest ever constructed. The magnified images, illuminated by the brilliant oxyhydrogen light, were projected onto a screen with an area of 425 square feet (39 sq m). The microscope was increasingly regarded as essential equipment for providing the dramatic illustrations for science lectures which the public relished. A perennial favourite was the magnified contents of a glass of London water. Two Indian visitors wrote of their amazement when they saw 'the hundreds of monsters of *horrid* shapes in a *drop of water* magnified so as to appear several feet long, and to see a flea made to look as large almost as an Elephant'.¹²

The Hall of Manufactures, the Great Hall and the theatre were the major public areas in the new building, though there were a number of smaller rooms which could be used for exhibits, demonstrations or classes. In the basement was a laboratory 'particularly adapted to private experimentalists and patentees' which was available for hire. It is not clear to what extent this was a public space.

The mansion house at 5 Cavendish Square was not open to the general public at first, though later some of its rooms were used for exhibitions. There was a plan to use the house to provide a reading room, library and meeting space for a club or society associated with the Institution, called the Polytechnic

Fig. 6, facing page
The lithographer G.J. Cox, who was based in the Polytechnic from 1838 to 1881, published a number of prints of the interior and exterior of the building. This view of the Great Hall dates from the early 1840s.

- 11 For a more detailed study, see Michael Fardell, 'Entertainment and Education: Alternative Uses for Divers and the Diving Bell in Nineteenth Century England', *International Journal of Diving History*, 1 (2005), pp. 38–56.
- 12 Jehangeer Nowrojee and Hirjeebhoj Merwanjee, *Journal of a Residence of Two Years and a Half in Great Britain* (London: Allen, 1841), p. 125.



ROYAL POLYTECHNIC INSTITUTION.
GREAT HALL.

Printed & Published at C. J. Cox's Litho Establishment, Royal Polytechnic Institution 309, Regent St. London.

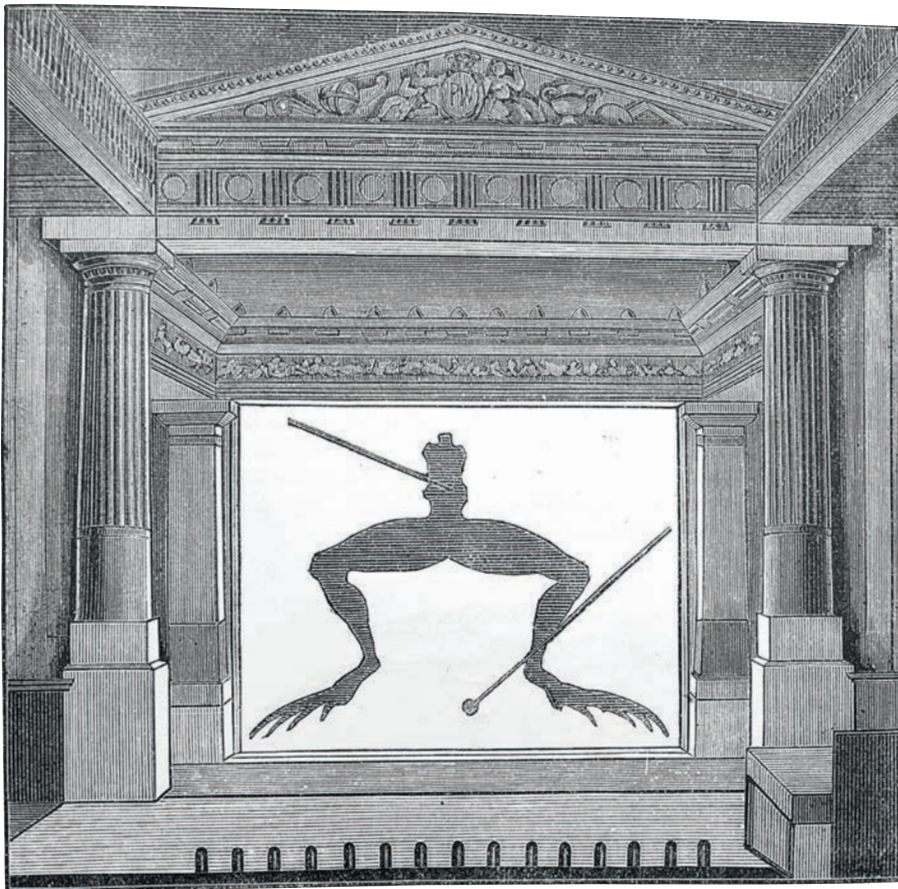


Fig. 7
Pepper's drawing of Galvani's experiment with the nerves and muscles of a dead frog shows the impact of magnified objects projected by the oxyhydrogen microscope (see Fig. 8) onto the screen at the Polytechnic.

Association. Very little information has been found about the Association, which was founded in the early 1840s but disappeared after a few years. Directors, shareholders and annual subscribers could enter the gallery through the private entrance from the house rather than from the public entrance in Regent Street.

POLYTECHNIC FINANCE

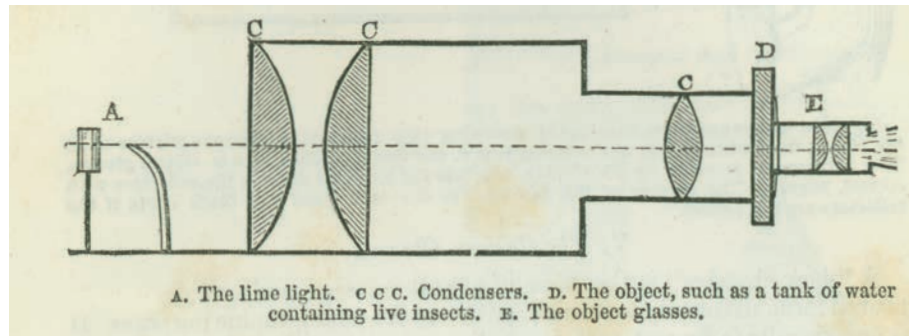
Payne had originally estimated that capital of £20,000 would be needed to found the Institution. The final cost was £35,000, which was raised from the sale of 350 shares at £100. The building cost around £15,000, with several thousand more invested in equipment.

Some brief calculations surviving from April 1837 show how Payne had planned to balance the books.¹³ Based on his experience of visitor figures at the Adelaide, he anticipated an average of three hundred visitors a day for 307 days a year. The main source of income would be entrance fees paid by visitors. This was one shilling throughout the life of the Polytechnic, the standard price for London exhibitions. An additional charge of one shilling was made for a descent in the diving bell, and sometimes also for entrance to particular lectures or exhibitions.

Shareholders' privileges included free admission for family and friends.

13 UWA RPI R22a.

Fig. 8
 Diagram of an oxyhydrogen
 microscope. The piece of lime (A)
 burned in a flame of combined
 hydrogen and oxygen to produce
 a brilliant light.



Regular visitors could purchase an annual subscription, either just to the public areas in the Institution, or to the Institution and Reading Rooms at 5 Cavendish Square. Additional income was expected from the sale of catalogues – which also cost one shilling – and from renting out the theatre and the laboratory.

The largest projected annual expenditure was on staff. The total number of staff is unknown, but at the beginning the Polytechnic had a manager, a secretary and a ‘money-taker’. There were also lecturers, a housekeeper, gallery attendants, porters and domestic servants. Anticipated running costs included a significant amount allocated to printing and advertising. The Polytechnic also incurred legal expenses; patent law (like company law) was undeveloped in the first half of the nineteenth century, and disputes arose over inventors’ conflicting claims.

No figures have been found to show how accurate these forecasts turned out to be in practice, but the expansion of the Polytechnic in the first decade must mean visitor figures far exceeded initial expectations. There was speculation in the press that the diving bell had proved a gold mine for the Polytechnic, realising £1,000 in the first year alone. One journalist worked out that this meant an average of 385 visitors paying an additional shilling to be submerged every week.¹⁴ Other sources of income remain problematic. The financial relationship between the Institution and its various exhibitors is unknown. Most exhibits were deposited free of charge, but who paid the glass-blowers and the men who worked the printing presses and other machines demonstrated in the Hall of Manufactures?

Some independent tradesmen were based inside the Polytechnic building. George Cox, a lithographer, was in the Great Hall throughout the life of the Institution, taking printing orders from the Polytechnic as well as other customers. C.W. Collins, a scientific instrument-maker, arrived in 1840. Collins manufactured and sold microscopes, lanterns and other instruments to external customers, and also worked very closely with the Polytechnic staff, building and maintaining equipment to meet their increasingly specialist specifications. The most successful business to share the premises was Richard Beard’s photographic studio, which opened on the roof of the building in 1841. Its income was reckoned to be as high as £150 a day. It is not known whether the Institution itself shared in the profits.

¹⁴ *Cleaves Penny Gazette of Variety and Amusement*, 7 May 1842, p. 238.

Figs. 9-11

The diver and the diving bell were widely illustrated in the press during the early years of the Polytechnic. The drawing of the interior (Fig. 9) shows the knocker or 'panic button' that unhappy visitors could use to cut short their descent.

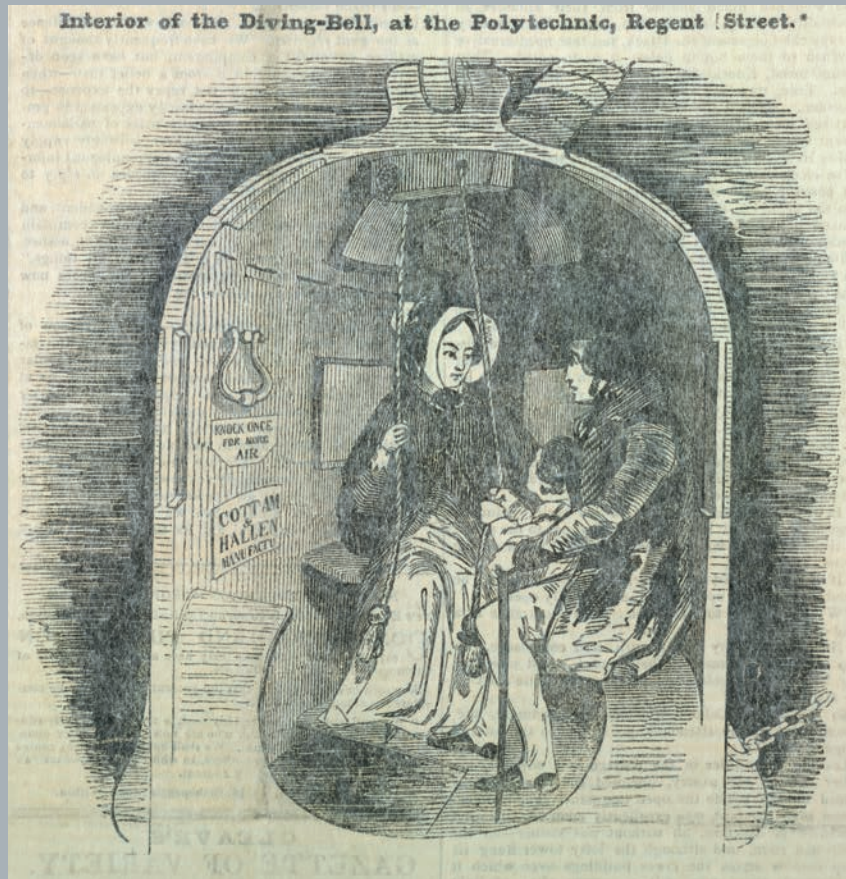


Fig. 9

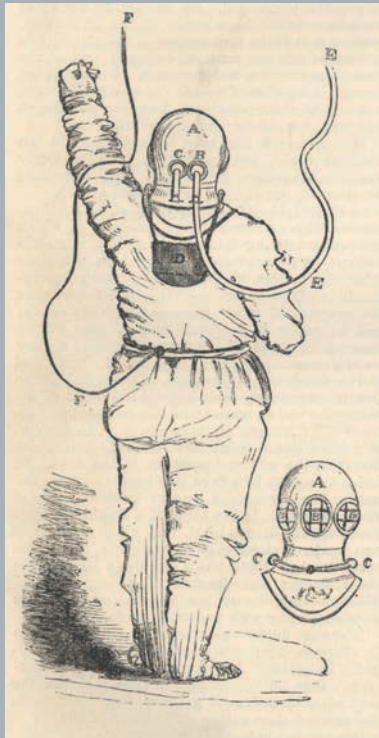


Fig. 10

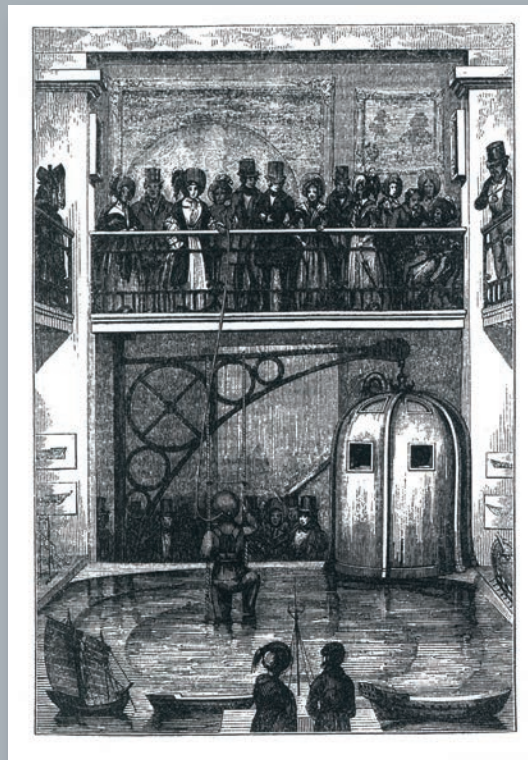


Fig. 11

Fig. 12, facing page
In the second poem about the diver, 'Moses' refers to a popular tailor and 'Deane' to Charles and John Deane, inventors of diving equipment.

We must refer our friends to the next number, in order that they may learn what steps Mr. Muff took to retrieve his losses, and how he succeeded—the minute anatomy of which speculation we shall also lay open, with any admonition we may think it advisable to give.

POLYTECHNIC POETRY.

We have received numerous letters calling our attention to the effusions of some highly mechanical bard, who has found in the Tank at the Polytechnic another Hippocrene. After much labour and enquiry, we have succeeded in procuring two specimens of these unique lyrics, with which we generously present our readers:—

No. I.

THE SONG OF THE BELL, (NOT SCHILLER'S).

Air—*The deep, deep Sea.*



THE BELL OF THE BALL-ROOM.

Oh! come with me, Miss Brown,
Perch yourself upon the plank,
And we'll dive a fathom down
In the deep, deep tank.
In the deep, deep tank,
In the deep, deep tank.

There are seats enough to spare,
No rough waves your nerves to shock;
And should you want more air,
You must give "a double knock."
And gold and silver fish
You'll encounter on your way;
With pieces of the ship,
That is blown up thrice a day.
Then come with me, &c.

Ah! how can young sweethearts lounge,
In the galleries above;
When a shilling makes them plunge
"Over head and ears" in love.
Should you not my suit repel,
When in air again we swing,
On emerging from the bell
I may treat you to a "ring."
Then come with me, &c.

No. II.

HE WORE A SUIT OF MOSES'.

(One of 'diver's' lays.)

Air of course anticipated by the title, so there is no occasion to put it.

He wore a suit of Moses',
When first at morn we met;
'Twas ten o'clock—the visitors
Had not assembled yet.
His high-lows were eight shilling ones,
His voice assumed the tone
Of one to whom both wet and colds
Were intimately known.
I saw him just, yet back again
My mind his image brings,
As he swept the upper gallery,
And dusted the queer things.

A dress of Deane's tight mackintosh,
When next we met, he wore;
He sought the bottom of the tank,
And walked about the floor.

His head assumed a goblin form
That might young children scare—
He seized the little "Royal George,"
And placed some powder there.
I saw him but an instant,
Then I closed my eyes and ears,
For Colonel Pasley's batteries
Aroused my keenest fears.

And once again I saw his shape
When rising from the tank;
He climbed the ladder dripping wet—
His hair was dank and lank.
But when at last he was assured
That there was no one near,
He shrunk behind the air-pump stand,
And took a drain of beer.
I mark'd him but a moment,
Yet again I see him quaff,
(Rejoicing that his dive was done,)
That pint of half-and-half.

Fashionable Intelligence.

ARRANGEMENTS FOR THE WEEK.

MONDAY.—Mr. Snob's *soirée cigarique*, or smoking party, at his chambers in Pump-court.

TUESDAY.—Mr. Jones's *tripe réunion*, at Whetstone Park.

WEDNESDAY.—Mr. Baron Nathan's last ball at Kennington. It is particularly requested that the ticket entitling the holder to a sandwich may be given up when the sandwich is delivered.

THURSDAY.—Mr. Seedy's *petite diner* at Cann's soup establishment.

FRIDAY.—Duke Humphry's grand entertainment in Red Lion-square.

SATURDAY.—A public breakfast under the Piazzas at Covent-garden. Coffee will be on table at half-past three, A.M., precisely.

FURTHER ARRANGEMENTS.

MONDAY WEEK.—We understand that this day has been selected for the long talked of marriage between Dashwold Diaper, Esquire, of Waterloo House, (and Miss Susannah Simper, one of the lovely and accomplished young ladies of the same fashionable establishment. We have been favoured with a sight of the *trousseau*, which comprises a tasteful selection from the last year's stock of soiled and damaged articles. The bride will be given away by the cashier, and as the present is the busiest part of the season, the happy couple are expected to spend the whole of the honeymoon behind the counter.

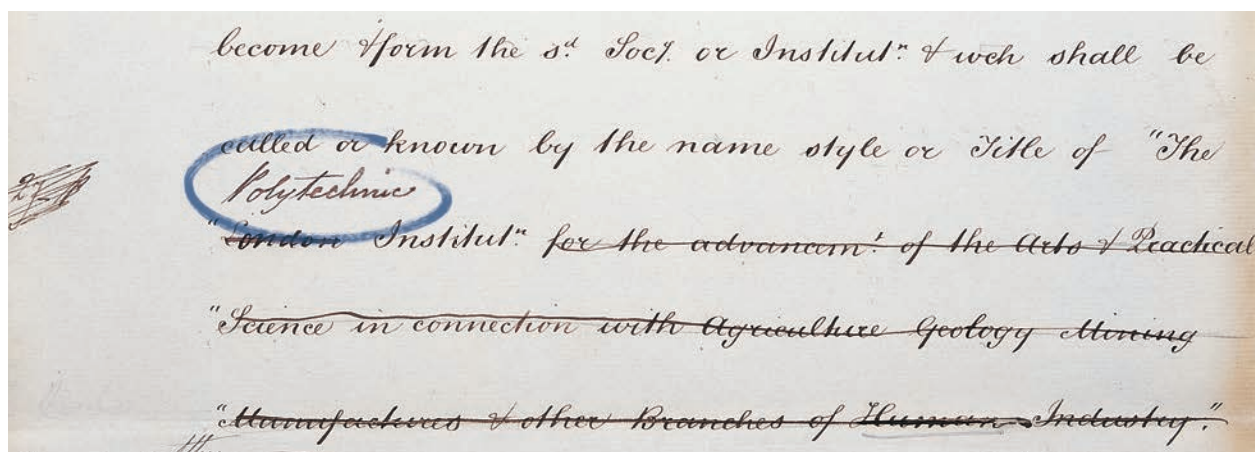
PUBLIC IMPROVEMENTS.

We have heard a whisper of a party of antiquarians having associated for the patriotic purpose of purchasing Aldgate Pump, with a view to bringing out an illuminated history of that well-known but somewhat unappreciated object. The Pump itself appears externally nothing remarkable; but antiquarian research, it is expected, will invest it with startling interest. The spout, when properly inspected and regarded in the most striking point of view, is capable of throwing a light on many important points of civic history; and there is no doubt that if the subject is carefully worked out, and elaborated with that patience which antiquarians know so well how to bestow, the topic will be one of rather an exciting character. It is to be hoped that the corporation to whom the Pump belongs will place no obstacle in the way of this great national design, which may be greatly damped if any handle is made use of for throwing cold water upon the zeal of the parties alluded to.



SECURING A HAPPY OLD AGE.

"It's a saving of one-half," as the toper said when his wife died.
"I shall soon get round again," as the earth said to the sun on the 1st of January.



These questions cannot be answered, but the new and increasingly complex business was apparently in profit, because in these early years the shareholders received dividends close to the anticipated 6 per cent.¹⁵

THE POLYTECHNIC NAME

The Polytechnic name – short, fit for purpose and memorable – must surely be counted among its assets, but it did not appear until quite late in the foundation process. A number of working titles are used in early documents. The first prospectus issued by Cayley to attract shareholders in December 1837 referred to '[the] Institution for the Advancement of the Arts and Practical Science, especially in connexion with Agriculture, Manufactures and other Branches of Industry'.¹⁶ In April 1838 an even longer version appeared in a draft legal document, but it has been struck through and 'Polytechnic' inserted in its place.¹⁷

The word derives from the Greek, and may be translated as 'skilled in many arts'. The name was widely used across continental Europe, notably by the élite military engineering school the Ecole Polytechnique, founded in Paris in 1795. Its first use in England was by the Royal Cornwall Polytechnic Society, founded in Falmouth in 1833. The Society was established by the Fox family, Quakers with shipping, mining and industrial interests in the area, 'to stimulate the ingenuity of the young, to promote industrious habits among the working classes, and to elicit the inventive powers of the community at large'.¹⁸ In 2008, the Society still functions as an arts centre and gallery called 'The Poly'.

The Geological and Polytechnic Society of the West Riding of Yorkshire (now the Yorkshire Geological Society) was founded in 1837, and the Liverpool Polytechnic Society 'for the encouragement of the useful arts and of inventions' in October 1838. It was wound up in 1898. These examples make it clear that 'polytechnic' was emerging as a recognisable label to describe a range of related activities. The Polytechnic Institution in Regent Street was the largest and most ambitious of these undertakings, and the one that reached out to the widest public.

Fig. 13

The first known use of the name 'Polytechnic' has been circled in this document.

15 Royal Aeronautical Society Library, Cayley Papers: correspondence between Sievier and Cayley contains references to good dividends.

16 UWA RPI R9.

17 UWA RPI R15b, p. 2.

18 *Royal Cornwall Polytechnic Society, First and Second Annual Reports, 1833–4*, p. 7.

The first ten years

At first the Polytechnic was open from 10.30 a.m. until 6 p.m., but this pattern soon changed to that of an afternoon session followed by a short closure and then a second evening session. The Institution was closed on Saturday evenings and on Sundays. Once inside, visitors were free to tour the building, viewing the exhibitions and displays, and also to choose from the daily timetable of lectures and demonstrations.

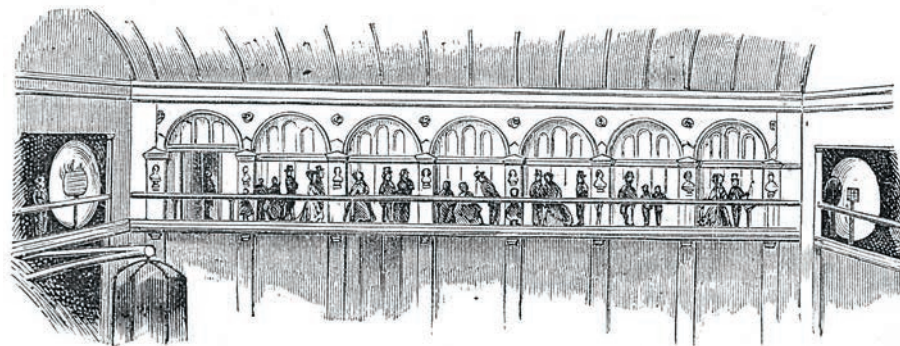
DISPLAY AND DEMONSTRATION

The range of exhibits on display in the Polytechnic – from Lord Dundonald's steam engine which drove the power looms in the Hall of Manufactures, to a tin case of preserved mutton, a patent steam fountain coffee pot, a cottage beehive and a New Zealand spear – was enormous. In the gallery around the Great Hall, a Rubens painting hung next to an iron rocking chair and a group of anatomical models, including a large papier-mâché model of the human ear. At either end of the gallery were two large metallic reflectors 'by means of which, whispers may be heard the whole length of the hall, without a tube, and cooking is daily performed by a fire 100 feet [30 m] from the meat'.¹

Visitors would have been familiar with eclectic displays such as these from their experience of viewing 'cabinets of curiosities' and private collections, the precursors of modern museums. Little discrimination (to eyes more familiar with organised classification) seems to have been used in the selection and

Fig. 14

As well as cooking meat at a distance, the reflectors enabled a whisper at one end of the gallery to be heard clearly at the other.



The large Polytechnic Metallic Reflectors.

A fire in the focus of one, and the meat in the focus of the other.

¹ UWA RPI R45/3, p. vi.

arranging of objects. Examples of marbled paper-hangings and ‘a specimen of rustic work’ were next to a ‘horographic orrery’ and an ‘Egyptian astronomical clock’, both made by T. Richards of Droitwich. Sculptures and paintings by artists such as Benjamin West and Hogarth are listed among the models and machines. *The Deluge* by John Martin was hanging in the gallery of the Great Hall in 1839, ‘deposited by the artist’.²

The 1838 *Catalogue* lists ten rooms open to visitors; by 1845 this had increased to thirty-four. Most of these rooms were devoted to specific themes, including ‘cosmorama rooms’ containing paintings and architectural models in the basement, rooms devoted to geological specimens and models, a ‘room for lectures on experimental philosophy’, and an ‘extreme west room’ overlooking Cavendish Square – so the public now had access to the whole building. Refreshments were available, and evening sessions in the Great Hall were accompanied by the Polytechnic Band – musical performance became a significant part of the programme at Regent Street.³

As well as viewing the objects on display, visitors could choose from a daily timetable of lectures and demonstrations:

Mr. Bachhoffner exhibits the Voltaic Light; and daily, at Three o’Clock, the Method of Blowing-up Sunken Vessels by Voltaic Electricity, is shown: – a Model of a Ship, containing a small charge of gunpowder, is sunk some depth under water, to which the Diver attaches wires communicating at a considerable distance with a Voltaic Battery, which, when connected instantly explodes the powder and the vessel is shattered to pieces.⁴

The Great Hall had been carefully designed as a setting for just such demonstrations. There was a serious point to this particular experiment – the ability to work underwater and remove wrecks was essential to many civil engineering works – but it also had dramatic visual appeal. Audiences clearly relished the minor explosions, flashes and sparks produced by the use of electricity; indeed some of them evidently experienced electrical power more directly. *Punch* noted that ‘the electrical pledge’ was offered to visitors; this apparently means drinking a toast out of an electrified glass and receiving a small shock as a result.⁵

Polytechnic lecturers needed highly developed performance skills. They had to hold the attention of an audience whose members might range from children to fellow scientists, and to conduct experiments in front of that audience, often several times a day.

George Bachhoffner was head of the department of natural philosophy at the Polytechnic from 1838 to 1855. As well as being a popular lecturer, he was an instrument-maker and inventor with a particular interest in electricity; his publications included *A Popular Treatise on Voltaic Electricity and Electro-Magnetism* (1838). Several of Bachhoffner’s electric and electro-magnetic machines were exhibited at the Polytechnic, alongside others deposited by E.M. Clarke and Francis Watkins. All three were members of the London Electrical Society.

2 UWA RPI R45/2, p. 19.

3 Jeremy Brooker, ‘Paganini’s Ghost: Musical Resources of the Royal Polytechnic Institution (1838–1881)’, in *Realms of Light: Uses and Perceptions of the Magic Lantern from the 17th to the 21st Century*, ed. Richard Crangle, Mervyn Heard and Ine van Dooren (London: Magic Lantern Society, 2005), pp. 146–154.

4 UWA RPI R45/2, p. ix.

5 Thanks to Iwan Rhys Morus for suggesting this interpretation.

Fig. 15

Pepper described this machine as fine-looking but lacking in power. Its capacity to generate an electric spark was adversely affected in a damp atmosphere.



The Society, previously centred on the Adelaide, came to an agreement to meet at 5 Cavendish Square and to use Polytechnic facilities, but it quickly ran into financial difficulties and failed in the 1840s.⁶

Polytechnic equipment was on a scale appropriate for public display. There was an enormous 'plate glass electrical machine' in the first-floor lecture theatre; in 1843 a second gigantic and potentially more powerful machine was added, which generated electricity by means of high-pressure steam from a boiler. The principle had been discovered by William Armstrong (later Sir William), the Tyneside industrialist. Armstrong supervised the construction of the new hydro-electric machine, and Bachhoffner 'assisted at and conducted most patiently the vast number of experiments which had to be carried out before the ponderous machine was considered ready to be exhibited to the public'.⁷

Bachhoffner's patience was rewarded. At the private view before an invited audience he conducted a series of experiments, including igniting gunpowder with a spark generated by the machine, setting fire to shavings and pieces of paper, and illuminating a cork chain hanging from the ceiling to appear 'like a splendid array of diamonds'. His performance impressed the reporter from *The Times*, who considered the machine would undoubtedly become 'a great lion of this popular and well-conducted establishment, the directors of which are ever on the alert to produce novelty in scientific matters'.⁸

6 Iwan Rhys Morus, *Frankenstein's Children: Electricity, Exhibition and Experiment in Early Nineteenth-century London* (Princeton NJ: Princeton University Press, 1998), pp. 99–124.

7 J.H. Pepper, *Cyclopaedic Science Simplified* (London: Warne, 1869), p. 273.

8 *The Times*, 15 September 1843, p. 7.

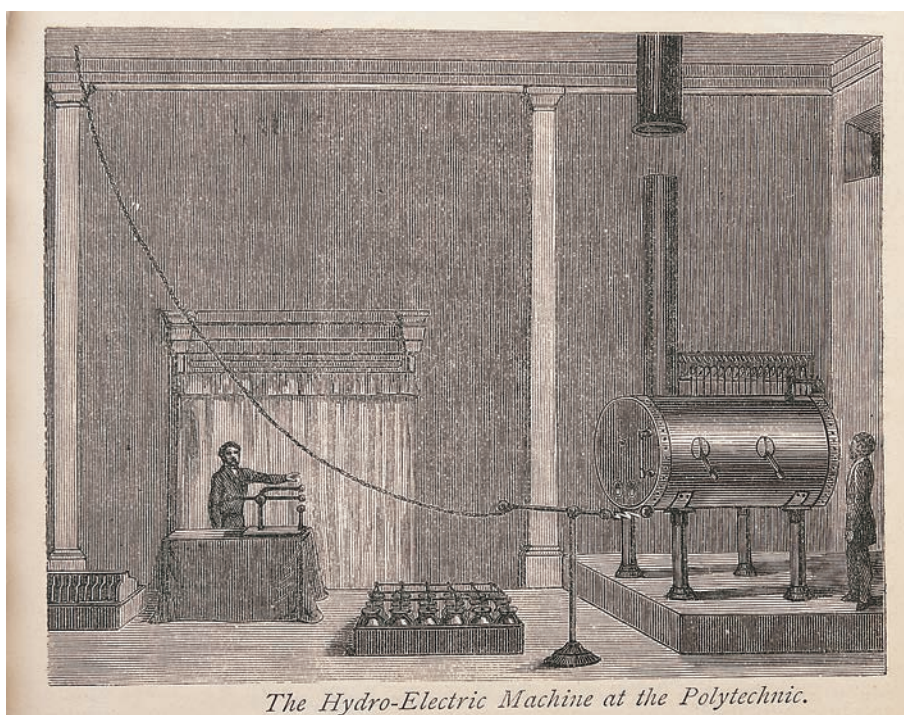


Fig. 16

In one of Bachhoffner's experiments, when the hydro-electric machine was first demonstrated, a spark generated by the machine illuminated the cork chain hanging from the ceiling.

Mr Punch, also present, was less respectful: 'The appearance of the boiler is somewhat that of a gigantic pantomime cock-horse; or rather a maimed locomotive upon wooden legs.' Nevertheless, he acknowledged the success of the evening, and wrote that the lecturer retired 'amid the cheers of the spectators'. The hospitality was liberal, and several 'polytechnic toasts' were allegedly drunk, including: 'May we ne'er want a visitor, nor a slight shock to give him.'⁹

The Polytechnic continued to show electrical exhibitions, claiming to own 'the two most powerful electrical machines in the world'.¹⁰

THE POLYTECHNIC COMMUNITY

As well as establishing itself as a centre of exhibition and display, the Polytechnic was also succeeding in creating a community of 'lovers of Practical Science', who could access the building when it was closed to the public, though information about the more private activities is very sparse.

The directors were responsible for the management of the Polytechnic, appointing staff, overseeing the accounts and ensuring that the Institution was managed according to the terms of the charter. Those directors whose names are known and interests have been identified were themselves practical scientists with wide-ranging interests and connections with scientific communities across London and beyond. The shareholders, annual subscribers and members of the short-lived Polytechnic Association cannot all be identified, but the active involvement of this wider group in the affairs of the Polytechnic helped to ensure the quality and vitality of its programme in the early years.

9 *Punch*, 1843, p. 131.

10 *The Times*, 24 January 1845, p. 1.

Once the Institution was securely established, Cayley's interest focused more on its scientific life than on the details of management. He exhibited some of his own inventions, and his influence is clear in the developing programme, but much of his contact was by letter from Brompton. Nurse, on the other hand, was a near neighbour and the manager was his brother-in-law; he remained closely involved in the day-to-day business.

During the early 1840s, Robert Sievier is described as managing director. Sievier's range of interests mirror the diversity of the Polytechnic.¹¹ He trained first as an engraver, but later became a sculptor of portrait busts. His distinguished sitters included Prince Albert. Then he moved into science. When he was elected a fellow of the Royal Society in 1841, the citation gave his profession as sculptor, but then listed the patents for which he had applied, including inventions used in the manufacture of elastic cables and plaited wire ropes, and also several for elastic goods and fabrics made in combination with caoutchouc (India rubber). Sievier exhibited examples of both his sculpture and his inventions at the Polytechnic. The surviving letters between Sievier and Cayley show them to have been in regular contact, discussing both the affairs of the Polytechnic and Cayley's progress in his Brompton workshop.¹²

Alexander Gordon was a member of the provisional committee who went on to become a director. He was a civil engineer, responsible for the design and construction of lighthouses around the world. In 1835 he constructed a temporary light on the roof of the Colosseum in the south-east corner of Regent's Park which *The Times* noted could be seen from as far away as Baker Street; it attracted 'considerable speculation' among passers-by.¹³ Gordon's interests were shared by the Cornish engineer Goldsworthy Gurney, whose 'Bude light' was exhibited in a lighthouse reflector in the chemistry laboratory at the Polytechnic. In 1838 Michael Faraday had confirmed the superiority of this invention of Gurney's and recommended it to the trustees of Trinity House for use in their lighthouses. Whether Gurney had an official connection to the Polytechnic is not clear, but he was a close friend and collaborator of Cayley, and a frequent visitor to the Institution. In 1835 Gurney had given evidence to a parliamentary inquiry into the prevention of explosions in coal mines, during which he had argued the case for using high-pressure steam as a means of ventilation. Little immediate action was taken, but at the end of February 1849 a meeting was held at the Polytechnic, attended by a parliamentary group including the former prime minister Sir Robert Peel, to address the issue of safety again:

The theatre of the Royal Polytechnic Institution was selected, as having at command the hydro-electric machine steam apparatus, made use of in the recent lectures on the steam jet at the Institution, which led to the adoption of the method of ventilation lately introduced by Mr. Foster of Newcastle. Dr. Bachhoffner demonstrated the principle by a series of conclusive experiments, which were afterwards followed by a discussion, in which Mr. Gurney, who was present, practically explained its application to coal mines as a positive means of preventing the many distressing accidents which so frequently occur.¹⁴



Fig. 17
Alexander Gordon, a director of the Polytechnic, designed prefabricated cast-iron lighthouses which were shipped to locations around the world. The Troubridge Island Light House, completed in 1855, protects the approaches to Adelaide in South Australia.

11 Martin Greenwood, 'Robert William Sievier (1794–1865)', *ODNB*.
12 Royal Aeronautical Society Library, Cayley Papers: Packet C.
13 *The Times*, 5 August 1835, p. 6.
14 *The Times*, 1 March 1849, p. 5.

The Polytechnic machines were therefore sometimes put to serious use. Captain Levett Landon Boscawen Ibbetson became a director of the Polytechnic in the early 1840s. Ibbetson's prime interest was geology, one of the many areas of knowledge emerging as a separate discipline in the early nineteenth century. William Smith's geological map of England – 'the map that changed the world' – was first published in 1815. Ibbetson's enthusiasm for his subject is reflected in a short guide to the Isle of Wight written to enable non-geologists to appreciate the remarkable features of the island.¹⁵ He was a model-maker as well as a writer, and deposited his 'trigonometrical model of the Undercliff on the Isle of Wight' (on a scale of 3 feet to the mile), together with a collection of fossils from the same area, at the Polytechnic, where they formed the main attraction in the new geological room. Magnifying glasses were provided so that visitors could fully appreciate the detail.

Given the strength of its scientific community – and the growth in the market for periodicals – it would seem an inevitable step for the Polytechnic to move into publishing, and there are suggestions that the shareholders did at least consider doing so in the early years. A number of short-lived journals with 'polytechnic' in the title appeared in the late 1830s to early 1840s, providing another example of the currency of the name. *The Illustrated Polytechnic Review and Record of Science, the Fine Arts and Literature*, first published in January 1843, includes so many articles and illustrations relating to the Polytechnic that a connection seems obvious – except for a statement on the first page firmly denying it: '[The Polytechnic] is the most extensive depôt of scientific inventions at present existing, and as we shall have much to do with the subject, we shall naturally have to recur to it; but as an establishment it has neither connexion with any present publication, nor any responsibility for any of its articles.'¹⁶

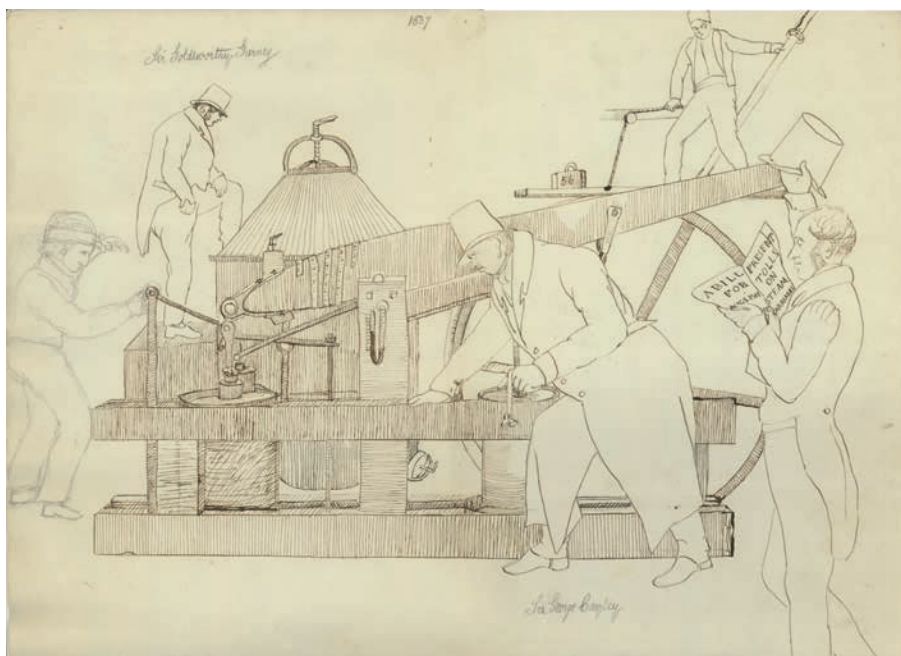


Fig. 18

Sir George Cayley (centre) with his son-in-law Edward Stillingfleet Cayley (right), MP, his collaborator Sir Goldsworthy Gurney, and his mechanics, working on the air engine in the Brew House at Brompton Hall. Sir George has endorsed the original drawing: 'All very like'.

15 Capt. L.L. Boscawen Ibbetson, KRE, FGS, *Notes on the Geology and Chemical Composition of the Various Strata in the Isle of Wight* (London: John van Voorst, 1849).

16 *Illustrated Polytechnic Review*, 7 January 1843, p. 1.

TOPICALITY AND NOVELTY AT THE POLYTECHNIC

The Polytechnic programme changed every few weeks in order to maintain the flow of visitors and to persuade them to return. This was achieved by finding new ways of using its own resources, and also by inviting visiting lecturers and inventors to demonstrate their work. Advertising, in the form of handbills, posters and press advertisements, kept the programme in the public eye. Inevitably, given this constant pressure for novelty, sometimes previous ideas were recycled and some of the old favourites began to look rather well worn. Edmund Yates, the journalist and novelist, wrote in his memoirs:

Ah me! The Polytechnic with ... its diver, who rapped his helmet playfully with the coppers that had been thrown at him; its half-globes, brass pillars, and water-troughs so charged with electricity as nearly to dislocate the arms of those that touched them; with its microscope, wherein the infinitesimal creatures in a drop of Thames water appeared like antediluvian animals engaged in combat; with its lectures in which Professor Bachhoffner was always exhibiting chemistry to 'the tyro' ...

The list continues, but the passage ends, 'with all these attractions and a hundred more that I have forgotten, no wonder the Polytechnic cast the old Adelaide Gallery in the shade'.¹⁷

Two illustrations will be given to show the variety of Polytechnic attractions. The first is from 1840, when Charles Green, 'the greatest English aeronaut and one of the most successful balloon pilots that the world has ever seen', was known to be planning a flight across the Atlantic from west to east in his balloon the *Royal Nassau*.¹⁸ The prospect of such a flight (which did not in the end take place) understandably captured the popular imagination and was much discussed in the press.

Cayley invited Green to spend a few weeks at the Polytechnic while he was working on the adaptations to his balloon necessary for the projected flight. Green's 'newly invented apparatus for steering, elevating and depressing, without discharging ballast or gas' was illustrated by a model every day at 3.30 in the afternoon in the Great Hall.¹⁹ The popular visual appeal of a small-scale balloon in such a setting is easy to understand.

Much of Cayley's attention since his early aeronautical experiments had been given to the development of a lightweight power source which might enable him to realise his ambitions. Discarding the suitability of steam, he had been experimenting with a hot-air engine. His interests extended to balloons and parachutes, and he regretted that after sixty years of manned flight balloons had not been put to more practical and serious use than pleasure trips and publicity stunts. Cayley took advantage of the publicity which surrounded Green's visit to make his third attempt to found a society devoted to the possibilities of flight, issuing a prospectus and holding a public meeting in the Polytechnic. The attempt was unsuccessful; Cayley remained

17 Edmund Yates, *Recollections and Experiences*, 4th edn (London: Bentley, 1884), p. 136.

18 L.T.C. Rolt, *The Aeronauts: a History of Ballooning 1783-1903* (London: Longmans, 1966), p. 118.

19 UWA ACC2004/47.

CHRISTMAS HOLIDAYS. 1843-4

OPEN
MORNINGS AND EVENINGS
(EXCEPT SATURDAY EVENING)
ROYAL

Polytechnic Institution,
REGENT STREET.

NEW AND VARIOUS LECTURES, DAILY, BY DR. RYAN, PROFESSOR BACHHOFFNER, PH.D., M.A., AND OTHER LECTURERS, WHICH EMBRACE ALL THE MOST RECENT SCIENTIFIC DISCOVERIES.

ARMSTRONG'S HYDRO-ELECTRIC MACHINE.
NEW MICROSCOPE, FOR SHOWING OPAQUE OBJECTS.
COTTON SPINNING MACHINERY.
NEW DISSOLVING VIEWS.
NUMEROUS PRODUCTIONS
In Art and Science, with continued NOVELTIES.

MORNING.
Opens at Eleven o' Clock; Closes at Half-past Five.
Hours of Exhibition.

TWELVE O'CLOCK . . .	COINING.
QUARTER-PAST TWELVE . . .	A POPULAR LECTURE ON SOME BRANCH OF EXPERIMENTAL PHILOSOPHY.
ONE	DISSOLVING VIEWS AND OPAQUE MICROSCOPE.
HALF-PAST ONE	MODELS DEMONSTRATED IN THE GREAT HALL.
TWO	LECTURE ON CHEMISTRY.
THREE	ARMSTRONG'S HYDRO-ELECTRIC MACHINE, OR POPULAR LECTURE.
QUARTER TO FOUR	DIVER, WITH EXPERIMENTS UNDER WATER.
FOUR	DIVING BELL.
HALF-PAST FOUR	DISSOLVING VIEWS, AND TRANSPARENT AND OPAQUE MICROSCOPES.

Music from Half-past Two o' Clock, Daily.

EVENING (except Saturdays).
Opens at Seven o' Clock; Closes at Half-past Ten.
Hours of Exhibition.

HALF-PAST SEVEN	COINING AND EXPLANATIONS IN THE GREAT HALL.
EIGHT	EXPERIMENTS WITH ARMSTRONG'S HYDRO-ELECTRIC MACHINE, OR A POPULAR LECTURE.
NINE	DIVER, WITH EXPERIMENTS.
QUARTER-PAST NINE	DIVING-BELL.
QUARTER TO TEN	DISSOLVING VIEWS AND OPAQUE MICROSCOPE.

To the Cosmorama Views, which are exhibited in the Evenings, several beautiful Pictures have lately been added.
The Band will play during the Evening.

Admission to the Morning Exhibition, 1s. Evening Exhibition, 1s.
Schools, when amounting to six, half-price.

The following Class Lectures are under the direction of Dr RYAN, the Professor of Chemistry to the Institution, viz.: a Course on Chemistry, a Course on the Steam Engine—and Steam Navigation for Naval Officers and other Gentlemen, and a Course for the Instruction of Railroad Engine Drivers and others, illustrated by a complete set of working models. Instruction in Experimental Philosophy by Professor BACHHOFFNER. The extensive Laboratory is open for Assays and Analyses under the direction of Mr THOMPSON, the Laboratory Chemist. Photographic Portraits taken by Mr BEARD.
The Hours of each Lecture and Demonstration are suspended in the Hall.

Fig. 19

The distribution of handbills was one of the means used by the Polytechnic to publicise its programme.

Fig. 20, facing page

Polytechnic ephemera have always appealed to collectors. This rare surviving poster, advertising Charles Green's visit in 1840, was acquired by the University Archive in 2004.

ahead of his time. The Aeronautical Society of Great Britain (the oldest in the world) was founded in 1866, after Cayley's death.²⁰

The second example of a new and topical attraction at the Polytechnic comes from 1845, when 'railway mania' was at its height. The steam locomotive is now seen as a quintessential symbol of Victorian engineering, but in fact, at this early stage in its development, not everyone was convinced of its supremacy. Steam locomotives were noisy, dirty, heavy and poor at tackling

²⁰ It became the Royal Aeronautical Society in 1918.

1840

POLYTECHNIC INSTITUTION

309, REGENT STREET.

MR. GREEN'S BALLOON

WITH HIS NEWLY INVENTED APPARATUS FOR

STEERING, ELEVATING, & DEPRESSING,

WITHOUT DISCHARGING BALLAST OR GAS, ILLUSTRATED BY A MODEL,

EVERY DAY AT HALF-PAST 3 O'CLOCK.

STEAM ENGINES, MODELS OF MINING, AND OTHER MACHINERY IN MOTION.

GLASS SPUN BY STEAM,

Each pound producing about 400 miles of Thread, afterwards wove by a Loom into Magnificent Articles,
FOR COURT ROBES AND TAPESTRY.

CHROMATIC FIRE CLOUD FOUNTAIN

Developing most Brilliant & Extraordinary Effect of Colour of Flame, never before exhibited in London, by Mr. E. M. CLARKE

Diving Bell

In which FOUR or FIVE Persons may descend with safety,

A DIVER WORKING UNDER WATER,

WITH DEAN'S PATENT APPARATUS.

BLOWING UP THE ROYAL GEORGE.

As practiced by Colonel Pasley, by means of Voltaic Electricity.

MR. SNOW HARRIS'S LIGHTNING CONDUCTORS,

FOR THE PROTECTION OF SHIPS &c. FROM LIGHTNING,

DAGUERRETYPE & PHOTOGENIC DRAWING,

M I C R O S C O P E

The most Powerful in Europe with a Disk 80 feet in Circumference shewing PICTURES so Elaborately Painted as to bear a Magnifying Power 30,000, in addition to the usual productions of Nature and Art, magnified many millions of times.

TWO METALLIC REFLECTORS,

by which a Whisper may be Heard, and Meat Cooked at 100 Feet distance,

SIX HORSE POWER STEAM ENGINE; LITHOGRAPHIC PRINTING; OPTICAL GLASS GRINDING; BRAIDING MACHINE; WAX FIGURE,
AND FLOWER MAKING. JACQUARD LOOM IN OPERATION.

MAGNETICAL & ELECTRICAL EXPERIMENTS.

Electro-type, or Process of obtaining Copies of Coins, &c. by means of Voltaic Electricity; Metalochrome, or Nobili's mode of Producing Splendid Colours on Steel Plates, by the agency of Electricity; Ship Launching; Working Locks on Canals; Water Wheels in Motion; Electro-Magnetic Machines; Powerful Water Battery; Magnets sustaining many Tons.

AN EXTENSIVE PUBLIC LABORATORY AND A SPACIOUS THEATRE,

In which Chemical Lectures are delivered daily, illustrated by costly Apparatus.

Mosaic Picture of GEORGE IV. containing Two Million Pieces of Stones.

Unrivalled Series of Forty-three Ships, Boats &c., in Miniature; Model of the Custom-house London, the celebrated Escriban, or Cabinet of Marguerite de Parma, the Governante of the Spanish Possessions in the Low countries, in 1559.

Open at Half-past 10 in the Morning, Admittance ONE SHILLING each person, to the Entire Exhibition. Catalogues 1s. each
Visitors who may wish to Descend in the DIVING BELL to pay 1s. extra.

F. COOBLAN, PRINTER, 55, WEST STRAND.

gradients, and some engineers looked for an alternative in the ‘atmospheric railway’, which used air pressure to provide power for traction. In this system, air was pumped from pumping stations at intervals along the track, into a pneumatic tube laid between the rails. An iron rod linked the carriage to a piston in the tube, and the acknowledged weakness of the system was finding an effective air-tight seal to close the gap along the top of the tube before and after the passage of this connecting rod. In 1838 the gas engineer Samuel Clegg, in partnership with the engineering firm of the Samuda Brothers, patented an improved valve and built a working model, followed by a full-scale test track. In 1844 Isambard Kingdom Brunel adopted the system for the new South Devon Railway. Building started in the same year and the first section of atmospheric track opened in 1847. It was a spectacular failure; the valve proved inadequate, and within a year the decision had been taken to convert the line to locomotive operation.²¹ The atmospheric railway – like Cayley’s aeronautics – was a brilliant concept which could not be realised given the technology available at the time.

In 1845 both the Adelaide and the Polytechnic were presenting lectures on the principles of the atmospheric railway – but the Polytechnic was offering visitors rather more: ‘The atmospheric railway, carrying from six to eight visitors at once, is lectured upon by Dr. Bachhoffner and exhibited daily and in the evenings.’²²

The *Catalogue* for the same year contains the entry: ‘Working Model of Samuda’s Atmospheric Railway, Seventy-Eight Feet long, with Carriages, &c., complete, capable of carrying Visitors from one end to the other.’²³

The model must have been powered by one of the steam engines in the Hall of Manufactures. It appears that one or more model carriages moved along a track beside the canals, something over half the length of the Great Hall. Visitors were being given at least a brief experience of travelling by atmospheric railway. The model continued to be listed in advertisements until the autumn of 1846, alongside such attractions as a swimming and diving display by an 8-year-old boy, a working model of Mr Coleman’s new locomotive engine ‘for ascending and descending inclined plains’ (imported from America by Nurse) and an illustrated lecture on diseases in potatoes. This last item had a horrible significance: 1845 saw the beginning of the Irish famine.

CLASSES AT THE POLYTECHNIC

Information about the Polytechnic’s educational role is particularly sparse. Some of the first teaching seems to have centred round the chemistry laboratory in the basement. The chemist John Thomas Cooper, joint inventor together with his son of the oxyhydrogen microscope, was appointed to equip and manage the laboratory, which the directors hoped would generate income. Cooper had previous experience as a consultant analytical chemist and planned to continue this role at the Polytechnic. The labora-

21 R.A. Buchanan, ‘The Atmospheric Railway of I.K. Brunel’, *Social Studies of Science*, 22 (1992), pp. 231–243.

22 *The Times*, 6 August 1845, p. 1.

23 UWA RPI R45/8, p. 78.

tory was available for hire by ‘private experimentalists and patentees’ for the sum of 50 guineas a year (a guinea was £1 1s 0d). Adjacent to the laboratory were a chemist’s private consulting room and a number of students’ rooms. This all suggests an area where individuals could come for private tuition or advice on how to develop their inventions, but no information has been found to show what kind of response there was to the facilities offered.

During the early 1840s the Polytechnic began to provide *ad hoc* series of lectures and classes directed at particular target audiences. An early example was a course ‘for the practical education of railway engine drivers’. Cayley had a deep concern for railway safety, prompted by his presence at the opening of the Liverpool to Manchester railway in September 1830 when William Huskisson was fatally injured under the wheels of the *Rocket* engine. He identified the lack of trained drivers during the railway boom of the 1830s as a major cause of the industry’s poor safety record.

The Polytechnic claimed that it was an ideal place for such a class because ‘every department, connected with instruction in Physical and Practical Science, is amply stored with proper instruments, books, and working models, as well for the communication and illustration of elementary as of profound knowledge; so the pupil comes to his lessons with every requisite assistance provided beforehand’.²⁴

Longbottom wrote to the railway companies in September 1840 outlining the syllabus, which was designed to explain the principles and management of steam power using the Polytechnic models, adding:

The Professor of the Institution will be assisted by a rail road engine driver of long experience who will be taught the philosophy of steam, and its best mode of application to the purposes of locomotion. His duty will be (after the Professor) to give practical demonstrations in the language well understood by rail road engineers.²⁵

The pupils were to be examined, and certificates awarded. Longbottom’s letter and prospectus were discovered in the records of the Stockton & Darlington Railway Company. The first engine drivers in the north-east were mechanics drawn from local industries; some may have been unable to read. The Polytechnic seems to have given some thought to the most effective way of presenting the classes, so it is frustrating that nothing has been discovered about the take-up rate for this course. There was also a series of ‘chemical lectures’, given by Dr John Ryan, the professor of chemistry, intended for ‘medical students, engineers, manufacturers, miners, agriculturists and others’ to be held in the Polytechnic three mornings a week. On alternate mornings Dr Ryan offered a course of lectures on the steam engine and steam navigation for ‘naval officers and other gentlemen’. The lectures began at 12 noon, so that the classes could make full use of all the Polytechnic’s equipment before the Institution opened to the public in the afternoon.

²⁴ UWA RPI R45/7, p. 13.

²⁵ TNA RAIL 667/11288.

POLYTECHNIC VISITORS

The Polytechnic appealed to all classes, and its visitors represented a social mix which was unusual in Victorian London. In this, as in other ways, the Institution was the precursor of the Great Exhibition of 1851. Few can have come so far as the two Indian visitors in London to study steam shipping; this is an extract from their description of what they saw:

At the end of the canal is a deep reservoir of water into which a diving bell capable of containing four or five persons is lowered to a considerable depth under water, air being supplied by two powerful air pumps, so that visitors may descend with convenience, and whilst we were there we saw several persons go down, among whom were some ladies, the only inconvenience experienced whilst under water is a great pressure upon the inside of the ears, which to stout persons of a full habit of body becomes very painfully troublesome. We know several persons who have descended and they have felt no ill effects from it. A diver, clothed in a patent water and air tight diving dress, goes down a ladder to the bottom of a reservoir of water, being supplied from the air pump with air through a tube that enters into his dress; he is when prepared to descend, the oddest looking creature ever seen, he has an immense helmet of white metal over his head, and in front of his eyes are two large thick pieces of glass protected by bars of metal, this helmet is strongly strapped to his water proof dress, and he then presents a most laughable appearance; he is obliged to load himself with heavy weights before he gets into the water, otherwise his buoyancy would cause him to float on the surface, but thus loaded down he goes, and will pick up money or any small thing thrown down to him, walking about the bottom of the clear water as unconcerned as possible ...²⁶

Jehangeer Nowrojee and Hirjeebhoy Merwanjee were naval architects; they wrote in their *Journal*: 'We have given a very long account of the visits we paid to the Polytechnic Institution because we saw nothing in London, – nothing in England, half so good.'²⁷

Engravings of the Great Hall began to appear in the 1840s, and it is striking that the visitors are represented as family groups, including women and children. An anonymous contributor to Charles Dickens' journal *All the Year Round* later remembered his impressions of the same view from a child's perspective:

A large raised basin, or tank, filled the centre of the floor, and on its limpid waters floated absolutely maddening models of ships, steamers, life-boats and other vessels which we felt we would have given worlds to possess. Lighthouses, piers, and docks, rose at intervals around this delightful harbour, and two or three small cork sailors, illustrative of the superior merits of somebody's life-belts, floated, smiling and blue-jacketed, on its serene surface.

26 Jehangeer Nowrojee and Hirjeebhoy Merwanjee, *Journal of a Residence of Two Years and a Half in Great Britain* (London: Allen, 1841), pp. 116–117.

27 Nowrojee and Merwanjee, *Journal*, p. 138.

28 *All the Year Round*, 29 May 1869, p. 167.

29 *Punch*, 19 February 1859, p. 77.

The sight of the diver had reduced him to tears of fright when he was small, but later the only cloud which hung over the enjoyment of a visit to the Polytechnic was the suspicion that it represented an attempt to improve his education: 'Instruction, we felt, lurked behind amusement, and it was impossible to forecast, from the programme of the entertainments, exactly at what point the baleful genius of mental improvement might be expected to claim its victim.'²⁸

In 1859 a fictional schoolboy tried to turn this to his advantage. In a spoof article in *Punch*, young Master Harry Hopeful wrote to his teacher, the Rev. Mr Stuffem, to assure him he was keeping his promise to improve his mind during the holidays by visiting London galleries:

Pursuing useful knowledge, I have sought the Polytechnic, and have had my mind improved by lectures on the Diving Bell. Optics I have studied in the Dissolving Views, and the medal-making machine has taught me something of Die-namics. Galvanism I have quite at my fingers' ends, for Briggs Major *would* make me put my hands into the basins; and what I learned of Chemistry in the ten minutes devoted to it has so impressed me with the wish to gain still further knowledge, that I have been daily hard at work repeating the experiments, and my mother feels persuaded that I shall ere long blow the house up.²⁹

Fig. 21
This view of the Great Hall in the early 1840s shows family groups among the Polytechnic visitors.



The Polytechnic encouraged children to visit by charging reduced fees and directing some of its advertising to schools, promising that ‘every scientific novelty will be explained in the most simple manner’.³⁰ Schools could also make use of the laboratory facilities.

As the railway network grew, so did the number of visitors who could travel into London. In 1851 the travel agent Thomas Cook arranged for 165,000 people to visit the Great Exhibition in Hyde Park, but even before this the phrase ‘country cousin’ was beginning to appear to describe some visitors to the Polytechnic, and continued in use throughout the life of the Institution. In May 1840 a description of the programme in the *Athenaeum* includes the detail ‘metallic reflectors to astonish country cousins by roasting beef-steaks a hundred feet [30 m] from the fire’. *Punch* reinforces the point with another spoof letter, this time from Simon Cowslip to his father at home on the farm, in which he recounts his experiences while attending a lecture ‘at a instootion they calls the Polly Ticnic, top a Regent Street, nigh Langum Pleace’.³¹

When Alexander Bain, the son of a poor Scottish crofter, came to London in 1837, he found work as a journeyman clock-maker in Clerkenwell, and attended lectures, exhibitions and demonstrations at both the Adelaide and the Polytechnic galleries in the attempt to teach himself electrical science. By 1841 his own printing telegraph was being exhibited at the Polytechnic, one of the first of a series of notable inventions in the area of electric telegraphs and electric clocks.³² This isolated example is taken from a detailed study of Bain and his work; insufficient evidence has been found to indicate how many working men visited the Polytechnic.

In December 1840 the Polytechnic received its first royal visitor. The Institution had closed briefly for redecoration and refitting before the Christmas season. On 9 December, just before it reopened to the public, Prince Albert, newly married to Queen Victoria, paid a visit to the Polytechnic. *The Times* reported that ‘The Prince was much pleased with the operations of the diver under water, and with the practical explanation of Colonel Pasley’s method of blowing up sunken vessels.’³³ According to the *Athenaeum*, the Prince had also descended in the diving bell.³⁴ After his visit Prince Albert agreed to become patron, and the name was changed to the Royal Polytechnic Institution. Following that visit the Polytechnic was obviously considered to be a suitable destination for minor and visiting royalty. In 1842 Robert Sievier wrote to Cayley: ‘We are increasing in public favour, and I may say also in Royal as we had last week in 3 separate times 2 Carriage Loads of Royalty – I happened to be at the Institution and did as well as I could to be agreeable to them.’³⁵

The Polytechnic did indeed appeal to a wide audience.

Fig. 22

Medals were probably produced as Polytechnic souvenirs by the coining machine in the Great Hall advertised in the handbill pictured on page 30. This example shows the heads of Queen Victoria and Prince Albert; the head of Minerva is on the other side.



30 *The Times*, 2 May 1840, p. 1.

31 *Punch*, 1848, p. 259.

32 Prof. R.W. Burns, ‘Alexander Bain, a Most Ingenious and Meritorious Inventor’, *Engineering Science and Education Journal*, April 1993, pp. 85–93.

33 *The Times*, 10 December 1840, p. 5.

34 *Athenaeum*, 12 December 1840, p. 990.

35 Royal Aeronautical Society Library, Cayley Papers: Sievier to Cayley, 6 June 1842.

Photography at the Polytechnic

Photography has occupied a unique place in the history of the University from the earliest days of the Polytechnic.

The introduction of photography dates from January 1839, when Louis Daguerre in France and William Henry Fox Talbot in England each announced a separate process for capturing an image. The daguerreotype process produced more impressive results at first, but the result was a single positive image which could not be copied. Talbot's experiments with what he called 'photogenic drawing' led him to discover the negative/positive principle which was to form the basis of modern photography.

The Adelaide and the Polytechnic competed to introduce photography to the public. The presence on the staff of J.T. Cooper, the chemist, helped give the Polytechnic the leading edge. Interested in chemistry and in optics, he was himself an early experimenter in photography. Cooper developed a light-sensitive paper called 'photogenic drawing paper', which was being advertised for sale as early as March 1839.¹

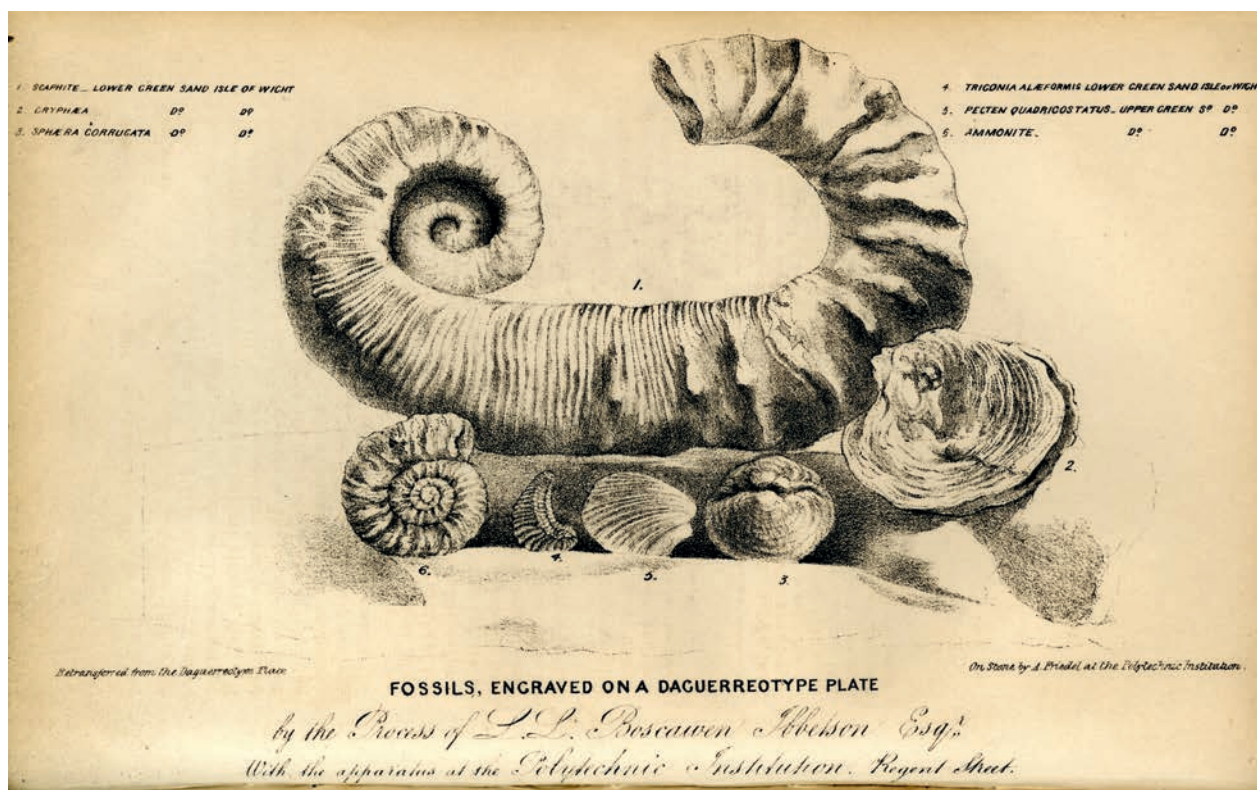
Lectures and demonstrations appeared in the Polytechnic programme as soon as details of the new photographic processes became known. By October Cooper was delivering a special illustrated lecture on the daguerreotype three times a week, for which an additional shilling entrance fee was charged. These lectures were advertised as being under licence from the patentee.² This was a prudent measure. Daguerre's process was patented in England, and similar demonstrations at the Adelaide in the autumn of 1839 were stopped because the directors had not obtained the appropriate licence.

The earliest photographic processes were slow and cumbersome and the equipment was expensive; practitioners needed considerable resources. Enthusiasts visited the Polytechnic frequently to attend lectures, view the exhibits and experiment with the equipment that was available.

L.L. Boscawen Ibbetson, previously introduced as a geologist, also has a place in the development of photography. During the winter of 1839–40, while he was living in nearby Margaret Street, Ibbetson conducted a series of experiments at the Polytechnic, including some which involved the application of oxyhydrogen light to speed up the exposure process. These experiments are mentioned in an article about photographic developments published in the

¹ *Athenaeum*, 16 March 1839, p. 193.

² *The Times*, 10 October 1839, p. 1.



autumn of 1840. The article is illustrated by two examples of Ibbetson's work. The first, of part of his fossil collection, was produced by an innovative attempt to engrave a daguerreotype plate in order to be able to reproduce the image in print. The second is of a piece of coral, resulting from his experiments with the oxyhydrogen microscope. The author of the article commented, 'As this is the first drawing of its kind that has yet been attempted, it must be regarded as but faintly indicating the perfection that may be attained, by similar means, in microscopic drawings, after further experiments.'³

Talbot's friends kept him informed of what they had seen at the Polytechnic. In November 1839 Sir John Lubbock wrote, 'I saw Cooper at the Polytechnic taking a drawing with the oxyhydrogen microscope in three minutes', and a few days later Sir John Herschel described a daguerreotype he had purchased there. Talbot himself made use of Polytechnic resources. In May 1841 Robert Longbottom, the secretary, wrote to him, 'I have been thinking that our large Microscope will be best suited for you tomorrow so it shall be ready for you at the time appointed.'⁴

Talbot improved his photogenic drawing process by developing the calotype, which he patented on 8 February 1841. Nurse succeeded in obtaining a licence to demonstrate the 'new and original invention for improvements in obtaining pictures or representations of objects' at the Polytechnic.⁵ This was no mean achievement for Talbot was very protective of his rights.

Photography did not capture the popular imagination until the arrival of portrait photography. Richard Beard, a former coal merchant, realised the

Fig. 23

This pioneering engraving of a daguerreotype plate by L.L. Boscawen Ibbetson enabled him to publish the results of his early experiments in photography at the Polytechnic.

3 *Westminster Review*, September 1840, p. 460.

4 The Correspondence of William Henry Fox Talbot. This on-line database contains many references to the Polytechnic. The Longbottom letter quoted is no. 04260. www.foxtalbot.arts.gla.ac.uk [accessed 16 March 2006].

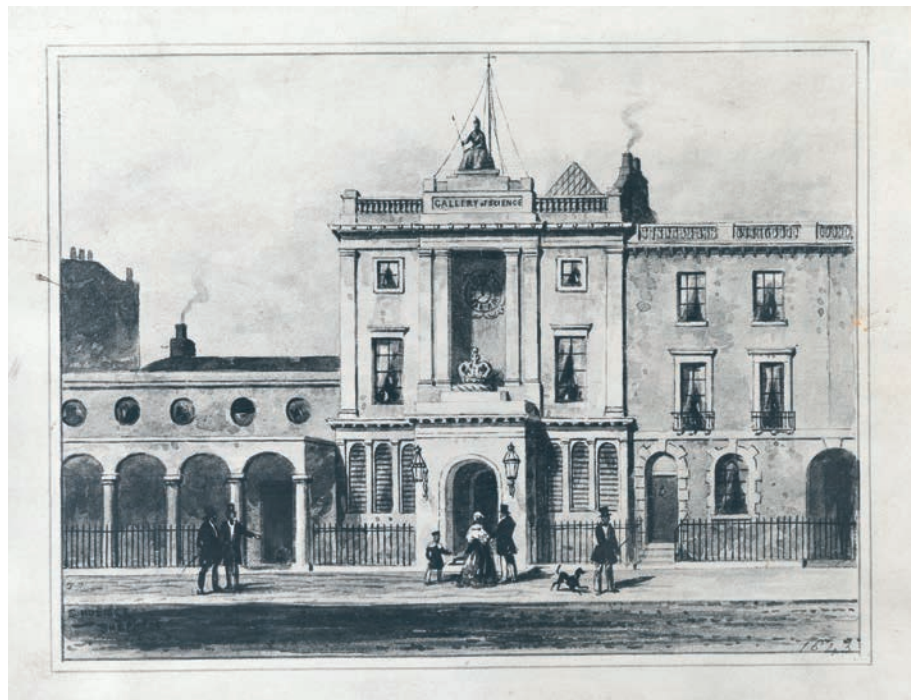
5 UWA RPI R41.

commercial potential of such a venture, provided that the photographs could be delivered in an acceptable time to the sitter. The first experiments with daguerreotype portraits in the United States had involved the subject facing brilliant sunlight, with closed eyes, for as long as twenty minutes. Alexander Wolcott and John Johnson developed a camera which used a convex mirror instead of a lens, reducing exposure times; they also devised a system, using mirrors, of maximising the natural light available to the photographer. Using both discoveries, they opened the world's first photographic portrait studio in New York in March 1840.

When Johnson's father, William S. Johnson, came to London early that year, Beard discussed with him the possibility of buying the rights to the camera and studio design and opening a similar business in London. Beard felt that it was necessary to speed up the process further to guarantee success, and employed John Goddard, formerly a lecturer at the Adelaide Gallery, to work on reducing the exposure time. During the winter of 1840–1 Goddard succeeded in accelerating the process by modifying the chemical preparation of the plate within the camera, reducing exposure times to somewhere between a few seconds and two minutes, according to the weather. Beard judged the time was right to go ahead with his plans.

Europe's first photographic studio was built on the roof of the Polytechnic building at 309 Regent Street. It opened on 23 March 1841. Claudet's studio at the Adelaide opened three months later. Beard's choice of location reflects the Polytechnic's growing reputation as a centre of innovation. Goddard and Cooper operated the studio, which was an instant success. Beard's business instincts had been sound. *The Times* reported that the first day 'drew together

Fig. 24
The glass roof of Beard's photographic studio appears to the right of the statue of Minerva in this drawing of the Polytechnic façade in 1843.



*The hands of the parties touch the day and year first
above written # (S)*

1839

W. H. F. Talbot
Wm M Nurse

Fig. 25

Fig. 25

The signatures of Talbot and Nurse on the agreement that allowed the Polytechnic to use Talbot's photographic process.

Fig. 26

In Cruikshank's drawing of Beard's studio, the subject is sitting on a raised platform which can be moved to face the sun, and his head is held in place by a clamp. The camera is on the shelf opposite the sitter, and the photographer on the steps is checking the exposure time. The couple on the left are examining their tiny daguerreotype portraits, measuring about 4 x 5 cm, through magnifying glasses.

Fig. 27

This daguerreotype portrait of William Henry Fox Talbot was taken in Richard Beard's studio on the roof of the Polytechnic, c. 1842.

Fig. 28, facing page

Richard Beard's trade card.



PHOTOGRAPHIC PHENOMENA, OR THE NEW SCHOOL OF PORTRAIT-PAINTING.

Fig. 26



Fig. 27



VIEWS, ARCHITECTURE, &c

STATUARY, STILL LIFE, &c

SINGLE PORTRAITS & GROUPS

MR. BEARD,
(SOLE PATENTEE)

OF THE
DACUERREOTYPE
OR
Photographic Portraiture.

34, PARLIAMENT ST. WESTMINSTER,
85, KING WILLIAM ST. CITY,
&
ROYAL POLYTECHNIC INSTITUTION
309, REGENT ST. LONDON.



Here is an agent in Photography by which the much-prized family Portrait the old cherished Picture may be multiplied at a trivial cost & with such exactness & truth as to establish an identity of character the minutest detail may be perfectly represented.

As well for momentary expression of countenance as for drapery in elaborate patterns, for chased Armour, carved furniture, articles of Vertu whether of Marble or Silver, indeed for every description of still-life the Photographic principle has been successfully employed.

The art of Photography is indeed as great a step in the fine arts as the steam engine was in the mechanical arts. it has called to its aid the highest resources of chemistry and Physics.

Edinburgh. Rev

Could we now see in Photogenic light & shade, Demosthenes launching his thunders against Macedon, or Paul preaching in Athens, with what rapture should we gaze upon impersonations so exciting! The heroes & sages of ancient times, would thus have been embalmed with more than Egyptian skill.

The progress made in bringing we might say to perfection, this surprising discovery must stagger the most incredulous. The fleshy tints & tints, the play of emotion, the glow of breathing life are all embodied.

Times

It was color that was wanting to crown the improvements. Then was obtained what had been so often sought for a speaking likeness. No matter how delicate the tint, how bright the glow, the color was communicated.

a host of curious fashionables, so many indeed, that notwithstanding the short period of time occupied in the operation, the room was crowded for hours together by parties anxiously waiting their turn'.⁶

Having a photographic portrait taken became all the rage. Visitors entered the building from Cavendish Square and climbed the stairs to reach the rooftop studio. There were separate waiting rooms for ladies and gentlemen, who were prepared to queue for a considerable time in order to sit for their portraits. The tiny daguerreotypes, measuring about 4 × 5 cm, were ready within minutes, and supplied to the sitter in a black case. A drawing of the studio appeared in *Cruikshank's Omnibus*, first published in 1842, together with a long poem by Laman Blanchard comparing the new experience of having a photograph taken with the more familiar one of having a portrait painted. It ends with the following note:

[All the World and his Wife must recollect that they are not figuring before a mere mortal artist with whom they may all the while laugh and chat. Here you must sit mute and motionless. You *may* wink; you may perhaps just put on a smile; but you *must* not laugh; for if you do, one half of your head will go off!]⁷

Beard opened two more studios in London and licensed others in the provinces. He made a great deal of money during the 1840s, though prolonged disputes over patents meant he went bankrupt in 1850. Nothing more has been discovered about the use of the studio on the roof, but other portrait photographers came to operate within the Royal Polytechnic for the remainder of its life.

The Indian visitors came to see an exhibition of photographic work during one of their visits to the Polytechnic:

several drawings taken by Daguerreotype were exhibited through powerful magnifying glasses, and we have to thank the gentleman who exhibited them, and who we understood to say that he had taken several of the views himself, for his kindness in changing the pictures several times whilst we were there, in order that we as inhabitants of another land might see as much as possible.⁸

Further technical developments, together with the relaxation of early photographic patents, made photography more accessible to a wider (though still well-to-do) public during the early 1850s. The first Polytechnic Photographic School, with its own glass house, class rooms and ladies apartment opened in the spring of 1853.⁹ The first teacher was Thomas A. Malone, who had worked with Talbot in his Reading studio, and then later as a partner in a photography business in Regent Street. When Quintin Hogg took over the Polytechnic building in 1882, he immediately engaged Ernest Howard (1856–1944), another Regent Street photographer, to teach evening classes. By the early twentieth century, the Polytechnic was claiming to have 'the First and uniformly most successful School of Photography in the World'.¹⁰

6 *The Times*, 24 March 1841, p. 6.

7 George Cruikshank, *George Cruikshank's Omnibus: Illustrated with One Hundred Engravings on Steel and Wood*, ed. Laman Blanchard (London: Bell & Daldy, 1870), p. 32.

8 Jehangeer Nowrojee and Hirjeebhoy Merwanjee, *Journal of a Residence of Two Years and a Half in Great Britain* (London: Allen, 1841), p. 126.

9 *Illustrated London News*, 7 May 1853, p. 360.

10 UWA RSP *School of Photography Prospectus* 1909/10.

The new Polytechnic theatre

On 14 September 1846 a formal notice appeared on the front page of *The Times*, inviting Polytechnic shareholders to a special general meeting ‘to take into consideration the Report of the Directors in favour of a considerable extension to the Institution on the adjoining ground, and to determine the course to be taken on the plans and estimates being then submitted to you’.¹

No record has been found of the ensuing discussion, but on 20 April 1848 the same newspaper reported that the Polytechnic:

was reopened last evening ... The alterations are on a scale of magnificence. There is a completely new theatre for lectures, which can accommodate 1,500 auditors or spectators. It is fitted up in the best manner, and has a disk for the exhibition of dissolving views, larger than any yet produced. There are also several new galleries for the exhibition of works of art and for the display of specimens of home manufactures ... The whole place has undergone a thorough renovation, and is crowded with innumerable models and specimens of mechanical skill and artistic progress.²

The *Builder* reported that Mr Mountford Nurse was ‘the prime mover’ behind the scheme.³ The theatre, which adjoined the main building on the south side, was designed by James Thomson, the architect of the Polytechnic; the cost was estimated at between £10,000 and £12,000. A new façade, twice the width of the original, was built across 307–309 Regent Street, but in fact the Polytechnic did not occupy the whole of the building behind this single frontage. Visitors entered the theatre from the Great Hall; there was no separate entrance to the street. The part of the new property between the theatre and Regent Street appears to have been sold off – possibly to finance the expansion scheme – and did not belong to the Polytechnic until 1891, when it was bought by Quintin Hogg.

Contemporary images of the interior of the Polytechnic building are nearly all of the Great Hall; none has been found that fully illustrates the ‘optical theatre’ on the first floor. Nevertheless it was the growing success of the programmes presented there that had shaped the form of the Polytechnic

1 *The Times*, 14 September 1846, p. 1.

2 *The Times*, 20 April 1848, p. 5.

3 ‘The New Theatre at the Royal Polytechnic Institution’, *Builder*, 8 April 1848, p. 173.



expansion and given the directors the confidence to commit to such a large investment.

The ‘optical theatre’ was where the *Punch* reporter, on his first visit to the Polytechnic, had sat in the darkness ‘regaled with microscopes and dissolving views’, watching images projected onto a screen.⁴ By 1845 the projection equipment included ‘the dissolving views, the dissolving orrery, the apparatus for exhibiting opaque objects, the physioscope (by which the human face is magnified to a giant size), the proteoscope, the chromatrope...’.⁵ The optical theatre was beginning to attract a community of lanternists and slide painters, creating an environment in which projection techniques reached new levels of sophistication, and audiences were offered a unique experience.

Henry Langdon Childe, an accomplished lanternist born in 1781, began his long association with the Polytechnic in the early years. ‘Optical’ or ‘magic’ lanterns were devices used to project transparent images (in the form of painted glass slides) onto a screen. Childe, who came from a family of artists, learned to paint on glass to create his own slides. His romantic effects, such as moonlight rippling on water, were especially admired. Around 1847 W.R. Hill began to work with Childe, first as his apprentice and then as his

Fig. 29

View from the stage of the large theatre showing the position of the projection box below the balcony. The opposite view, from the back of the theatre to the stage, appears on page 93.

Fig. 30, facing page

This ground plan of the Polytechnic in 1881 shows the position of the 1848 theatre. The only access to the theatre was from the adjacent Great Hall.

⁴ *Punch*, 1843, p. 91.

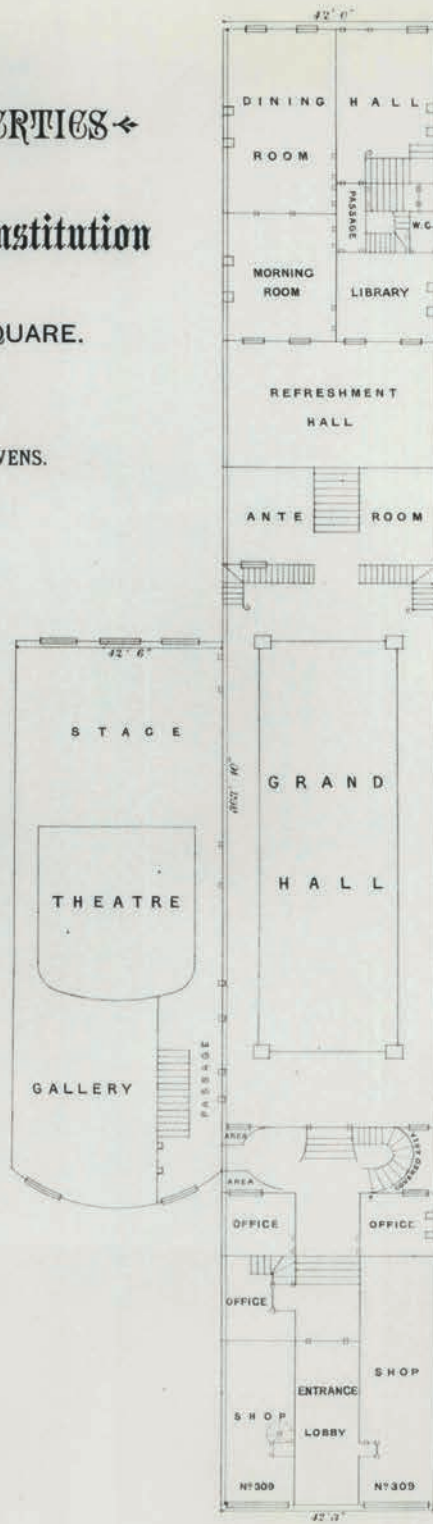
⁵ UWA RPI R45/8, p. 8.

CAVENDISH SQUARE

PLAN OF
 ↔ LEASEHOLD † PROPERTIES ↔
 DISTINGUISHED AS THE
Royal Polytechnic Institution
 AND
 No. 5, CAVENDISH SQUARE.

For Sale by Messrs.
 RUSHWORTH, ABBOTT & STEVENS.

1881.



NOTE.—This Plan is prepared from the Plans on the Leases under which the Property is held, and from which the Dimensions are taken, but the Vendor do not guarantee its accuracy.

REGENT STREET

partner, finally setting up his own business in 1867. It has been calculated that between them they painted almost 1,000 slides.⁶ The Polytechnic's growing reputation for wonderful images owed much to Childe and Hill, but many other distinguished artists on glass – such as Thomas Clare and Charles Smith – also painted slides which were shown at the Institution.

In Polytechnic publicity, lantern shows are often billed simply as 'dissolving views'. 'Dissolving view' is the name given to the technique by which one slide fades gradually into the next, avoiding an abrupt break in the sequence. On the screen this creates effects such as night turning into day or winter into spring. 'The shrine of the Nativity, with the much-admired change from darkness to light' was advertised as part of a new series of dissolving views at the Polytechnic in January 1845.⁷

The technical advances made at the Polytechnic were summarised in an article published in the *Illustrated Polytechnic Review* in February 1843:

It remained, however, for the spirited Directors of this Institution to bring this beautiful process before the world, assisted by all that art and science could minister to its success. Instead of the dull uncertain light of a common Argand lamp, the hydro-oxygen or lime light was introduced – lanterns of enormous size and lenses of the highest powers were constructed by Cary, and, finally, to crown the whole, artists of undoubted skill were employed to depict upon the glass subjects of interest, at home and abroad. The screen or disc upon which the views are reflected at this Institution presents a surface of 648 square feet [60 sq m]; and we may form some idea of the magnifying power of the lenses employed when we state that, although the glass upon which each object is painted, is not more than six inches by seven, yet the reflected picture occupies the whole area of the disc, which is in reality too small to allow the full play of the apparatus.⁸

Adopting oxyhydrogen – or limelight – as an illuminant enabled images to be projected from the back of the theatre onto the screen, a distance of some 35 feet (11 m). It provided an intensely brilliant light. Limelight was produced by heating a piece of lime with a flame of combined oxyhydrogen and hydrogen gases. Managing the gas supply required considerable skill; at the Polytechnic 'the pressure of gas was very great, and it was used most lavishly'.⁹ The quality of the projection lenses available was such that the conventional small slide would have produced a blurred image when projected across that distance. The unique large-format Polytechnic slides, together with the lanterns and lenses to project them, were developed so that a clear detailed large image appeared on the screen. Projected images in the Polytechnic theatre were becoming bigger and better than any that could be seen elsewhere.

In addition to dissolving views, many other special effects were developed at the Polytechnic. Childe's chromatope was a slide consisting of two glass discs with patterns painted on them; when these rotated in opposite directions colourful kaleidoscopic images were projected onto the screen. It was

Fig. 31, facing page
Cox's print shows Thomson's new façade of the Polytechnic building after the addition of the theatre in 1848. The premises between the entrance on the left and the new theatre were not part of the Polytechnic until they were purchased by Quintin Hogg in 1891.

6 *Encyclopaedia of the Magic Lantern*, ed. David Robinson, Stephen Herbert and Richard Crangle (London: Magic Lantern Society, 2001), p. 136.

7 *Illustrated London News*, 25 January 1845, p. 62.

8 *Illustrated Polytechnic Review*, 11 February 1843, pp. 97–98.

9 Wellcome Library, MS.5699, item 8, p. 3.



first shown as part of the Christmas programme in 1844. Collins manufactured chromatropes for sale within the building. Articulated slides produced movement on the screen; considerable skill was exercised by the lanternists in projecting these special effects slides as smoothly as possible.

The anonymous author of the article in the *Illustrated Polytechnic Review* rejects the 'vile phantasmagoria' of previous years in order to emphasise that lantern shows at the Polytechnic were produced for the most high-minded educational purposes. He wrote:

we now behold them no longer administering to the vulgar and depraved appetite, alternately exciting the laughter and terror of the beholders; but, assisted by the genius of philosophy and the pencil of art, they picture forth the truthful representations of lovely and picturesque scenery, the holy temples of distant nations, and the heart-stirring scenes of our country's triumphs.¹⁰

¹⁰ *Illustrated Polytechnic Review*, 11 February 1843, p. 97.

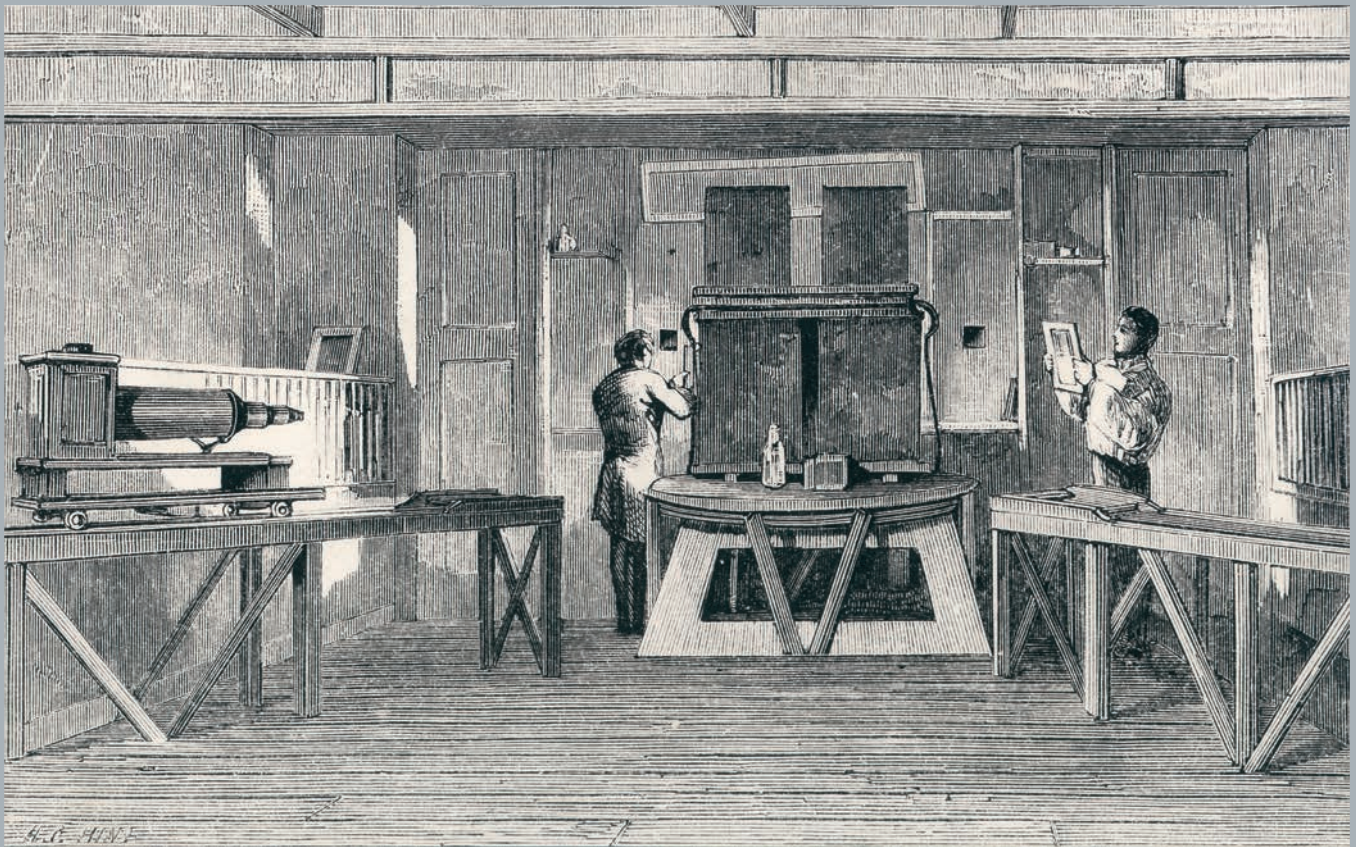


Fig. 32



Fig. 33

Some of the elements that contributed to the Polytechnic's success in lantern projection are shown here: the projection box in the new theatre (Fig. 32), a lantern illuminated by limelight (Fig. 35) and a large-format Polytechnic slide (Fig. 33). The slide is the painting of the Great Hall by W.R. Hill that appears on the cover of this book. The wooden frame measures approximately 31 x 26.5 cm, and the glass plate 20.5 x 15.5 cm.

Fig. 34 shows a lantern lecture, 'The Siege of Delbi', in progress in the new theatre. The large screen occupies the whole proscenium area. Appropriate sound effects are being vigorously created in the room on the right. The Union Flag hangs over the stage, and the lecturer no doubt encouraged the audience to voice their patriotic sentiments during the performance.

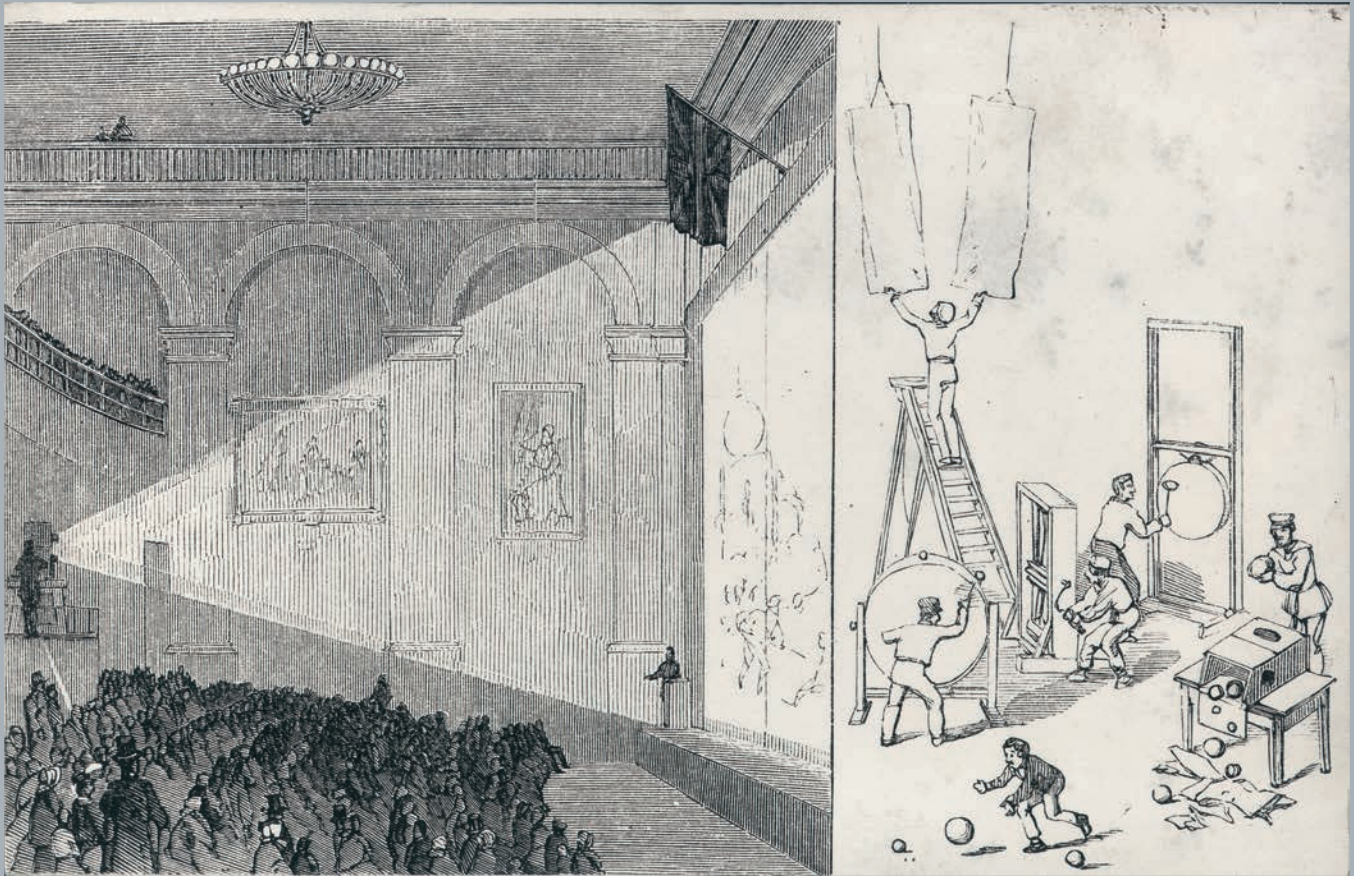
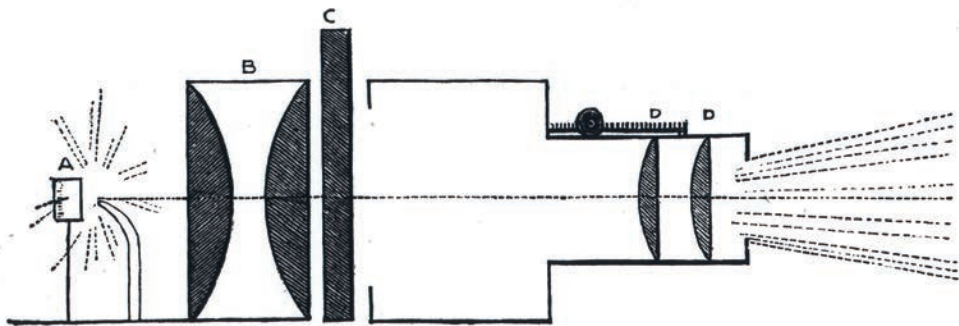


Fig. 34



A. The lime light. B. The condensers. C. The picture. D D. The front lenses for focussing, with rack-work.

Fig. 35

Slides were used to illustrate lectures on geology, to show the stratification of rocks, and on astronomy, to show the movement of the planets. Views of faraway places – North America, Afghanistan, Constantinople and the Holy Land – were unfailingly popular. The optical theatre at the Polytechnic enabled Victorian audiences to see into new and different worlds.

The new large theatre that opened in 1848 was designed to exploit the latest developments in lantern technology to their best advantage. It has been argued that – long before the invention of cinema – it represents the world's first permanent projection theatre.¹¹ The auditorium contained stalls and a balcony. Movable shutters covered the large skylight in the roof; the *Builder* explained: 'this is for the purpose of exhibiting optical illusions in broad daylight, and in an instant to restore the light again for the general promenade of the public'. C.W. Collins, the resident instrument-maker, manufactured six giant lanterns which were installed on iron rails in the projection room at the back of the auditorium. The equipment was positioned so that the large-format Polytechnic slides registered perfectly on the screen. The screen itself was massive, measuring 33 × 27 feet – almost 900 feet square (10 × 8 m – about 84 sq m). It was made of wood covered with board and oiled canvas, and was designed so that it could be moved easily, 'the slightest impulse from the hand being sufficient'.¹² Since the screen filled the proscenium, it was essential that it could be removed quickly to make way for other activities on the stage.

The scene was now set for the most spectacular shows. In the same year that the new theatre opened, John Henry Pepper joined the staff at the Polytechnic. He became its greatest showman.

- 11 This argument has been advanced by Jeremy Brooker during his on-going research into projection at the Royal Polytechnic Institution.
- 12 'The New Theatre at the Royal Polytechnic Institution', *Builder*, 8 April 1848, p. 174.

The impact of John Henry Pepper

UNDER NEW MANAGEMENT

John Henry Pepper has been called ‘the celebrity chef of Victorian science’.¹ At the Polytechnic, he became both manager and star performer; it was his personal stage. Pepper and the Polytechnic became synonymous in the public mind. In fact, his connection with the Institution falls into two separate periods – from 1848 to 1858, and then from 1861 to 1872.

Pepper’s early career is typical of other young men of his generation who were trying to make a living from science. Born in London on 17 June 1821, he was educated at King’s College School in the Strand, and then studied at the Russell Institution as a pupil of J.T. Cooper before being appointed as assistant lecturer in chemistry at the Granger School of Medicine. Presumably it was Cooper who introduced him to the Polytechnic. Pepper gave his first ‘chymical lectures’ in June 1847, and joined the staff as lecturer and analytical chemist the following year.² He became a fellow of the Chemical Society of London at the age of 22. His only paper to the Society, ‘A new test for strychnine’, was given on 17 May 1852 but not published.

Much more remarkable is the fact that in 1854, six years after joining the Polytechnic and while he was still in his early 30s, Pepper had taken charge of the Institution, directing its programmes and taking over the financial risk from the directors. He described himself as ‘resident director’, implying that he lived on the premises. Information about this arrangement is very sketchy. Writing much later, in 1890, Pepper referred to a period ‘when he was sole lessee at the Polytechnic at a rental of £2,480 per annum, which had to be paid before a single lecture or entertainment was brought before the public’.³

This suggests that the directors were no longer as actively involved as they had been in earlier days. Inside the Polytechnic the scene was changing: Sievier had left, Nurse died in 1855, Ibbetson went to live abroad. Cayley was increasingly confined to Brompton. He died in 1857, a few days before his 84th birthday. It seems that the scientific community which had met at 5 Cavendish Square and conducted private experiments in the Polytechnic had faded away. Advertisements for a reduced subscription to the ‘Royal Polytechnic Reading and Chess Rooms’ appeared briefly at the beginning of 1854, but then stopped.

1 J.A. Secord, ‘Quick and Magical Shaper of Science’, *Science*, 297 (2002), p. 1648.

2 *The Times*, 17 June 1847, p. 1.

3 Professor Pepper, *The True History of the Ghost; and all about Metempsychosis* (London: Cassell, 1890), p. 2.

The wider London scene within which the Polytechnic operated was also changing; it was being reshaped in the aftermath of the Great Exhibition in 1851.

The summer of 1851 was extraordinary. The weather was glorious, and more than six million visitors from all over the world poured into London to see the marvels of the Victorian industrial age exhibited inside one of the greatest of those marvels: the Crystal Palace in Hyde Park. Lord Aberdeen famously remarked to the Queen, ‘I never remember anything before that *everyone* was pleased with, as is the case of this Exhibition’.⁴

The immediate impact on the Polytechnic was beneficial; its description was included in the many guidebooks to London produced in this period, and its own visitor numbers increased. The longer-term impact was to be more problematic. In later years the Polytechnic claimed to have been the inspiration for the iconic event: ‘It is generally believed that the idea of the Great Exhibition of 1851 was suggested to the late Prince Consort by the previous success of the Polytechnic, and by the demonstrations which it afforded of the efficacy and value of such an instrument of technical instruction.’⁵

Whatever the justification for this claim, the Polytechnic displays must have seemed very small to visitors in comparison with those of the Crystal Palace. New attractions could still draw in the crowds but it was increasingly difficult to retain an audience. The Polytechnic’s old rival, the Adelaide Gallery, had closed in 1848 to reopen as Laurent’s Casino, and the Diorama in Regent’s Park closed at the end of 1851.

The considerable profits made from the Great Exhibition were partly used to further Prince Albert’s aims of supporting education and industry. The estate in South Kensington which is now the home of museums, colleges and royal societies was purchased and the first South Kensington museum opened in 1857. This was the forerunner of both the Victoria and Albert Museum and the Science Museum. Over time, the growth of the public museums was to have a profound impact on private institutions like the Polytechnic. In 1853 the Department of Science and Art was created to encourage the teaching of art and applied sciences. The Department achieved its aim by supporting a number of schools and museums, giving grants for evening classes in science and arts, and becoming an examining and regulatory body. This marked the first intervention by central government into the area of post-elementary education. Eventually this was to prove a critical factor in the history of the Royal Polytechnic and also of its successor, the Regent Street Polytechnic.

An event in 1852, the year after the Great Exhibition, should be mentioned even if it cannot (yet) be explained. On 20 November 1852 the directors of the Polytechnic were granted a supplement to the original charter of incorporation. In 1838 capital of £35,000 had been divided into 350 shares of £100 each. Under the terms of the new charter, this was changed to 3,500 shares of £10 each, which made them accessible to a wider range of shareholders. The new charter said that the Institution was planning to establish ‘an Elementary School of Science’ among other important plans, and there-



Fig. 36
Photograph of John Henry Pepper taken from a carte de visite and transferred to a lantern slide.

4 Quoted in Eric de Maré, *London 1851: the Year of the Great Exhibition* (London: Folio Press, Dent, 1972), p. 43.

5 Wellcome Library, MS 5699, item 1.

fore was allowed to increase its capital from £35,000 to £50,000. ‘Such capital was never increased’ and the ‘Elementary School of Science’ is never mentioned again.⁶

Pepper began to make his mark as soon as he was appointed to the staff of the Polytechnic. The following report from June 1851 illustrates his developing style. There was no lecture programme at the Great Exhibition, so a series called ‘The Great Exhibition and the Royal Polytechnic Institution’ was presented at the Polytechnic highlighting particular exhibits. Pepper’s lecture on the chemistry of minerals and crystals was reported in the *Illustrated London News*:

The learned Professor stated that he was greatly indebted to Messrs Hunt and Roskell of Bond-street, who had kindly lent, to illustrate the lecture, several thousand pounds’ worth of diamonds, rubies and other precious gems, which were all shown to great advantage by the oxyhydrogen light. The mode of finding, grinding and polishing, were all matters of interest, which were fully discussed, and the Professor concluded his illustrations by two most satisfactory though simple experiments. Within two bottles of oxygen were placed common charcoal and the diamond, both being previously heated; when red-hot, carbonic acid gas was the product in both cases, shown by limewater becoming milky. The lecture was well attended, and the audience appeared highly gratified by the learned Professor’s labours.⁷

Pepper went on to give much more spectacular shows than this fairly routine science lecture, but his trademarks are here. He makes his lecture topical by linking it to the Great Exhibition, he adds an element of dazzling display using the Polytechnic’s oxyhydrogen light, he gives a comprehensive coverage of his subject, he performs successful experiments in front of his audience, and he makes sure that his particular lecture (just one part of the Polytechnic’s daily series of events) is fully and favourably reported in the press. Pepper’s genius for publicity was to become an asset to the Polytechnic, but it always included a strong element of self-promotion. The repetition of ‘learned’ in the review is characteristic. Throughout his life Pepper remained concerned to establish his scientific credentials; he later wrote that his title of professor ‘was not that of a hair-dresser or dancing master, but was conferred upon him by express minute of the Board of Directors’.⁸

Popular science lecturers could attract large audiences in the second half of the nineteenth century, but success depended on meeting high expectations of performance. Many are known to have rehearsed their delivery very carefully. Edmund Wilkie, a lanternist who joined the Polytechnic staff in 1872, wrote in his memoir of Pepper:

His style of lecturing was conversational and fluent ... His voice was clear, far reaching and of a kind that commanded attention; while the matter of his lectures was so arranged that his hearers were led onwards, step by step, until they became absorbed and the time devoted to the subject seemed all too short ...

⁶ TNA J 36/04.

⁷ *Illustrated London News*, 21 June 1851, p. 585.

⁸ *The True History of the Ghost*, p. 2.

Wilkie identified another quality in Pepper which must have given him the confidence to enter into his single lessee agreement with the directors, namely 'his correct judgement as to the public taste'.⁹

The announcement that Pepper was taking over as manager, and that following a short closure for alterations, the 'lectures, optical and other exhibitions' would continue as before, appeared in *The Times* on 1 July 1854.¹⁰ Just before opening to the public, Pepper hosted a formal *conversazione* to entertain supporters, scientists and the press. Two photographs were on display, 'one the largest, and the other the smallest, ever produced by the process'. The largest was a life-size portrait, and the smallest a miniature copy of the front page of *The Times* – which ensured a favourable notice in that newspaper.¹¹ When the Polytechnic opened to the public a few days later, the main attraction was 'the splendid illuminated cascade, displaying a variety of colours', accompanied by Pepper lecturing on optics and Bachhoffner on astronomy. A new photographic gallery was opened under the direction of a Mr Scott. In a separate advertisement placed by Scott in *The Times*, he:

respectfully informs his friends and the public that having been principal photographer for 14 years with Mr. Beard, he has now opened an establishment at this popular place of instruction for taking daguerreotype and stereoscopic portraits, in connexion with the School for Teaching the Art of Photography. The rooms have been erected expressly for the purpose, and are most effectively lighted, so that portraits can be taken at any time in the day.¹²

Pepper was faced with the task of mounting a weekly programme of events in both theatres, as well as demonstrations and exhibitions in the Great Hall and

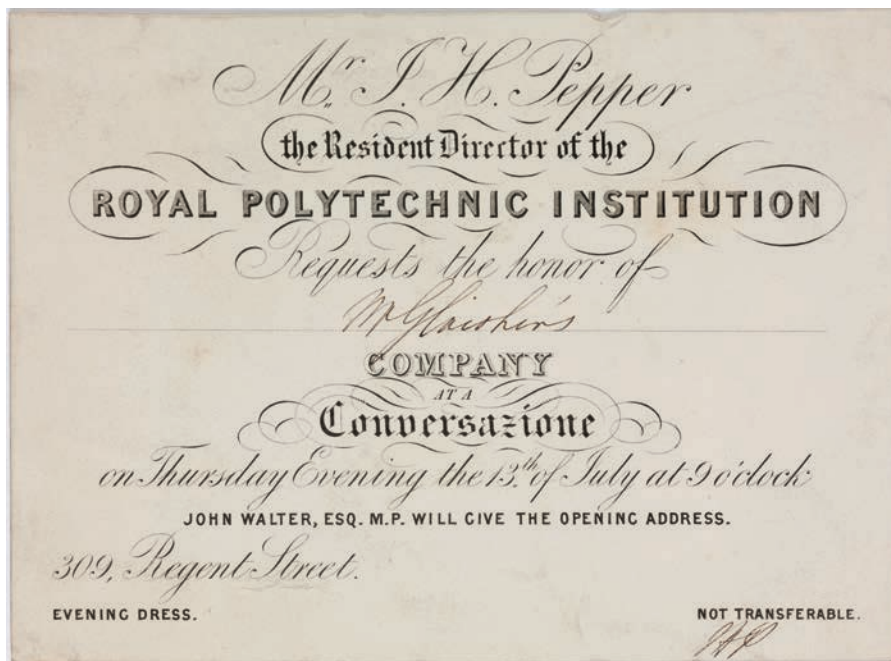


Fig. 37

Pepper held this *conversazione* in 1854 to mark the beginning of his period as manager and sole lessee of the Polytechnic.

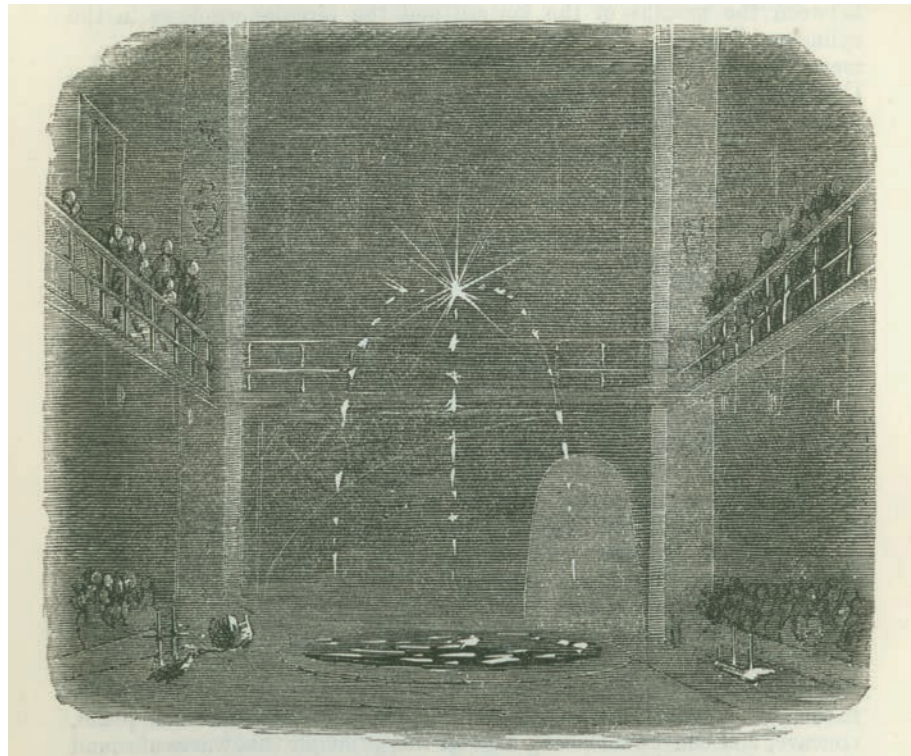
- 9 E.H. Wilkie, 'Professor Pepper: a Memoir', *Optical Magic Lantern Journal and Photographic Enlarger*, 11 (1900), p. 72.
- 10 *The Times*, 1 July 1854, p. 2.
- 11 *The Times*, 17 July 1854, p. 7.
- 12 *The Times*, 22 July 1854, p. 1.

galleries, featuring sufficient ‘new attractions’ to appeal to an increasingly demanding public. He was not an inventor like Cooper (who died in 1854) or Bachhoffner (who left the Polytechnic in 1855 to become manager at the Colosseum); his skills lay in his dramatic and innovative presentation of the work of others. In 1855 he demonstrated the acoustic experiments of his friend Sir Charles Wheatstone, whose inventions had regularly been exhibited at the Polytechnic, by means of a telephonic concert ‘... by which four of Erard’s harps play sweet but mysterious music, without visible hands, as the sounds are conducted to them by rods from instruments played upon by performers who are placed several floors beneath the lecture-room’.¹³ A drawing of this experiment by the artist Henry George Hine appears as the frontispiece of Pepper’s *Boy’s Playbook of Science* (see p. 61).

Top of the bill in the new Easter holiday programme that opened on 17 April 1854 was a series of dissolving views showing the principal places and battle scenes from the Crimean War, including the battle of Sinope and the destruction of the Turkish fleet. The slides, which were created from images supplied by the *Illustrated London News*, accompanied a lecture giving the latest news of the campaign.¹⁴ This was a new departure for the Polytechnic – using its resources to report on an event in the news, rather than a scientific development – but it was evidently popular because subsequently similar events featured regularly in the programme. Pepper, ever in touch with the public mood, accompanied this series with patriotic and charitable events to raise money for the victims of war.

Fig. 38

The illuminated cascade was built by the distinguished French optician and lanternist Louis Jules Duboscq during his visit to the Polytechnic in the summer of 1854. Spectacular colourful effects were created in the falling water by the careful positioning of electric lamps and lenses. Pepper wrote that the Queen and her family ‘minutely examined’ the working of the cascade during the royal visit.



13 *Illustrated London News*, 3 February 1855, pp. 117–118.

14 The circulation of the *Illustrated London News* increased during its reporting of the war.

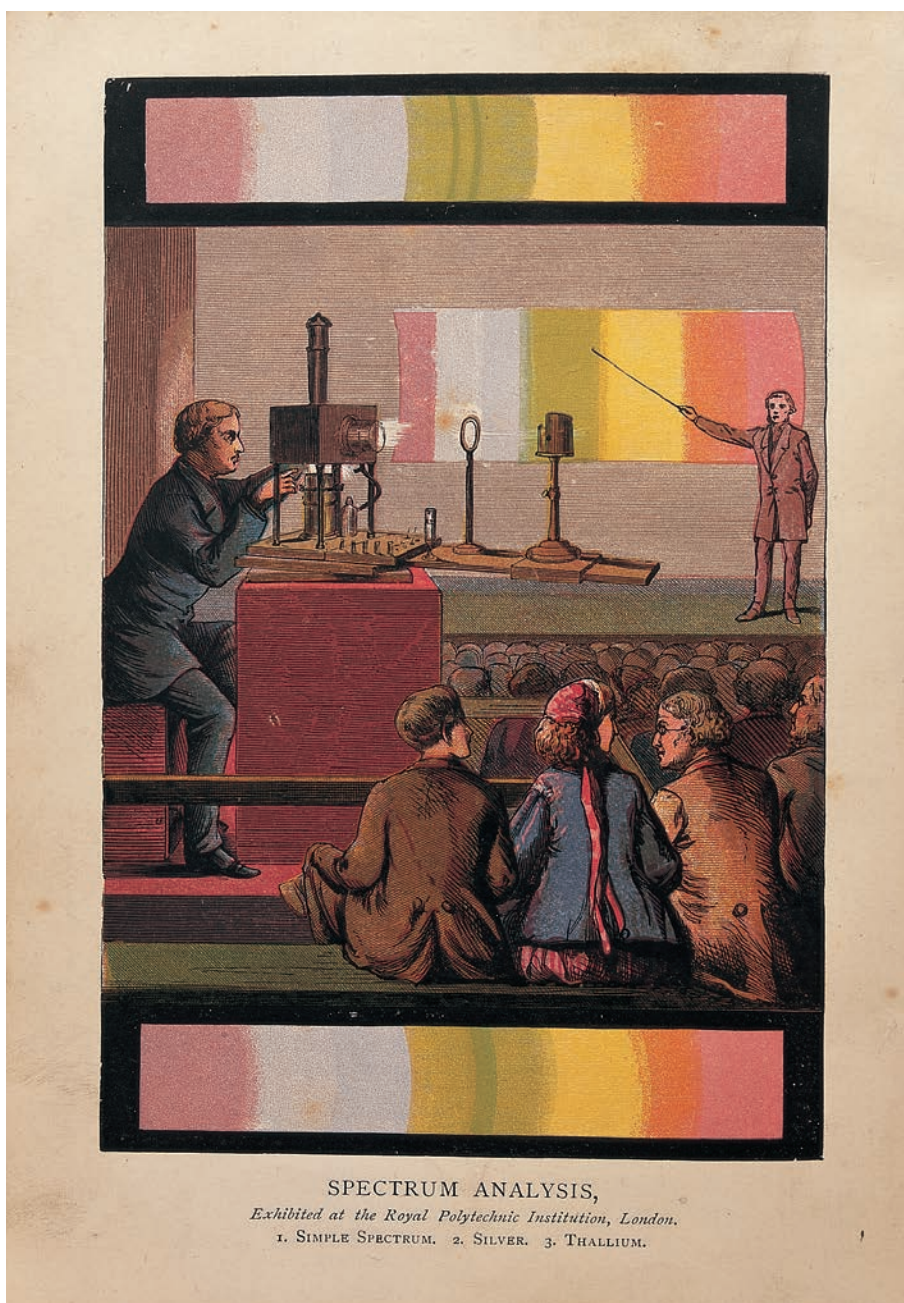


Fig. 39

A lecture on spectrum analysis using Duboscq's lantern, which was illuminated by electric light.

Press advertisements make it clear that Pepper was beginning to include items lacking even the slightest connection with science in the Polytechnic programme. The telephonic concert was accompanied by a sequence of dissolving views called 'Sinbad the Sailor', readings from Shakespeare and comic songs. Once *Punch* noticed that 'the proprietors of the Polytechnic ... are about to introduce dramatic readings and singsongs as part of their attractions', it launched into an elaborate piece of nonsense entitled 'Philosophical Drama', suggesting a series of suitable themes and punning (as it often did) upon Pepper's name:



Fig. 40
This cartoon showing actors loose among the Polytechnic machines accompanied an article entitled 'Philosophical Drama'.

Mr. Pepper might make the reading of various compounds quite simple, and if he could not reach the sublime, might at least achieve a sublimate ... 'The reduced Oxide, or I don't care a Button' would be a good title for either farce or tragedy; with a few well-seasoned remarks from Mr. Pepper, a good audience could not fail to be mustered.¹⁵

PEPPER AND EDUCATION

During Pepper's first month as manager of the Polytechnic, a further notice of his intentions appeared in *The Times*:

In order to render this popular place of instruction of greater national value than heretofore, Mr. Pepper begs to inform the industrial classes at all factories and workshops that they and their families will be admitted on Monday evenings at a payment of 6d. each, provided they produce a ticket signed by the foreman of the works to which they may belong. Books of tickets have been supplied to many factories and will be furnished to all others as soon as possible. The lectures will be delivered by eminent professors, and will consist of regular courses on chymistry, geology, natural philosophy, astronomy, mechanics, etc.¹⁶

Pepper did not invent this admission system; it was also used by the Government School of Mines and Science Applied to the Arts in 1852 to encourage working men to attend a special series of science lectures. The School had been founded in Jermyn Street after the Great Exhibition; it became the Royal School of Mines in 1863, moved to South Kensington in 1872, and was incorporated into Imperial College of Science and Technology in 1907. In 1856 Pepper took a much bigger step, introducing a comprehensive series of evening classes, to be held every weekday in subjects ranging from arithmetic and algebra to French and German. At the end of the year students could opt to enter for the Society of Arts examinations.

The Society's full name – the Society for the Encouragement of Arts, Manufactures and Commerce – reveals its purpose; the Society had instigated the Great Exhibition of 1851. Afterwards, members debated what action the Society could take to tackle the need to improve educational standards highlighted by the Great Exhibition. As a first step in 1852 various scientific societies, literary societies and mechanics institutes were invited to join in union with the Society; the first annual conference of the Union of Institutions in Association with the Society of Arts was held later that year. In 1856 this private body took the initiative of introducing the first public examinations to be held in this country, offering the opportunity of gaining a qualification to members of all partner organisations.¹⁷ After the initial round, other institutions teaching similar subjects were invited to join the Union, and Pepper took advantage of this offer. The *Journal of the Society of Arts* records the speech he made at an inaugural meeting for evening-class teachers held in

15 *Punch*, 1854, p. 179.

16 *The Times*, 31 July 1854, p. 2.

17 The earliest examination was held in 1855, but only one candidate presented himself. Frank Foden, *The Examiner: James Booth and the Origins of Common Examinations* (Leeds: University of Leeds School of Continuing Education, 1989), provides a detailed history of the introduction of these examinations.

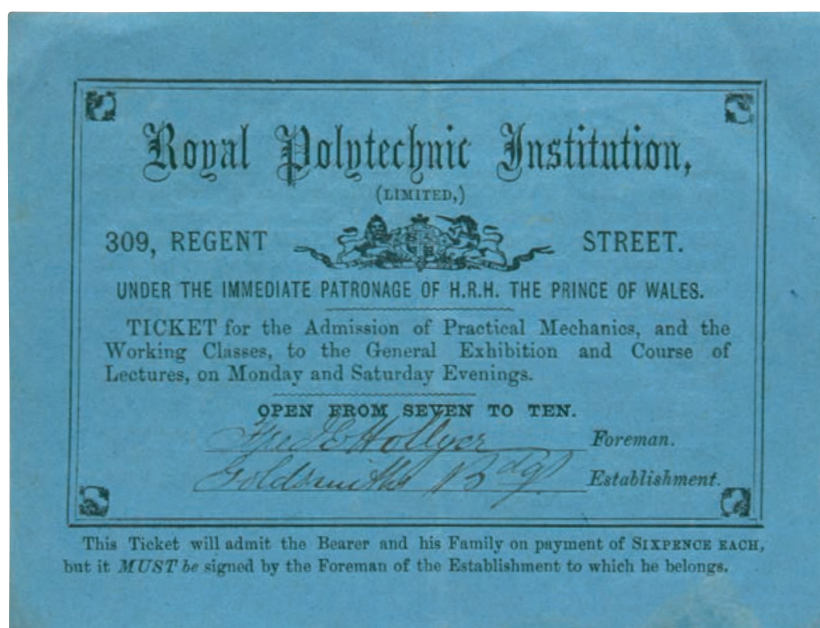


Fig. 41

Pepper instituted a scheme for reduced admission rates for working men in 1854; this surviving example of an admission ticket, duly signed by the bearer's foreman, is of a later date.

Regent Street in September 1856. The following extract reflects his characteristic enthusiasm, and also his appreciation of the significance of the introduction of the Society of Arts' certificates:

He had always been anxious to make the Polytechnic not only a place for popular amusements in science, but an Institution in which the elements of science should be regularly and accurately taught ... He regarded this movement of the Society of Arts as one of great educational importance ... He was anxious to impress upon the gentlemen present the national importance of these examinations, and he hoped the teaching would have reference to such results ... How much better it was for a young man to work out his own independent position rather than importune friends for letters of recommendation and testimonials, which are often regarded as utterly worthless ... He had started these classes, not with any desire to make a profit, but to meet what he considered a want. Every farthing after the ordinary expenses of the class room were paid, would go for the benefit of the teachers ... He had placed the general direction of the classes under Mr. Buckmaster, one of the science masters of the Department of Science and Art, and well acquainted with the duties of such an undertaking ...¹⁸

John Charles Buckmaster was a determined and eccentric character who had come late to science. The son of an agricultural labourer, largely self-educated, in the mid-1850s he was combining studying science at the School of Mines with part-time teaching. Buckmaster was an early advocate of technical education: 'I could not understand a teacher being educated who could not explain the construction and operation of a common pump ...'¹⁹

Buckmaster arranged the Polytechnic evening classes and taught chemistry; he also campaigned vigorously for better conditions for both students

18 *Journal of the Society of Arts*, 26 September 1856, p. 728.

19 Quoted in Foden, *The Examiner*, p. 57.

20 TNA PRO 30/29/19/20.

21 *JSA*, 26 June 1857, p. 465.

and teachers. His request to Lord Granville, the lord president of the council, that the Privy Council on Education receive a deputation from the Royal Polytechnic Institution to discuss further support for the evening classes was turned down.²⁰ At the Annual Conference between the Institutions in Union and the Council of the Society of Arts in 1857, his contributions provide a unique glimpse of the Polytechnic's classes. His careful preparation of his students for the examinations had given excellent results:

The classes started at the Polytechnic Institution last autumn, were with especial reference to these examinations; but for the establishment of these examinations those classes would probably not have been formed. There were 500 pupils in those classes last September, the major portion of the candidates from which were those who lived by their daily labour. Each person was limited to three subjects. The classes proceeded in the most creditable manner, and out of 53 candidates, 49 of the number obtained certificates, and he was satisfied that the same thing might be done at half-a-dozen other points in London, if only people had the energy and determination to set about it.²¹

So little information is available about these earliest students that it is not possible to say whether any women were included in their number, though the Society of Arts examinations were open to all. Certainly by the 1870s women were included in the classes.

Fig. 42
Timetable for the first session of
Polytechnic evening classes in 1856.

TIME TABLE OF CLASSES
MEETING AT
THE ROYAL POLYTECHNIC INSTITUTION,
(In union with the Society of Arts.)
WINTER SESSION. FIRST TERM, 1856.

DAYS.	SUBJECTS.	TIME, P.M.	PROFESSORS.	TEXT BOOKS.
MONDAY	Arithmetic and Algebra.	7 o'clock to half-past 8.	Dr White, F.C.P., Member of the Council and Examiner in the Royal College of Preceptors.	Colenso's Arithmetic and Algebra.
	Chemistry.	20 minutes to 9 o'clock to half-past 9.	J. C. Backmaster, Esq., of the Department of Science and Art; and J. H. Pepper, Esq., F.C.S., A. Inst., C.E., &c.	Wilson's Chemistry, by Chambers.
TUESDAY	Geometry and Mensuration.	7 o'clock to half-past 8.	George J. Tear, Esq., C.M.D., of Training College, Winchester.	Tate's Mensuration; Pott's Euclid.
	Geography.	20 minutes to 9 o'clock to half-past 9.	George A. Chapman, Esq., C.M., of St Mark's College, Chelsea.	W. Hughes's Geography.
WEDNESDAY	History and Literature.	7 o'clock to 8.	The Rev. C. Boutell, M.A., Oxon.	
	French.	Quarter-past 8 o'clock to half-past 9.	Mons. G. Roub'ot, Bachelier des Lettres.	Smith's French & English Pocket Dictionary; de Fiva's French Grammar; Montequieu's Grandeur, et Decadence des Romains Voltaire, La Henriade.
THURSDAY	Mechanics and Elements of Mechanism.	7 o'clock to half-past 8.	John Bridge, Esq., M.A.	Lardner's Handbook of Mechanics
	German.	20 minutes to 9 o'clock to half-past 9.	M. Heidenheim, Esq., Ph. D.	Ahn's Exercise and Grammar.
FRIDAY	Bookkeeping.	7 o'clock to 8.	Alex. Macpherson, Esq., Public Accountant.	Chambers' Elements of Book-keeping.

It is proposed to divide the Session into two Terms—the first term will commence October 13th, and terminate in January 1857. The second term will commence in January and end a few weeks previously to the Annual Examination of the Society of Arts. The teaching of the second term will adapt itself as much as possible to the lessons of the previous term, so as to form a progressive course of instruction. The main object of these classes is educational, and they will be open to all without difference or distinction. Each student must provide himself with the specified text-book, which will be supplied at a very reduced rate.—Tickets for the term Five Shillings for each subject; there will be about 14 lessons in the term.
J. H. PEPPER, F.C.S., A. Inst. C.E. &c. &c.
Sole Lessee and Manager.

57

Buckmaster was especially sensitive to the needs of working men, whose elementary education was so deficient that they really needed practical instruction to accompany the lectures. Lectures continued to be the means of teaching at the Royal Polytechnic; it was Quintin Hogg who later pioneered the introduction of practical trade classes on a large scale.

Buckmaster continued his own scientific studies, and did not stay long at the Polytechnic. His life provides a striking example of the social mobility which the new educational opportunities afforded to determined students; he became the inspector of science and art schools for the Department of Science and Art. His four sons, all graduates, had distinguished professional careers, and one of them – Stanley – was appointed lord chancellor in 1915, becoming Viscount Buckmaster in 1933.

Once the classes were successfully established, they disappeared from view to later generations. Most press comment about the Polytechnic concentrated on exhibits and performances; Pepper was rarely fully credited for his contribution to its educational work.

PEPPER'S DEPARTURE

Pepper's management of the Polytechnic received a royal accolade when Queen Victoria and Prince Albert visited the Polytechnic for a private performance on 12 May 1855. The Queen saw a programme which included the telephonic concert; she also purchased a photograph of a wounded veteran from the battle of Inkerman. The presence of several of the royal children in the party reflects the direction in which Pepper was taking the Institution. He had a real rapport with young audiences, and many events, particularly during the Christmas and Easter holiday seasons, were directed at them.

The Polytechnic was now established as a centre of respectable family entertainment, but had its scientific reputation suffered under Pepper's management? In May 1858 *The Times* published one of its regular reviews of theatres and entertainments in London – but this article is more analytical than usual, going beyond the usual listing of attractions to show how the particular character of the Polytechnic was perceived by Londoners. The reporter considers that of the remaining 'semi-scientific places of amusement ... the establishment at which the scientific element is most distinctly preserved is the Polytechnic Institution'. The Panopticon, a grand new building opened in Leicester Square in 1854, designed to outshine the Polytechnic, had quickly 'failed as a scientific enterprise', changed its name to the Alhambra, and become an 'equestrian circus'. He suggests that the inclusion of entertainment is probably a necessary measure to attract an evening audience, and concludes, 'the visitor to the Polytechnic must be fastidious indeed if he does not find something to amuse him amid all the variety that is presented'.²²

The article appears to confirm that Pepper was demonstrating a sure touch in his management, but in fact within a few weeks Pepper was announcing that he would be leaving the Institution on 24 June.²³ The directors

²² *The Times*, 17 May 1858, p. 9.

²³ *The Times*, 19 June 1858, p. 1.

Fig. 43
Wheatstone's telephonic concert was part of the programme seen by Queen Victoria and her family when they visited the Polytechnic on 12 May 1855.



had demanded an increase in his rent, which Pepper considered unrealistic. He later wrote of this period: 'The efforts made by the writer to give refined science at the Polytechnic to the public at that time were not successful in a monetary point of view, and he lost his private patrimony trying to effect this object, as sole proprietor of that establishment.'²⁴

After arranging a lavish three-day benefit for himself, he departed to become an itinerant lecturer, accepting invitations to speak from a variety of organisations, including a number of public schools. The lectures he gave at

24 J.H. Pepper, *Cyclopaedic Science Simplified* (London: Warne, 1869), p. 525.



Fig. 44

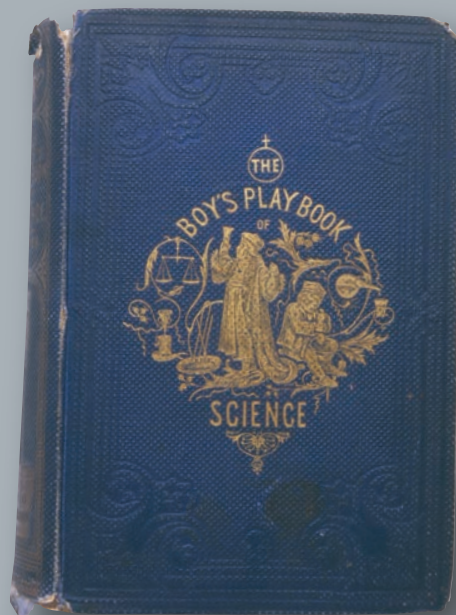


Fig. 45

Pepper had a particular rapport with children. He is seen here giving one of his popular children's shows (Fig. 44). Two of Hine's cartoons from The Boy's Playbook of Science (Fig. 45) show his light touch in providing an introduction to science (Figs. 46, 47). Hine appears to have used artistic licence – here and on page 83 – in presenting Pepper as an avuncular figure. His appearance on page 52 and page 82 is quite different.



Fig. 46

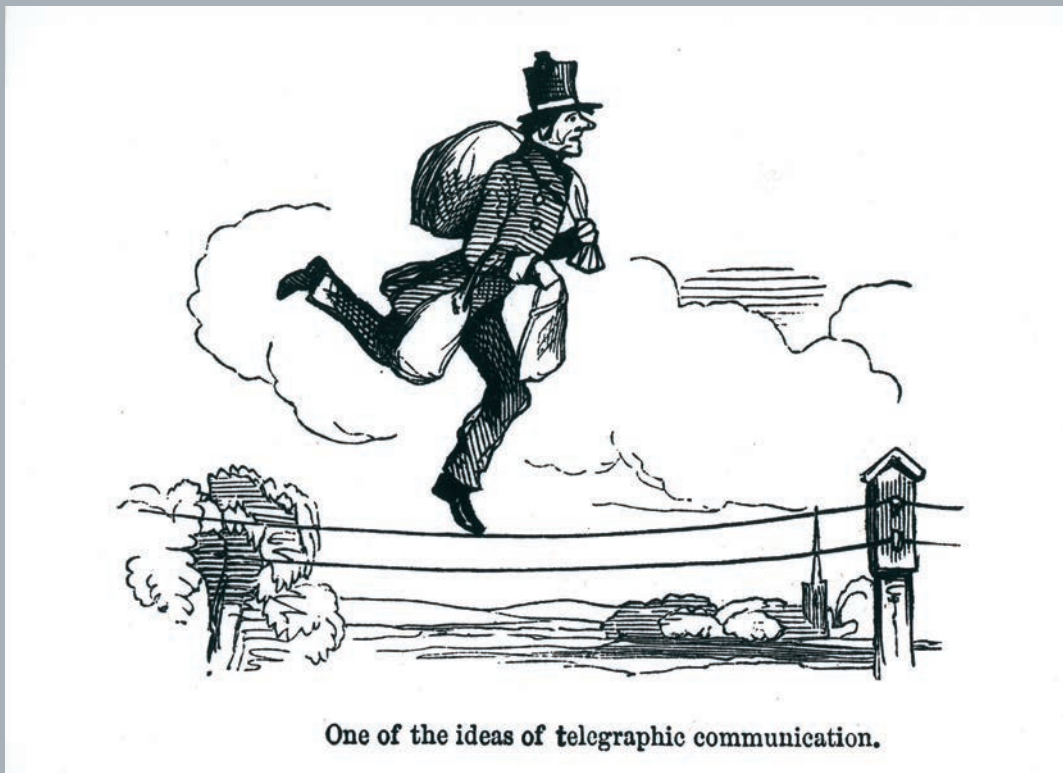


Fig. 47

Eton must be mentioned, because among his schoolboy audience was the young Quintin Hogg. Hogg wrote home to his mother:

Pepper, the Polytechnic lecturer, is giving a weekly course of lectures down here, and I attend them, and I am going to try for the School prize, though it is an awful sap. There are five lectures, ten questions every lecture, each question takes me an hour besides the diagrams ... The lectures are on electricity, and he has every sort of equipment on an enormous scale.²⁵

Pepper published his most famous textbook, *The Boy's Playbook of Science*, in 1860. It was an immediate success, selling throughout the English-speaking world and running into a number of editions. The illustrations – produced by the comic artist and slide painter H.G. Hine from Pepper's own sketches – retain a humour and freshness which explain the strength of their appeal to children. Pepper looked back to his own boyhood: 'The author recollects with pleasure the half-holidays he used to devote to Chemistry, with other King's College lads, and in spite of the terrible pecuniary losses in retorts, bottle and jars, the most delightful amusement was enjoyed by all who attended and assisted at these junior philosophical meetings.'

He also writes more seriously about his belief in the importance of scientific education:

Let 'Young England' enjoy his manly sports and pastimes, but let him not forget the mental race he has to run with the educated of his own and other nations; let him nourish the desire for the acquisition of 'scientific knowledge', not as a mere school lesson, but as a treasure, a useful ally which may some day help him in a greater or lesser degree to fight 'The Battle of Life'.²⁶

The break with the Polytechnic was not a clean one. In November 1858 Pepper took the directors to court to recover sums which he claimed were owing to him. The case was never heard, however, because it was overtaken by a disaster so serious that the very future of the Polytechnic was thrown into jeopardy.

25 Ethel M. Hogg, *Quintin Hogg: a Biography*, 2nd edn (London: Archibald Constable, 1904), p. 32.

26 John Henry Pepper, *The Boy's Playbook of Science*, 2nd edn (London: Routledge, Warne & Routledge, 1860), p. 2.

Disaster and recovery

FATAL ACCIDENT AT THE POLYTECHNIC

Just before 11 p.m. on 3 January 1859, as the audience was leaving after a Christmas performance, the spiral staircase leading down from the balcony of the large theatre collapsed. Emma Pike, aged 10, was killed and some thirty casualties were taken to the nearby Middlesex Hospital. The Christmas holidays were the Polytechnic's busiest time; there had been more than a thousand people in the building that evening. Most of them had reached the street before the collapse occurred, or the death toll would have been much higher. Even so, it was a catastrophic accident:

For some minutes, a scene of consternation ensued which it were impossible to describe. It was distressing to hear the screams of the terror-stricken people who had fallen with the stairs, and some moments elapsed before the cloud of dust cleared away sufficiently to allow of the police and the bystanders rendering any assistance to the unfortunate sufferers.¹

The first inquest hearing on 6 January set up an investigation into the cause of the disaster. At the final session on 24 January, the jury reached a verdict of accidental death. The foreman made a long statement, in which he identified inadequate repair work done the previous year as the cause, and regretted that the directors had not chosen to reconstruct the staircase instead. The jurors also made a series of recommendations demanding the inspection and certification of buildings open to the public, which they asked the coroner to forward to the secretary of state.

The coroner observed in his summing up: 'The accident had caused uneasiness in the public mind. The Polytechnic Institution – the fountain of science, so to speak – they might have supposed would have been the last place in which there was any lack of regard for the public security, seeing that during the last 20 years it had done so much to improve the public mind and educate the people.'² The jury also deplored the cause of the accident, but praised the courageous conduct of the lecturer J.L. King in going to the rescue of victims trapped by the falling staircase.

The directors launched a public appeal on behalf of the victims; Prince

¹ *The Times*, 5 January 1859, p. 12.

² *The Times*, 25 January 1859, p. 10.

Albert headed the list of contributors. Behind the scenes the board, led by Robert Longbottom – who had been appointed as managing director following the departure of Pepper – was plunged into a series of crises. The directors were increasingly concerned about their personal liability in the face of the anticipated claims for compensation. Legal opinions on the protection offered by the charter which Cayley had obtained with such difficulty in 1838 were divided. The Polytechnic did not have sufficient funds to meet the costs that were already spiralling as a result of the accident. The board decided its only course of action was to wind up the company; its decision was confirmed by the shareholders at a special general meeting on 7 May 1859.

The directors were advised that their best course was to try to sell the Polytechnic as a going concern, and it remained open throughout 1859, providing some income to cover expenses. Some £1,500 was raised by mortgaging the property to pay damages, costs, arrears of rent and other pressing demands. Eliza Brazier was the first victim of the accident to bring an action against the Polytechnic; she had been awarded £10 and costs, which came to over £300, and further actions were anticipated.³ There was an attempt to sell the Institution at auction on 17 June but the reserve price was not reached. The master of the rolls finally granted the winding-up order on 29 December 1859.

The fate of the Polytechnic building hung in the balance for the next three months. Attempts were being made to form a rescue company, but it was slow to raise the necessary capital. Meanwhile the liquidator, assisted by William Greatorex of Chancery Lane, the Polytechnic solicitor, and Longbottom, was sorting out the affairs of the old company, preparing the final lists of shareholders and of creditors, valuing the assets prior to auction and disposing of the objects.⁴

The affidavits from the creditors have survived. They cast a belated light on the daily workings of the Polytechnic, as well as on the extent of its debt. The longest is from Pepper, and reveals the Byzantine nature of his financial arrangements with the directors. The livelihoods of those who depended on the Polytechnic were threatened; Collins was owed for numerous repairs and adaptations to the lanterns and other equipment, Cox was owed for printing, and Frederick Heinke of 103 Great Portland Street for repairs to the diving helmet and diving area. The builder, Mortimer Timpson, had not been paid for work on the staircase following the accident.⁵

Greatorex was also on the provisional committee for the proposed new company, and did his best to ensure a smooth transition. When the mortgage holder wanted to sell the property early in 1860, he found another backer to buy the deeds, giving the new company a little more time to raise the necessary capital. But he could not delay the auction, which took place in the large theatre at the Polytechnic on 7 March. Bidding reached £3,100, but the reserve price was revealed as £3,500 and the property remained unsold.

The unsuccessful bidder was Edward Tyrrel Smith, of whom it has been written: 'At the sale of any place of entertainment Smith would make the highest bid, flourish a £1000 note to demonstrate his means, and trust to luck



Fig. 48

G.J. Cox invented the petalcaust process for decorating ceramics and demonstrated it in the Polytechnic. This plate was fired on 15 January 1866.

3 The directors seem to have settled with some claimants out of court, but had to meet eight actions in all, which cost over £1,000.

4 This proved to be a nightmare. Eventually permission was obtained to sell unclaimed items at auction, which raised only £50. An offer from the South Kensington Museum to take the objects had to be refused.

5 TNA J 36/304, *passim*.

to raise the funds afterwards.⁶ If Smith had bought the Polytechnic building, he would undoubtedly have split the property, keeping the theatre – which would probably have been turned into a music hall – and disposing of the house in Cavendish Square and the gallery at 309 Regent Street. Smith offered to pay the reserve price after the auction, by which time the new company was finally in a position to offer £4,000 for the property. The liquidators arranged a meeting on 22 March to which both parties were invited. Smith did not appear at the appointed time, and the Polytechnic Institution Limited bought the property. The rescue bid had finally succeeded.

THE POLYTECHNIC INSTITUTION LIMITED

The movement to rescue the Polytechnic grew out of a widely held sense that the Institution had been performing a useful social role. The supporters listed in a surviving prospectus for the new company include clergymen, philanthropists and educationalists rather than the lovers of practical science who had supported the Institution in 1838. Although the directors of the new company declared its purposes in terms copied almost *verbatim* from Cayley's documents, the emphasis had shifted significantly towards education.⁷

The directors included John Phené, the first managing director of the new Institution, and Thomas Twining, a member of the wealthy family of tea merchants, who was an authority on technical education.⁸ The Rev. Charles Mackenzie became head of the educational department. In 1848 the bishop of London had appealed to the clergy to start evening classes to improve the moral, intellectual and spiritual condition of young men in London. Mackenzie had responded by establishing Metropolitan Evening Classes for Young Men in Crosby Hall, Bishopsgate. He remained director of the educational department at the Polytechnic until the Institution failed in 1881. The Rev. J.B. Owen became the chairman.

The directors needed to prepare the building for reopening and to persuade visitors to come back to the Polytechnic, which had been closed since 6 March 1860, the day before the auction. It remained closed until the autumn while considerable reconstruction and redecoration was carried out.⁹

The directors promised tighter financial control. They increased the rental income by letting out the house at 5 Cavendish Square and by building two new shops into the Regent Street frontage. The laboratory was moved out of the basement and re-equipped. Classrooms for the educational department were added to the front portion of the building on the first floor. A former lecture theatre was converted into a new picture gallery. The large steam engine – one of the remaining machines from the old Hall of Manufactures – was moved into the Great Hall. The diving bell was still in place, though the canals had disappeared. All publicity emphasised that the staircases had been completely reconstructed.

The directors began to advertise their prospective programme. On 1 August 1860 a notice appeared in *The Times* inviting inventors, patentees, artists,

6 John M. Turner, 'Edward Tyrrel Smith (1804–1877)', *ODNB*.

7 Forming a limited company was much easier in 1859 than it had been in 1838; the Polytechnic Institution Ltd was established when six shareholders registered the memorandum of association on 23 December 1859. TNA BT 31/442/1708.

8 Information about Thomas Twining (1806–95) from T.A.B. Corley, 'Richard Twining (1749–1824)', *ODNB*.

9 *Builder*, 17 November 1860, p. 739.



Fig. 49

The Polytechnic provided an important display and sales area for local industries. The Royal Polytechnic barometer was manufactured by the firm of Joseph Davis and Co., which had a workshop in Kennington Park Road. The Polytechnic barometers were made from about 1870 and manufacture probably continued beyond 1881. A card dial is shown here.

photographers, manufacturers and others to deposit objects for display. They evidently felt that the Polytechnic still had a role to play in exhibitions in spite of the growth of publicly funded museums, but exhibitions were on a smaller scale than before.

The Polytechnic was now offering several strands of educational provision. Popular science lectures were still to be part of the public programme in the hall and the theatres. In addition, the newly established educational department began to advertise a series of classes prior to its opening on 1 October. As well as evening classes in a wide range of subjects, it offered more general afternoon lectures 'calculated both to supply the deficiencies in early education and to stimulate the appetite for more close and laborious study'.¹⁰ A second group of lectures and classes grouped around the new chemistry laboratory was being advertised by E.V. Gardner, professor of chemistry. He was offering practical instruction in chemistry and analyses, and assistance with patent applications, as well as lectures for gentlemen preparing for government examinations.¹¹ These services are very similar to those offered when Cooper first established the chemistry laboratory in 1838, which suggests that they were finding a market, even though no information about them has survived.

Fig. 50, facing page

The Programme for 23 August 1861 names John S. Phené as managing director; in fact by that date Pepper had replaced Phené.

10 *The Times*, 27 September 1860, p. 3.

11 *The Times*, 19 November 1860, p. 1.

POLYTECHNIC INSTITUTION,

(LIMITED),

309, REGENT STREET.

THE PREMISES, HAVING BEEN ALTERED, IMPROVED, AND THOROUGHLY REPAIRED,
ARE RE-OPENED TO THE PUBLIC.

PROGRAMME FOR FRIDAY, AUGUST 23, 1861.

MORNING—OPEN FROM TWELVE TO FIVE O'CLOCK.

Half-past 12 - LECTURE on Messrs. VICTOR & POLGLASE'S NEW PATENT FUSE, and its applicability to Mining purposes, and great protection to our Miners lives, with the Physical properties of Mines and the Earth's Crust in General.—by John S. Phené, Esq.

One o'clock - SUB-MARINE EXPERIMENTS with the DIVER and DIVING BELL, the DIVER in HEINKE'S PATENT DRESS and HELMET.

Promenade in the New Picture Gallery.

Half-past 1 - EXHIBITION OF THE OXY-HYDROGEN MICROSCOPE, with living and other Objects,—by Mr. J. L. King.

Two o'clock - Musical Promenade in the New Picture Gallery.

Quarter-past 2 A TRIP UP THE RHINE TO SWITZERLAND, returning through France—CONFLAGRATION OF GLARUS—Novel Effects of the Fire—Three Hundred Houses burnt. being a Magnificent New Series of Dissolving Views, to which has been lately added magnificent effects of the FIRE at LONDON BRIDGE.—the whole arranged and the MS written by John S. Phené, Esq.

Quarter-past 3 FARADAY'S DISCOVERIES in ELECTRICITY, shown by IMPROVED APPARATUS, and INDUCTION COIL, GASSIOT'S CASCADE, &c., by which the ELECTRIC FLUID is made to assume VOLUMES of BEAUTIFUL COLOURS. By Professor GARDNER.

Four o'clock - Mr. GEORGE BUCKLAND'S Second Volume (quite new) of GRAVE and GAY," SCENES and INCIDENTS from ENGLISH HISTORY, PICTORIALY ILLUSTRATED, with VOCAL and INSTRUMENTAL MUSIC.—MASTER ARLIDGE (Le Petit Musicien), or a Glimpse into the Times of Louis Quatorze.

Artists:—Messrs. THOMAS DANSON, BUSS, MOON, &c., &c.

Artists for Dissolving Views.—Messrs. CLARE, SMITH, H. COX, FRY, & others; for "Don Quixote," Mr. PORTER.

OPEN DAILY from 12 to 5; EVENINGS, 7 to 10 o'clock.

ADMISSION, 1s. SCHOOLS, and CHILDREN under Ten Years of Age, HALF-PRICE.

RESERVED SEATS, 2s. STALLS, 3s.

Reserved Seats and Stalls will be numbered the same in each Theatre; and the Ticket will admit to the same seat in the Scientific Department, and Musical and other Entertainments, during the hours of each Morning and Evening.

NOTICE.—The INSTITUTION is OPEN to the INDUSTRIAL CLASSES, (for whom Special Courses of Lectures are now in preparation), EVERY SATURDAY AND MONDAY EVENING, ON PAYMENT OF SIXPENCE EACH, and the Directors are willing to negotiate with Schools, and Religious and other Societies, for the admission of numbers on the most liberal Terms.

An EDUCATIONAL DEPARTMENT has been formed, with suitable Class Rooms, for the Study of Art, Science, and Literature, for both Male and Female Pupils, under the Direction of the Rev. CHARLES MACKENZIE, M.A.

John S. Phené, Managing Director.

ENTIRELY NEW ENTERTAINMENTS.

ENTIRELY NEW ENTERTAINMENTS.

The Polytechnic opened fully to the public on 17 November 1860, in time for the Christmas season. The programme of lectures and entertainments comprised popular science lectures by King, Gardner and Phené, dissolving views and musical entertainments. *The Times* included the Polytechnic in its review of Boxing Day attractions on 27 December, remarking that it was well attended.¹² Two years after the disaster, the Polytechnic was on its way to recovering its former popularity as a centre of respectable family entertainment.

The *Art-Journal*, however, identified a missing factor:

To Mr. Pepper the Polytechnic is indebted for its old reputation, and we cannot refrain from still cherishing the hope that once again he may exemplify Mr. Layard's felicitous expression, by becoming 'the right man in the right place'.¹³

It seems that Pepper was taking advantage of his good relations with the press to begin his campaign to return. In 1860 he was based at the Marylebone Literary and Philosophical Society, and his advertisement for invitations to lecture may be found on the front pages of *The Times* that also include advertisements charting the progress of the new company. Phené's managing directorship at the Polytechnic was short lived; by the end of the summer of 1861 Pepper was back.

¹² *The Times*, 27 December 1860, p. 7.

¹³ *Art-Journal*, 22, 1860, pp. 377–378.

Pepper's ghost

On 16 August 1861 the following advertisement appeared in *The Times*:

POLYTECHNIC INSTITUTION. Return of J.H. Pepper, Esq., F.C.S., A.Inst.C.E., etc. The Directors beg to announce that they have made arrangements with this gentleman, and appointed him Professor of Chymistry and Honorary Director of the Scientific and General Departments. Professor Pepper will receive pupils and perform analyses in the laboratory and deliver popular scientific lectures on all the new subjects of the day, morning and evening.¹

Pepper's responsibilities no longer extended to the educational department, where the Rev. Charles Mackenzie remained in charge. Educational activities, however, are hidden from view in the 1860s; the attention of press and public was focused on the events in the Polytechnic theatres.

Pepper's impact on the programme was immediate; he began to lecture on 'The Art of Balancing', capitalising on the popular success in London of the tightrope-walker Blondin and the trapeze artist Léotard, and also on 'The Prevention of Railway Catastrophes and Collisions'.² Recalling the successes of 1851, he negotiated exclusive rights to exhibit photographs of the building under construction for the second London International Exhibition planned for 1862. These photographs of 'South Kensington's forgotten palace' in Cromwell Road were projected onto the screen in the large theatre during the final months of 1861.³

It was at Christmas that Pepper really came into his own, mounting the first of the spectacular Polytechnic pantomimes which brought the Institution to the height of its popular fame during the 1860s. The 1861 programme established the pattern for family entertainment that was followed in future years. The building was decorated with 'holly, Christmas and exotic plants' and the giant Christmas tree in the entrance hall was the focal point for a 'Gratuitous Distribution of Thousands of beautiful Ornaments, Toys, Pocket Knives, Scissors, Cannons, etc., among the Juvenile Visitors'.⁴

In accordance with established Polytechnic practice, the programme was made up of a variety of events around the building, which were repeated

1 *The Times*, 16 August 1861, p. 1.

2 *The Times*, 24 September 1861, p. 1.

3 *The Times*, 6 November 1861, p. 1.

4 UWA RPI R84, p. 3.

Polytechnic Institution,
(LIMITED),
309, REGENT STREET.
This Institution has for Twenty-three Years continued to Instruct and amuse the Public.

**THE CHRISTMAS TREE,
THE ENTERTAINMENTS, & LECTURES**
Provided this year are on the most liberal scale, and commence on
Boxing Day, December 26, 1861.

No. 1. *The Great Novelty, and (never before attempted) optical Entertainment of the*
COMIC PANTOMIME
OF
HARLEQUIN AND MOTHER GOOSE;
OR, THE GOLDEN EGG.
Being a revival of the late Joey Grimaldi's most favourite and Popular Piece.
The whole optical resources of the Establishment will be brought to bear upon this Novel Entertainment, and in order that full effect may be given to the Pantomimic Tricks, Mr. CHILDE has been engaged with his
PHANTASMAGORIA APPARATUS,
By which many novel movements and curious effects will be exhibited. The Entertainment includes optical illusions, shown by the Dissolving Views, Messrs. Childe and Hill's Phantasmagoria, and the Shadow Effects, as introduced by J. H. Pepper, Esq., at the Crystal Palace, the Chromatropes, and other optical contrivances.

MR. GEORGE ARMYTAGE COOPER
Will enact the "Chorus" for the Pantomimic Characters, and sing various favourite Comic Songs.
MASTER SANDERS, THE INFANT VOCALIST,
Of extraordinary power, will also sing the much admired Song of "The Cabin Boy," written and composed for this Pantomime when first performed in 1806.

No. 2. Exquisite and most beautiful series of Photographs, by Mr. England (Photographic Artist to the London Stereoscopic Company) of
SCENES IN AMERICA.
With special reference to the present Crisis.

Exhibition (Mornings only) of a
**No. 3. WONDERFUL RUSSIAN CAT, PERFORMING BIRDS,
AND MAGICAL DELUSIONS,**
By Professor Logrenia, who has lately returned from Russia.
[For conclusion of General Programme, see last page.]

Fig. 51
Harlequin and Mother Goose,
the first Polytechnic optical
pantomime, opened on Boxing
Day 1861.

during the two daily openings from 12 noon until 5 p.m., and then from 7 until 10 in the evening. Visitors could choose between 'promenading' to music around the picture galleries and the exhibits in the Great Hall, descending in the diving bell, taking refreshments and attending lectures such as that by Pepper on 'The Magnificent Field of Discovery, opened out by the New Terrestrial and Stellar Chemistry, and Experiments by Professors Bunsen and Kirchhoff. Illustrated with the new optical apparatus and the Electric Light from a most powerful battery'⁵ or by James D. Malcolm on 'Navies, dockyards and ironclad steamers', accompanied by a new series of dissolving views. Most of these items were short, lasting about thirty minutes; the pantomime was (unusually) allocated an hour on the programme.

The success of *Harlequin and Mother Goose* was followed in later years by other traditional favourites including *Cinderella*, *Aladdin* and *Beauty and the*

Fig. 52

Pepper incorporated shadow play into his optical entertainments. This illustration shows effects that he produced during performances at the Crystal Palace in Sydenham.



Beast. The pantomime usually ran until the beginning of Lent, when Pepper gave a series of lectures on astronomy, accompanied by optical effects and sacred music, before introducing new attractions for the Easter holiday. In 1862 the Polytechnic summer programme was linked to the International Exhibition; Pepper lectured on 'the chief scientific specialities' on show in South Kensington, and himself accompanied a 'select party' of visitors there each week. It was in the autumn, when the influx of exhibition visitors had departed and he was looking for new novelties for the Christmas holiday programme, that he first saw the model of a new invention called the 'Dircksian phantasmagoria', and so began the sequence of events that led to the first appearance of the ghost illusion on the Polytechnic stage.

Much has been written, at the time and since, about the rival claims of Pepper and Henry Dircks concerning the invention of the ghost illusion. Pepper's own account, *The True History of the Ghost*, did not appear until 1890. Dircks certainly began the process. He presented a model of his 'phantasmagoria' at the British Association for the Advancement of Science meeting

in Leeds in 1858. He was disappointed when no theatre manager expressed interest in his invention, but the design in its original form was impractical. It would not have worked in any existing theatre building. Pepper's contribution – based on his practical experience of creating spectacular effects within the Polytechnic – was to adapt the illusion so that it could be presented in any hall with a small pit under the stage.⁶

According to Pepper, the first appearance of the ghost was on Christmas Eve 1862 at a private view before an invited audience of 'a number of literary and scientific friends, and my always kind supporters, the members of the press' in the small lecture theatre.⁷ The 'new and curious illusion' was one of a number of experiments included in 'A Strange Lecture' by Pepper, advertised alongside the pantomime in the large theatre and other entertainments as part of the Christmas programme due to open to the public on Boxing Day.

Pepper was planning to follow the demonstration with an explanation of how it was done. The impact that the appearance of the ghost made on his audience, however, far exceeded his expectations, and he changed his mind. Pepper and Dircks made a joint application to patent the adapted apparatus. This was not granted until the autumn; the instant success of the illusion in the theatre meant the application was opposed by other theatre managers. In the beginning Pepper was careful to acknowledge Dircks as inventor, but as the illusion continued to grow in popularity Dircks's name disappeared. Dircks complained about what he saw as unfair treatment for the rest of his life.⁸

The ghost was an instant sensation. On 16 January 1863 the Polytechnic inserted a second advertisement below that advertising its pantomime programme in *The Times*:



Fig. 54, facing page
Painted lantern slides from the 1868 pantomime which was billed as The Wonderful Lamp – An Eastern Story which you will find A-Ladd-in.

Fig. 53
By the 1860s the Polytechnic was producing colourful and sophisticated posters. This illustration is signed by Alfred Concanen.

- 6 For a full and entertaining account of illusions at the Polytechnic, see Jim Steinmeyer, *Hiding the Elephant: How Magicians Invented the Impossible* (London: Arrow, 2005).
- 7 Professor Pepper, *The True History of the Ghost; and all about Metempsychosis* (London: Cassell, 1890), p. 3.
- 8 Henry Dircks, *The Ghost!* (London: Spon, 1863).



POLYTECHNIC. The SPECTRE DRAMA. This astounding optical effect, in which a living being walks through the apparently solid image of another person, surpasses all the phantoms of the spirit-rappers and mediums, and is introduced in Professor Pepper's 'Strange Lecture'. The press have pronounced it to be the most startling novelty produced this season at any place of entertainment. For hours, see programme of eight pages, sent anywhere for two stamps.⁹

The language is very close to that of the review published in the same newspaper on 27 December 1862:

We really do not think we say a word too much in praise when we call this 'strange lecture' one of the most curious displays in London. The spectres and illusions are thrown upon the stage in such a perfect embodiment of real substance that it is not till the haunted man walks through their apparently solid forms that the audience can believe in their being optical illusions at all ... Why did not the 'medium' and spirit rappers get hold of this invention before it was made public? The illusions might fail to convince, but at least they would have left all seekers after spiritual revelation in a sore state of puzzle and uncertainty, as they most certainly do now at the Polytechnic.¹⁰

Punch joined in the fun, asking:

If there are any real ghosts, and if they can communicate with the living by raps, why do they suffer their authenticity to be impugned without a sensible protest against a calumnious representation? Why do they not give PEPPER, and the other philosophers who produce the sham ghosts, a rap over the head, or at least, a rap on the knuckles?¹¹

Visitors continued to crowd into the small theatre at the times when the ghosts were due to appear; on Easter Monday the show transferred to the large theatre and remained part of the programme for the whole of 1863.¹² In May the Prince of Wales (the future King Edward VII) brought his new bride (later Queen Alexandra) and an entourage to see it. After the performance the royal party were taken behind the scenes and shown how the effect was created. Shortly after this visit the Prince agreed to be patron of the Institution, enabling it once again to use the title of 'Royal Polytechnic' that had been lost when the first Company was wound up.

Ghosts began to appear in other theatres. Pepper attempted to attract a more aristocratic audience by putting on special sessions at an increased price:

A series of 'fashionable Saturday morning entertainments' has been commenced at the Polytechnic, on the assumption that a heightened tariff will command an increase of refinement in the visitors. The aristocrats of Saturday are not to be debarred from the enjoyments which are so attractive to the democracy during

9 *The Times*, 16 January 1863, p. 1.

10 *The Times*, 27 December 1862, p. 4.

11 *Punch*, 10 October 1863, p. 140.

12 For a more detailed account of these early performances, see Jeremy Brooker, 'The Polytechnic Ghost: Pepper's Ghost, Metempsychosis and the Magic Lantern at the Royal Polytechnic Institution', *Early Popular Visual Culture*, 5 (2007), pp. 189–206.

the rest of the week. The ghost is guaranteed to walk at 4 o'clock precisely, and relieve a lecture on the newly-discovered metal thallium, to which substantial fare it forms a piquant dessert.¹³

This comment from *The Times* hints at the impact of the ghost upon Pepper and the Polytechnic. Both benefited from the unexpected bonanza. Pepper later wrote, 'the ghost at the Polytechnic ... earned £12,000 in a comparatively short space of time. I received an illuminated address of thanks, with a handsome honorarium, from the directors, and subsequently they presented my bust in marble to my dear late wife ...'.¹⁴

This sudden burst of celebrity shaped the rest of Pepper's career. The public expected a new sensation every season. *The Times* journalist who attended the private view of his new Christmas entertainment in December 1867 wrote:

The title, 'Faraday's Discoveries and their Results', summarises accurately enough the earlier portions of the lecturer's address; but with the major part of the audience interest and expectation had been excited principally by the latter or alternative branch of the title which ran thus, – 'being real Science as contrasted with unreal Science, called "Spiritual Manifestations"' – a declaration leading to the belief that Professor Pepper was about to lift the veil which has hitherto concealed, or partially concealed, the doings of professors of the black art.¹⁵

During the evening Pepper performed a number of experiments, arranged a transatlantic exchange of messages by the electric telegraph, and presented an illusion in the form of levitating a table and a chair designed to debunk the spiritualists, but in spite of all this the journalist expressed a sense of disappointment. The demonstrations of 'unreal science' had not been thrilling enough.

Although the pressure of public expectation drove Pepper to devise ever more elaborate optical illusions, he continued to see himself as a serious man of science. At a time when spiritualism was much in vogue, he was careful to present magic at the Polytechnic in rational, scientific terms. This point is so clearly made in the following extract from a favourable press review reproduced in the Polytechnic weekly programme that it may well have originated from one of his own press releases: 'Professor Pepper deals boldly and cleverly with the subject of spiritualism, and science can do under the full blaze of a lime light what the spiritual professors could only do in the dark for the fear of discovery.'¹⁶

It is ironic, as his younger colleague Edmund Wilkie observed, that a man who wished to be remembered as a scientist should actually be remembered for an illusion.¹⁷ The historian Richard Altick dismissed the ghost as 'an illusionist novelty that exactly suited popular taste in those years of cheap sensations'.¹⁸ This view of Pepper and the Polytechnic in the 1860s has been challenged by historians of science such as Bernard Lightman and Jim Secord. They do not dismiss Pepper's illusions as mere stage magic, but value them

13 *The Times*, 25 May 1863, p. 9.

14 *The True History of the Ghost*, p. 35.

15 *The Times*, 23 December 1867, p. 6.

16 Royal Polytechnic Institution, *Programme for Week Beginning 5 October 1868*, BL 8710 cc1.

17 E.H. Wilkie, 'Professor Pepper: a Memoir', *Optical Magic Lantern Journal and Photographic Enlarger*, 11 (1900), p. 72.

18 Richard D. Altick, *The Shows of London: a Panoramic History of Exhibitions, 1600–1862* (Cambridge MA: Harvard University Press, 1978), p. 504.

POLYTECHNIC
ROYAL INSTITUTION LIMITED
 THE REGENT STREET.
 PATRON: H. R. H. THE PRINCE OF WALES.

This Institution has for Twenty-six years continued to instruct and amuse the Public.

EASTER HOLIDAY ENTERTAINMENTS.
 No. 1. — **THE NEW & PATENTED ILLUSION**
 (J. H. PEPPER & THOMAS WILLIAM TOBIN JOINT INVENTORS.)
 CALLED
PROTEUS;
 OR,
WE ARE HERE, BUT NOT HERE
 (Title and Entertainment Copyright.) The right of Translation is reserved,
 THIS
STARTLING ILLUSION
 Exhibited daily, in Professor Pepper's
NEW LECTURE ENTERTAINMENT,
 WHICH WILL INCLUDE
NOVEL, PICTORIAL, DIORAMIC, AND SPECTRAL SCENES,
 (J. H. PEPPER & HENRY DIRCKS JOINT INVENTORS.)
 ILLUSTRATING
CAPTAIN RICHARD K. BURTON'S PILGRIMAGE
 TO
MECCA AND MEDINAH.
 With some of the remarkable incidents in the Life of Mahomet.

The SCENES, and especially that of the Tomb of Mahomet, have all been Painted under the immediate superintendence of Captain Richard K. Burton, the distinguished Traveller, whose Guide Book (written expressly for this Entertainment) may be obtained at the Polytechnic.—Price One Shilling.

The New Scenery and Effects by Mr. George... The Machinery by Mr. W. Day.
 For conclusion of General Programme, see page 8.

Fig. 55

The masthead on this programme for Easter 1865 shows the change of name following the visit of the Prince of Wales in May 1863.

as an integral part of his major contribution to the popularisation of science. By blurring the lines between experiment and performance, between laboratory and theatre, Pepper made the phenomena of physics and chemistry both visible and accessible to the general public.¹⁹

A few examples must suffice to indicate the dazzling variety of entertainment presented at the Polytechnic during this exuberant decade. The highlights of the Easter programme in April 1865 were 'a new and patented illusion' called 'Proteus; or We are Here, but not Here', and a 'lecture entertainment' illustrating the explorer Richard Burton's pilgrimage to Mecca.

Proteus was the first in a series of illusions developed by Pepper and his young assistant Thomas Tobin. It represented the first magician's cabinet

19 Bernard Lightman 'Lecturing in the Spatial Economy of Science', in *Science in the Market Place: Nineteenth Century Sites and Experiences*, ed. Aileen Fyfe and Bernard Lightman (Chicago IL and London: Chicago University Press, 2007), pp. 97–132; J.A. Secord, 'Quick and Magical Shaper of Science', *Science*, 297 (2002), pp. 1648–1649.

trick. Pepper's own description of what the audience saw on the stage reveals its significance in the development of stage magic:

A large and handsome box, like a huge sentry box on wheels, and raised from the floor so that the spectators could see under, over and all round it is wheeled on to the platform ... On being opened, it appeared to be well lighted from the top by an ordinary railway carriage lamp, and, of course, seemed to be perfectly empty. The assistant now being invited to enter the box, the door is closed and locked, and after a few minutes have elapsed, is reopened, when a skeleton appeared to be standing in the very place where the living being had been formerly observed ... Again the door is closed, and the next time it is opened the skeleton has vanished, and the assistant walks out of the box with a carpet bag. The person explaining the apparatus now goes in, and sounds the walls all around with his knuckles; and while doing this, the door is suddenly closed, and being as quickly opened, he is found to have disappeared, again to appear after the door is once more closed and opened.

This description is followed by an explanation of the precise placing of the mirrors inside the box which made these appearances and disappearances possible; it comes from Pepper's *Cyclopaedic Science Simplified*, first published in 1869, which reveals the secrets of many of his Polytechnic performances.²⁰ Jim Steinmeyer comments: 'Proteus was a fascinating curiosity at the Polytechnic. It never matched the ghost for public appeal and was treated only as an optical curiosity. It wasn't a sensational illusion, but it led to a great number of important ideas.'²¹

The explorer Captain Richard Burton was a Victorian hero, famous both for his exotic exploits and his writings. In 1853 Burton, who was an extraordinarily gifted linguist, travelled in disguise as a member of the hajj, the Muslim pilgrimage to Mecca. He was not the first European to make the journey, but he was the first to write about it, and his book *Personal Narrative of a Pilgrimage to El-Medinah and Meccah* became very popular.²² Early in 1865 Pepper persuaded Burton to allow him to mount a 'lecture entertainment' at the Polytechnic illustrating that journey. Childe and Hill painted the lantern slides, and G. Apps the stage scenery. The programme shows that a number of special effects – including the inevitable 'spectral scene' – were included. To mark the occasion Burton wrote a new *Guide-Book* which went on sale at the Polytechnic for the relatively modest price of one shilling.²³

The Christmas programme for 1866 was billed as the strongest ever presented. Pepper's and Tobin's continued experimenting with illusions had led to the appearance of floating cherubs and an apparently disembodied head – presented as 'the modern Delphic oracle' – on the Polytechnic stage. In mid-December this technique was used again in a truly macabre illusion called 'the decapitated head speaking'. An engraving on the front page of the *Penny Illustrated Paper* shows the scene that greeted the audience as the curtain rose, revealing the severed head of a recently executed criminal. Its reporter

20 J.H. Pepper, *Cyclopaedic Science Simplified* (London: Warne, 1869), p. 27.

21 Steinmeyer, *Hiding the Elephant*, p. 79.

22 Richard F. Burton, *Personal Narrative of a Pilgrimage to El-Medinah and Meccah*, 3 vols. (London: Longmans, 1855, 1856).

23 Richard F. Burton, *The Guide-Book. A Pictorial Pilgrimage to Mecca and Medina* (London: Clowes, 1865).

described what happened next: 'To the right is the alchemist, gorgeously attired, who performs certain incantations, at the end of which the head becomes brilliantly illuminated by a light from above, slowly opens its eyes and lips, and, in a state of semi-animation, confesses that it was alone in its guilt. This satisfactory result obtained, the curtain falls.'²⁴

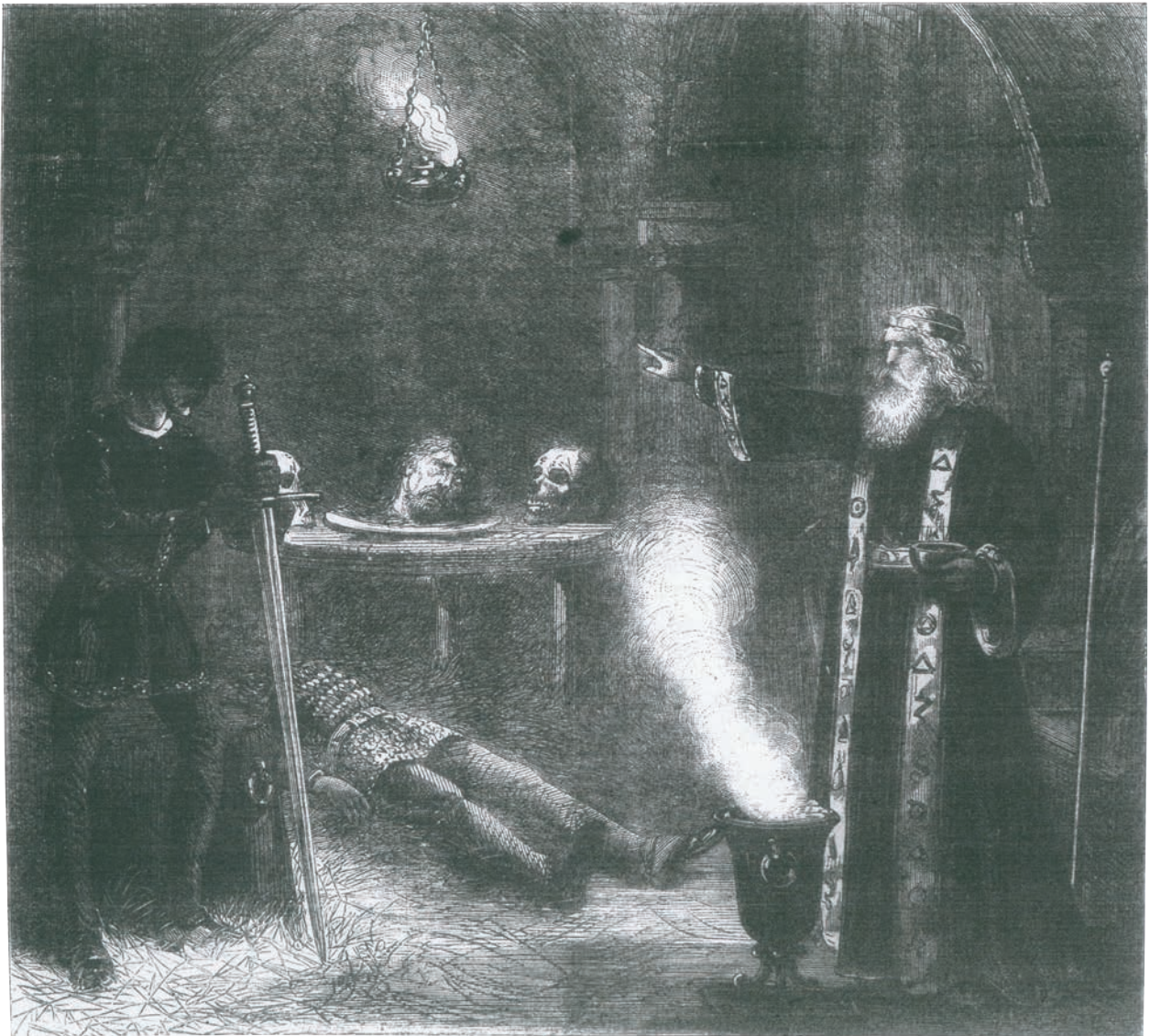
This gruesome sight was followed by another illusion using the same technique to more pleasant effect, showing 'a representation of Ariel (or, rather, Ariel's head), in the centre of a brilliant star, on the principle of the cherubs of last summer'.²⁵

More serious-minded patrons of the Polytechnic could also attend Pepper's lectures on 'Combustion by the Invisible Rays of Heat'.

The full Christmas programme included a dramatic reading of Dickens' *A Christmas Carol*, during which a succession of ghosts silently walked the stage,

Fig. 56

This engraving of the 'speaking head of the decapitated rebel' appeared on the front page of the Penny Illustrated Paper, 15 December 1866.



and the pantomime *Dick Whittington*, in which Dick was recalled to be lord mayor of London, 'not only by the touching appeal of Bow bells, but also by airy figures produced by "the ghost illusion apparatus"'. Such appearances were expected and becoming routine, but Pepper had a new attraction in store for the Christmas audience, which appeared not in the theatres but in the Great Hall. One of his earliest lectures on returning to the Polytechnic in 1861 had been on the art of balancing. The 'curious mechanical figure' promised to illustrate the subject was delayed, and seems never to have appeared; the lecture soon disappeared from the programme. In 1866 he returned to the topic. This time the lecture was delivered by J.L. King, and it was followed by the 'exhibition of a most astonishing figure, called the Automatic Léotard à la Frankenstein'.²⁶

This life-sized automaton, resembling the famous trapeze artist, safely performed its tricks above the promenading visitors in the Great Hall. The popular song inspired by the real Léotard, 'The Daring Young Man on the Flying Trapeze', was written the following year; perhaps it became part of the repertoire of the Polytechnic musicians. The slide painter W.R. Hill included Léotard in his much reproduced painting of the Great Hall that appears on the cover of this book. Finally, Christmas 1866 also saw the appearance in the small theatre of a new special effects slide, the eidoscope.²⁷ Like the chromatrope (*see* p. 46), this created a moving pattern on screen, but the discs were made of metal, not painted glass:

Two small plates of perforated zinc, moved about upon each other, and thrown, powerfully magnified, upon the canvas, assume all manner of fantastic shapes and beautiful patterns. The idea was Professor Wheatstone's, and, as it is capable of application upon a parlour window-blind, no doubt the eidoscope will become an amusing object of the home circle.²⁸

King, described by Pepper as 'my pupil and friend', was the stalwart among Polytechnic lecturers; he appeared on the programme several times a day, covering a wide range of topics including walking under water, the history of London and naval warfare. His lecture on earthquakes and volcanoes, introduced into the large theatre in November 1868, was illustrated by dissolving views representing these phenomena and accompanied by suitably atmospheric music on the electric organ. This instrument, built by Bryceson, was the first of its kind in England. Part of it had been installed in Her Majesty's Theatre, Drury Lane, for a concert in May 1868, after which it was moved to the Polytechnic.²⁹

In 1869 Pepper evoked the earlier traditions of the Polytechnic when he commissioned a new electrical machine, the great induction coil; it was installed in the large theatre, and later moved to the Great Hall. The machine, built by Apps in the Strand, could produce a spark as long as 29 inches (74 cm), and was advertised as 'The Great Lightning Inductorium'. Two of Queen Victoria's daughters, Princess Louisa and Princess Beatrice,

24 *Penny Illustrated Paper*, 15 December 1866, p. 2.

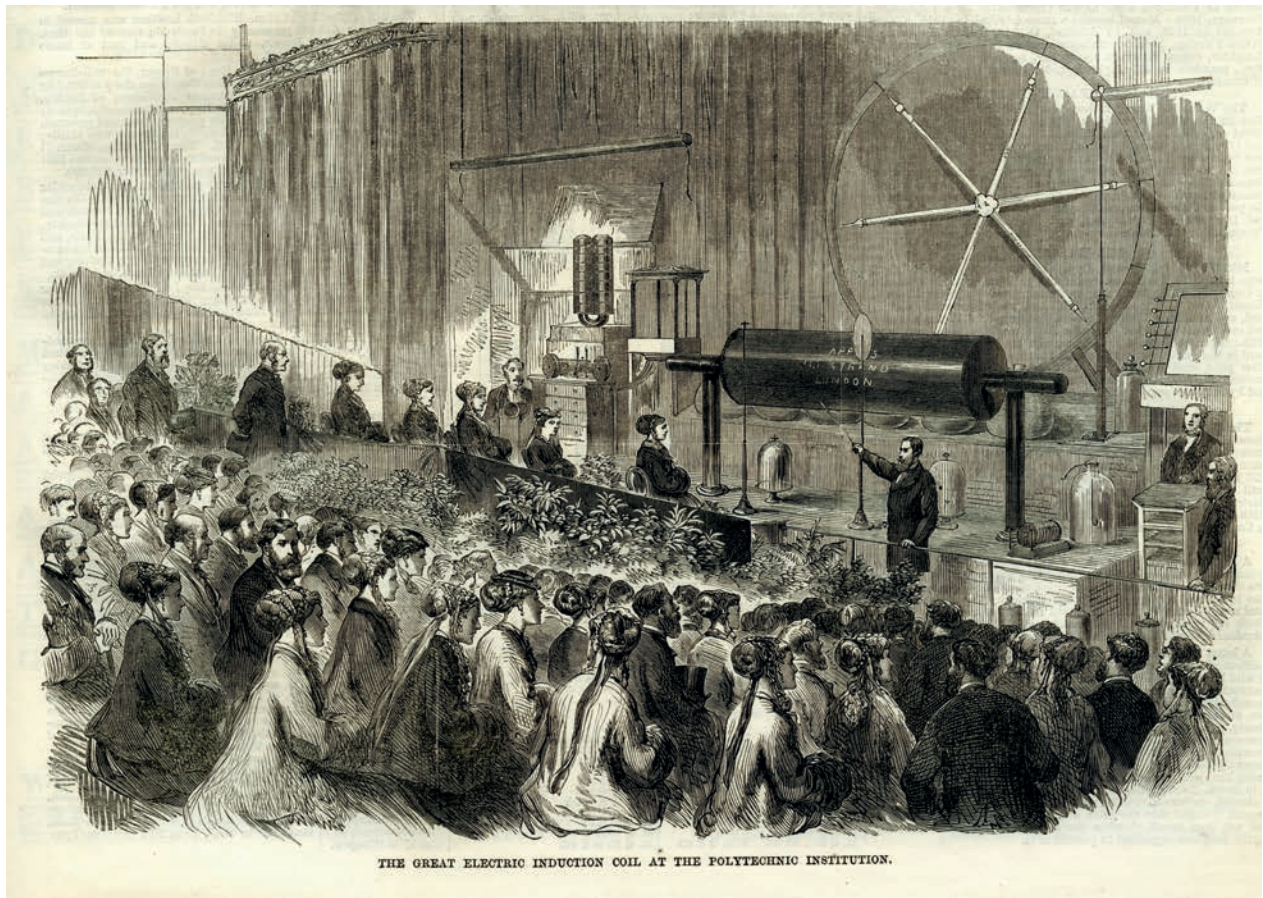
25 *Penny Illustrated Paper*, 29 December 1866, p. 15.

26 *The Times*, 21 December 1866, p. 1.

27 This is usually called the eidotrope.

28 *Penny Illustrated Paper*, 29 December 1866, p. 15.

29 Jeremy Brooker, 'Paganini's Ghost: Musical Resources of the Royal Polytechnic Institution', in *Realms of Light*, ed. Richard Crangle, Mervyn Heard and Ine van Dooren (London: Magic Lantern Society, 2005), pp. 146–154 (p. 153).



attended Pepper's first lecture. The scientific correspondent sent by Charles Dickens to report on the event for his journal *All the Year Round* described both the popular appeal of this demonstration and also its interest to the scientific community:

In the darkened theatre at the Polytechnic, the long flash lights up the room and the audience with the peculiar lurid glare so well known as an effect of brilliant lightning at night, and displays the features and action of everyone present ... It is the smallest part of the advantage expected from the new coil, that it allows all the destructive phenomena of chamber electricity to be exhibited, in hitherto unapproached beauty and intensity. Men of science anticipate from it new discoveries of high importance. In the intervals between the public exhibition of artificial lightning, the effects of the coil are being closely studied by those who are best able to appreciate them ...³⁰

Charles Talbot wrote to his father William Fox Talbot at home in Lacock Abbey: 'I went not long ago to the Polytechnic to see a very big induction coil on Rhumkorff's [*sic*] principle, made by Apps of the Strand. They show some very fine experiments with it.'³¹

Pepper published the results of his experiments with the coil in the

Fig. 57
Pepper demonstrating the great
induction coil, April 1869.

30 *All the Year Round*, 29 May 1869, p. 620.

31 The Correspondence of William Henry Fox Talbot. The letter quoted is no. 09523. www.foxtalbot.arts.gla.ac.uk [accessed 16 March 2006].

Proceedings of the Royal Society.³² The Polytechnic could still, on occasion, attract the 'men of science'.

We shall never know to what extent the audience was deceived by the illusions that they saw at the Polytechnic, or whether their compliance was assured because they came in pantomime mood, prepared to enjoy the show. Pepper claimed that few people could understand how the ghost was produced, and in what must surely be an outrageous piece of hyperbole – written long after the great natural philosopher's death – quoted Michael Faraday as saying, "Do you know, Mr. Pepper, I really don't understand it." I then took his hand, and put it on one of the huge glass plates, when he said, "Ah! now I comprehend it; but your glasses are kept so well protected I could not see them even behind your scenes."³³ But the ghost illusion was not a closely kept secret, so it is difficult to believe that no member of the audience ever tried throwing an object to bounce off the plate glass during a performance. Nevertheless, standards of technical presentation at the Polytechnic remained high; in other theatres audiences were sometimes dissatisfied with less impressive spectral appearances. A local reporter, reviewing a ghost production at the Theatre Royal, Birmingham, in September 1863, complained that the ghost simply looked like a human figure in the spot-light and continued:

On the whole, therefore, we are impelled to the conclusion that Professor Pepper's ghost – a perfect illusion at the Polytechnic – is a palpable sham at the Theatre Royal, and that having fallen into unskillful [*sic*] hands and absurd surroundings, the best thing to be done for him is to engage with some one who understands him, and cast him in a piece which, at least, shall be intelligible.³⁴

Fig. 58

Hine's drawing shows a sailor who has been tricked into receiving a mild electric shock at the Polytechnic.



32 John Henry Pepper, 'Some experiments with the Great Induction Coil at the Royal Polytechnic', *Proceedings of the Royal Society*, 18 (1869), 65–72.

33 *The True History of the Ghost*, p. 35.

34 Quoted in Alan Sutcliffe, 'The Ghost Illusion on the Birmingham Stage, 1863–1900. Part 1: 1863–7', in *New Magic Lantern Journal*, 10 (2005), pp. 7–11 (p. 8).

Polytechnic Institution,
(LIMITED),
• 309, REGENT STREET.
PATRON: H.R.H. THE PRINCE OF WALES.

This Institution has for Twenty-four years continued to instruct and amuse the Public.
THE LECTURES AND ENTERTAINMENTS,
Provided are on the most liberal scale.

"If the Polytechnic only offered these two amusements—the STANGE LECTURE of Professor Pepper's, and CINDERELLA—they would well repay a visit from all holiday folk, to whose notice we can sincerely recommend the whole programme of this Institution. It is really well worth seeing, whether by old or young."—(First Notice) *The Times*, December 27th, 1862.

"The Ghosts of the Polytechnic, which manifest themselves as a startling appendix to Mr. Pepper's 'Strange Lecture' on optical illusions, have proved singularly attractive, and when the hour arrives for their appearance the lecture-room becomes as crowded as the pit of a theatre on the night of Boxing-day."—(Second Notice) *The Times*, January 20th, 1863.

"The Polytechnic, as an old established favourite, always makes a point of having its holiday programme of the freshest and most attractive kind, and that of yesterday was all that could be wished in these respects. Altogether we can emphatically endorse the announcement of the managers of the institution that the attractions which they offer to holiday folks in search of amusement are more varied and more entertaining than those of almost any other place of amusement in London. It is really well worth a visit."—(Third Notice) *The Times*, Tuesday, April 7th, 1863.

"By special command, Professor Pepper had the honor, yesterday, of delivering his ghost lecture before their Royal Highnesses the Prince and Princess of Wales, the Prince and Princess Louis of Hesse, who were attended by the Countess of Macclesfield, Baroness Von Grancy, Baroness Von Schenek, Major Teesdale, and Captain Westeweller. The distinguished party were received by the Rev. J. B. Owen and the other directors of the Polytechnic Institution, and, after being conducted round the galleries, passed to the large theatre, where a commodious Royal box had been prepared for their reception."—*The Times*, May 20th, 1863.

No. 1.— Professor Pepper's adaptation of Mr. Dircks's
ORIGINAL AND MOST STARTLING
GHOST ILLUSION!!
IN THREE SCENES.

FIRST SCENE.

Reading from Dickens's "HAUNTED MAN," and appearance of the GHOST and SPECTRE of the Sister.

SECOND SCENE.

The ARTIST'S STUDIO. The Ghostly Visitor in the form of a Rival Artist.

The Ghost Drinking a Glass of Water!!
(This Illusion must be seen to be believed.)

THIRD SCENE.

The Reading of the LOVE LETTER, and mysterious arrival of the Little Postman "CUPID."

[For conclusion of General Programme see page 8.

Fig. 59

Pepper's diagram (Fig 60) shows how the ghost illusion was created. The image of an illuminated figure concealed under the stage is reflected from the looking glass, passes through the transparent plate-glass sheet and appears in spectral form on the stage. The appearance and disappearance of the ghost is controlled by the strength of the hidden light source. Success depends on the plate glass being invisible to the audience, and also on careful rehearsal, because the other actors could not see the ghost on the stage.

At the first performance, portrayed in the press (Fig. 61), the ghost took the form of a skeleton, held under the stage by a man concealed in black velvet. As the stage staff developed their skill in presenting the illusion, so the ghost was seen to move around and even to drink a glass of water (Fig. 59). Dircks's book was published in 1863 and Pepper's in 1890 (Figs. 62 and 63).

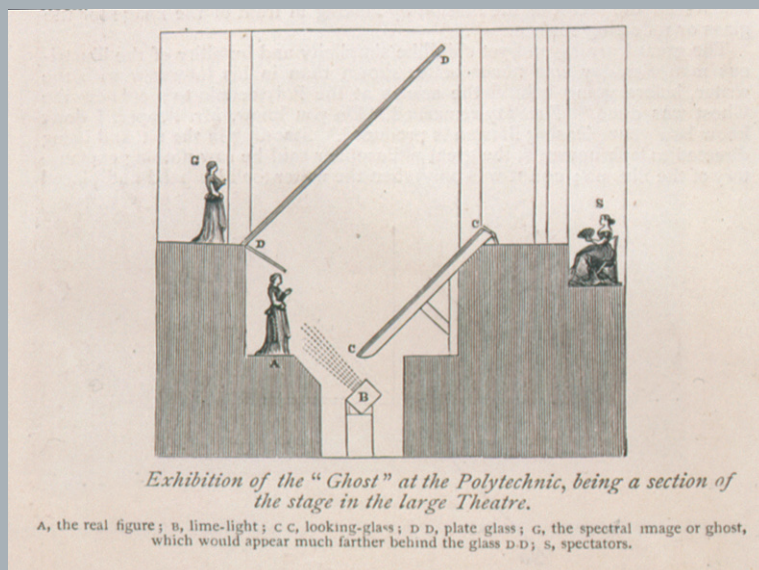


Fig. 60

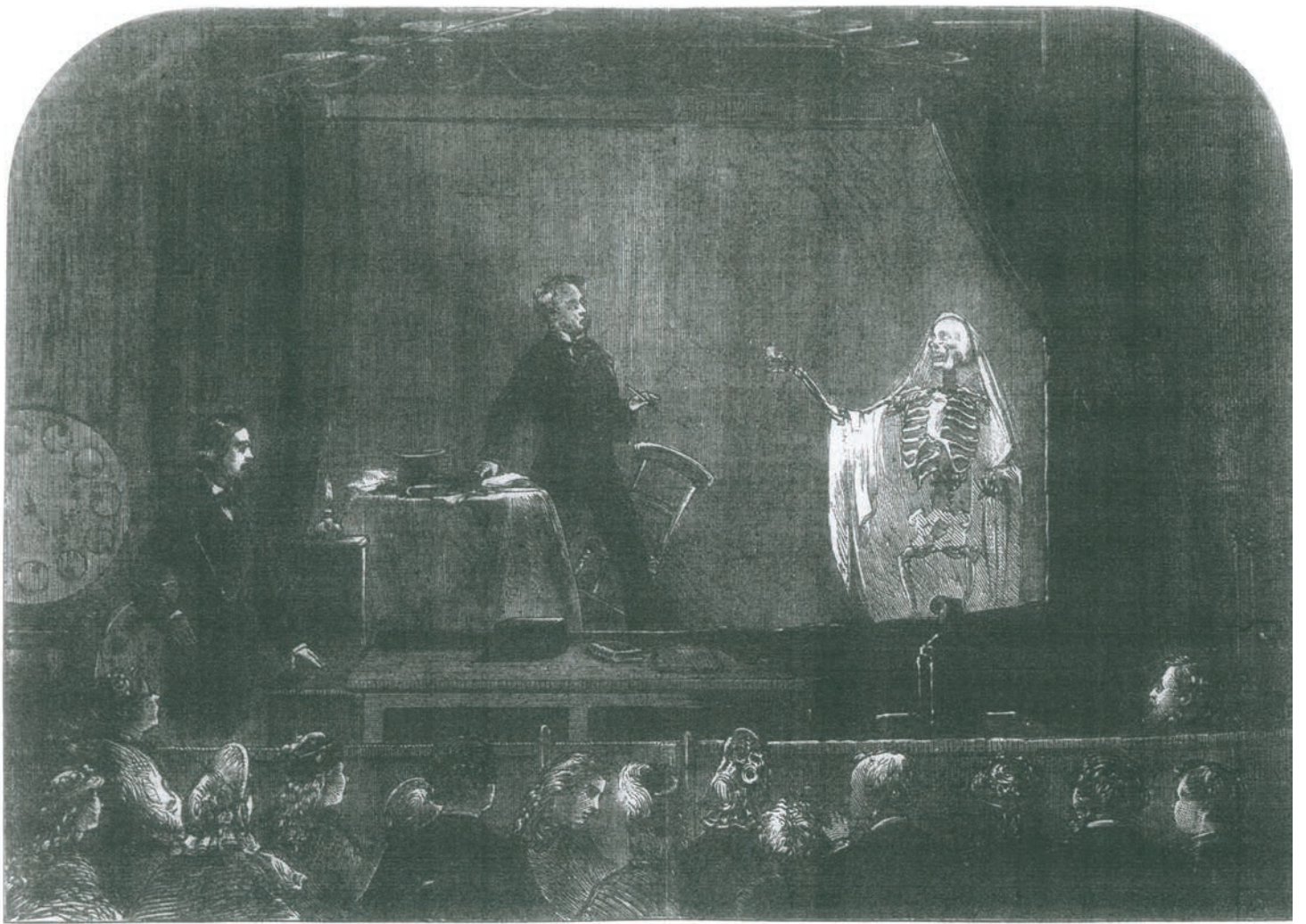


Fig. 61

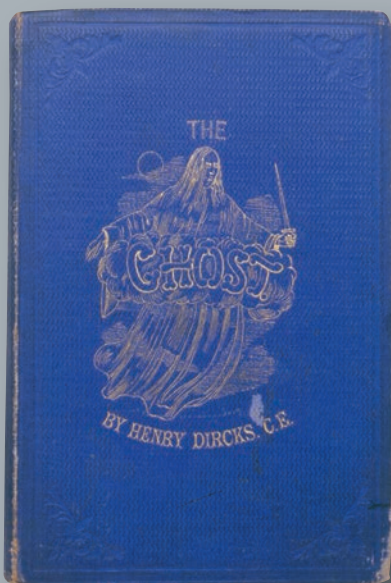


Fig. 62

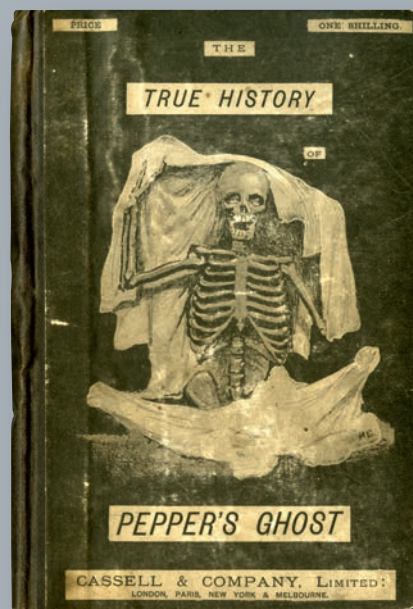


Fig. 63

Pepper was an accomplished performer used to managing complex apparatus during his travels as an itinerant lecturer – witness the ‘every sort of equipment on an elaborate scale’ which Quintin Hogg wrote that he used while lecturing to schoolboys at Eton.³⁵ In the fixed environment of the Polytechnic, he was able to bring together all the resources at his disposal – dissolving views, live performers, music, singing, sound effects, ghosts and spectres, illuminated fountains and fireworks – to give audiences what they wanted to see. His extraordinary combination of technical expertise, imagination and verve underlay the popularity of the Polytechnic during its heyday in the 1860s. *The Times* review of the 1871 Christmas entertainment ‘Shadows and the Story of the Shadowless Man’ captures a single typical scene in a performance:

which is illustrated by all the optical resources of the establishment. The production of some grotesque shadows upon a screen, and an explanation of the changes they are made to undergo, serve as an introduction to the story of Peter Schlemihl [*sic*], who sold his shadow to the enemy of mankind, and whose adventures, as recited by Professor Pepper, are also rendered visible by a succession of groupings, dissolving views and transparencies. The scene in which Minna, personified by Miss Alice Barth, flies in horror from the unhappy Peter, is contrived with especial ingenuity; the lady’s own shadow being of the most pronounced description, while her lover, although on stage with her, casts none.

In fact ‘The Shadowless Man’ proved to be Pepper’s last Christmas show; the same review goes on to say:

The recent announcement of differences between Professor Pepper and the directors of the Polytechnic, such as may possibly occasion the Professor’s withdrawal from the institution, has been received with much regret by all interested in its welfare. It is understood that these differences have reference only to the degree in which the discretion of the managing director should be controlled by the Board; and it is hoped that they may yet be adjusted on a satisfactory basis.³⁶

The harmony established by the successes of 1863 had disappeared and was not to be restored; Pepper left early in 1872. He moved with Tobin to the Egyptian Hall in Piccadilly – London’s premier venue for magic shows – but lost money. Pepper then embarked on an international lecture tour. Returning from America in 1878, he made a series of guest appearances on the Polytechnic stage, where he performed his ‘metempsychosis’ illusions – including one in which he turned oranges into pots of marmalade, which were then distributed among the audience. In 1879 he left for Australia, accepting a position as public analyst in Brisbane, where he remained for ten years.³⁷ His long connection with the management of the Royal Polytechnic Institution was finally broken.

35 Ethel M. Hogg, *Quintin Hogg: a Biography*, 2nd edn (London: Archibald Constable, 1904), p. 32.

36 *The Times*, 26 December 1871, p. 9.

37 R.F. Cane, ‘John H. Pepper – Analyst and Rainmaker: the Genesis of Chemistry Teaching in Queensland’, *Royal Historical Society of Queensland: Historical Papers*, 9 (1974–5), pp. 116–133.

The final years

Pepper's abrupt departure left a number of gaps in the Polytechnic programme which had to be filled at short notice. The remaining directors recovered quickly; a new manager – R.F. Chapman – was appointed, and the new season's entertainments were in place before the Easter holiday. During 1872 they introduced a number of initiatives for expanding and publicising the work of the Institution. One of these was the inclusion of a short newsletter, called *The Polytechnic Record*, within the weekly programme. The *Record* provided an insight into what went on behind the scenes at the Polytechnic, and also answered readers' letters – although it refused to give away the secrets of the current illusions. This lively and informative publication proved short lived, disappearing after eight weekly issues.

THE POLYTECHNIC COLLEGE

On 15 July 1872 an article appeared on the front page of the *Record* under the headline 'What the Polytechnic does in the way of Education':

Very few are aware of the solid work which is quietly done in the Evening Classes of this Institution. Ever since the revival of the Polytechnic in 1855, there have been in connection with it a number of Evening Classes, where study in the languages, the arts and the sciences, has been pursued under the direction of careful teachers, and quite distinct from the popular instruction of the public lectures and the agreeable amusements of the general audience.

Some credit is surely due to the young ladies and gentlemen who have withstood the fascination of such a pastime, and have devoted themselves to specific studies ... It must be remembered, that such study is not only voluntary, it is attended with expense, and the sacrifice of much time which was at their own disposal. After a tedious day of professional or mechanical work, the students have given up one or more evenings a week to the acquisition of some knowledge from which their early circumstances had debarred them.¹

¹ *The Polytechnic Record*, 15 July 1872, p. 9, bound in *Royal Polytechnic Institution, Programme for the Week Commencing 15 July 1872*, BL 8710 cc1.

Further information about the evening classes emerges from an article in *The Times* which describes a meeting in Regent Street on 7 October 1872, chaired by the elderly and much respected evangelical philanthropist Lord

ROYAL POLYTECHNIC INSTITUTION.
CHEMICAL DEPARTMENT
UNDER THE SUPERINTENDENCE OF
Professor E. V. GARDNER, F.E.S., M.S.A., &c.

The Directors of the Royal Polytechnic Institution beg to give notice that they have re-organized the CHEMICAL DEPARTMENT of the Institution, which is confided to the care of PROFESSOR E. V. GARDNER, F.E.S., M.S.A., whose large experience is well known.

THE LABORATORY

Is entirely refitted, and is now open for the reception of Pupils, who will be under the personal care of PROFESSOR GARDNER.

Analyses connected with Agriculture and Manufactures conducted with careful attention. PRIVATE EXPERIMENTS and Scientific Investigations connected with Patents may also be arranged for, and an efficient Patent Agent can also be consulted on Patents' rights, free of charge.

Government Examinations.—Gentlemen preparing for these Examinations will have the unusual advantage of an extensive school apparatus in the departments of Electricity, Galvanism, Magnetism, Heat, and Chemistry.

FEES MODERATE.

Particulars upon application to PROFESSOR E. V. GARDNER at the Institution.

PRIVATE CLASS ROOMS FOR LADIES.

THE POLYTECHNIC COLLEGE,
IN CONNECTION WITH
The Royal Polytechnic Institution, (Limited,)
AND IN UNION WITH
The Society of Arts, the Science & Art Department, Kensington,
and the City of London College, E.C.

UNDER THE DIRECTION OF THE REV. CHARLES MACKENZIE, A.M.,
PREBENDARY OF ST. PAUL'S.

The names of the Council will be published shortly.

SESSION 1872—3 will commence 7th October, 1872.

All certified Students who continue to attend the Classes, or subscribe 10s. 6d. per annum, are called MEMBERS. All other attendants at the Classes are called STUDENTS.

A Member's or Student's Annual Ticket entitles him to attend one class for one hour per week, and gives him admission to the entertainments at the Institution DURING TERM TIME.

The annual tickets for Classes marked thus (*) costs £1 1s., but for those marked (†) the fee is £1 5s. In both cases the admission to the entertainment is included.

The price of attendance for a second hour at the SAME CLASS is 3s.

The terminal fee for each Class for those who do not take Annual Tickets is marked on the other side; and such Students can have Tickets of Admission to the Institution by payment of an extra half-a-crown each term. All admission Tickets must be produced whenever required by any Officer of the Institution.

Morning Instruction in vocal and instrumental Music and other Classes will be supplied upon demand. Names and addresses should be left at the Office.

Fig. 64

Advertisements for educational activities began to appear in the Polytechnic weekly programme in 1872.

Shaftesbury, to mark the opening of a new body called the Polytechnic College. The Rev. Charles Mackenzie, who had been director of the educational department since 1860, explained that the structure was being formalised in the hope of securing a more permanent footing for the evening classes.

Those present at the meeting were convinced that the provision of further education would help to protect the morals of young people 'who were just entering into life, and who were tempted on every side to spend their money and their time in amusements of every character'. Mackenzie particularly hoped that young women would take advantage of the opportunities offered 'in place of devoting their attention to the pernicious literature of the

libraries and cheap press'.² The tone is very different from that of Pepper's speech when he began the first evening classes because he thought it was 'much better for a young man to work out his own independent position rather than importune friends for letters of recommendation'.³

Students could now progress to a wider choice of examinations, set by the Society of Arts; the Science and Art Department, South Kensington; and the City of London College. The most popular subject was French. Limited grants were available from the Science and Art Department, and the College apparently received donations from its supporters which financed prizes to successful students. Even from the very scant information available, however, it is obvious that the College did not have the means to be self-supporting. As Mackenzie acknowledged at the inaugural meeting, it was wholly dependent for its accommodation on the goodwill of the directors of the Polytechnic. Although not all those directors can be identified, it is apparent that men like the wealthy philanthropist Samuel Morley, MP, joined the board of the Institution because of their support for the educational work of the Polytechnic. Morley, who was a generous supporter of many educational initiatives, also served on the London School Board from its foundation in 1870 until 1876.

The College was not the only educational activity within the Polytechnic; there was teaching associated with the chemistry laboratory under the charge of Professor Gardner. The Polytechnic's educational role was recognised in the following description of the sort of people usually encountered in the Institution in the 1870s:

the intelligent working men striving hard to master the obstacles which long hours of labour and short wages throw in the way of self-improvement, and the cads and counter-jumpers who try to look like swells and don't succeed; the wondering provincial and his equally astonished chaperone, the family parties and the young lovers ...⁴

THE POLYTECHNIC TRAVELLING BRANCH

A further innovation introduced during 1872 was the Polytechnic Travelling Branch:

During the past half year the directors have made arrangements to reproduce the Lectures given at the Institution in all parts of the kingdom. For this purposes they have engaged the services of Mr. B.J. Malden, a gentleman of great experience and high standing as a lecturer in the provinces ... The Institutions throughout the country have shown great eagerness to avail themselves of the services of a gentleman bearing the official stamp of approval by the Polytechnic, and not only is Mr. Malden's time fully occupied, but the services of the other lecturers on the staff of the Institution are in great demand.⁵

² *The Times*, 8 October 1872, p. 10.

³ *Journal of the Society of Arts*, 26 September 1856, p. 728.

⁴ *Fun*, 3 December 1870, p. 223.

⁵ UWA RPI R48 *Programme* 1873, no. 1, p. 10.

The directors also claimed to be protecting the reputation of the Institution, since they were aware that some itinerant lecturers made false claims to have worked at the Royal Polytechnic. The Travelling Branch, which benefited from the growth of the railway network, was considered to be a great success, and the directors intended to expand it. So little information has been discovered that it is not possible to say how large it became. It is certain, however, that Edmund Wilkie joined the staff as Malden's assistant. Wilkie deserves a special mention in any history of the Royal Polytechnic because, as the last in the great tradition of Polytechnic lantern lecturers, his reminiscences have provided a significant source for the study of that tradition.

In 1873 the Polytechnic mounted a large-scale event outside London, to mark the opening of new buildings at the Huntley & Palmer biscuit factory adjoining Reading station on a Saturday evening in November. More than 4,000 people were present, and the Polytechnic provided simultaneous entertainments – a performance of the Proteus illusion, dissolving views, juggling, singing, lectures and experiments – throughout the building.⁶ Even allowing for the proximity of the railway, the logistics of this must have been difficult, and it would be interesting to know whether the event resulted in significant profit and if similar events were ever mounted elsewhere.

According to *The Times*, the directors ended 1872 with a flourish when a strike of gas stokers threatened street lighting:

In order to lessen the public inconvenience as much as possible during the present deficiency of gas, the authorities of the Royal Polytechnic Institution have arranged to throw a powerful electric light from the top of the Institution in the direction of Oxford-circus and Regent-street. The light will be shown from 6 to 10 o'clock every evening until the full supply of gas is again given by the gas companies.⁷

THE PROGRAMME IN THE 1870s

The entertainments listed in the surviving programmes for the Polytechnic during the 1870s make it clear that less and less time was devoted to science. It did not disappear altogether; the redoubtable Mr King continued to give illustrated lectures, as did Professor Gardner, the head of the chemistry laboratory. There were occasional demonstrations of new technology – a typewriter was exhibited in 1876, and in 1878 a telephone line was rigged up between the Institution and Cavendish Square, giving some visitors their first opportunity to use the new instrument.⁸ There was, however, nothing on the scale of the great induction coil to bring the 'men of science' into the Polytechnic.

The programme was increasingly filled by entertainers, including singers, impressionists, ventriloquists and conjurers. Such performers had begun to make occasional appearances at the Polytechnic in the 1850s, but in the 1870s

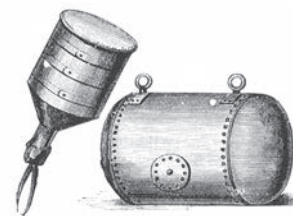
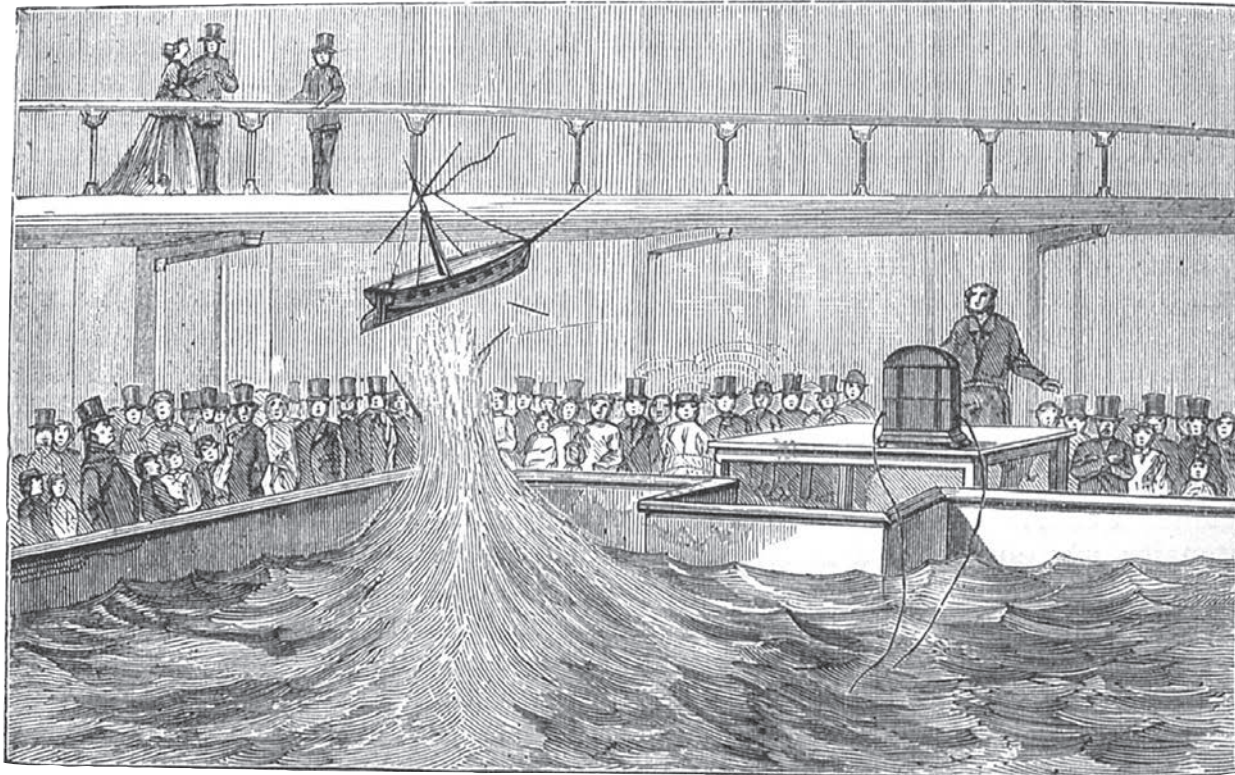


Fig. 65
Torpedoes were the subject both of lantern lectures in the theatre and demonstrations in the Great Hall. The Polytechnic torpedo, invented by Pepper, is shown above left.

Fig. 66, facing page
J.L. King frequently performed this 'miniature torpedo experiment' in the diving tank.

- 6 T.A.B. Corley, *Quaker Enterprise in Biscuits: Huntley and Palmers of Reading 1822–1972* (London: Hutchinson, 1972), p. 81.
- 7 *The Times*, 5 December 1872, p. 5.
- 8 UWA RPI R56, *Programme* 1876, no. 256, p. 8.
- 9 William Stokes, *Memory* (London: Houlston, 1888), claims to be the 92nd edition.
- 10 UWA RPI R48, *Programme*, no. 12, p. 9.
- 11 *The Times*, 23 April 1878, p. 4.
- 12 *Penny Illustrated Paper*, 25 August 1877, p. 13.

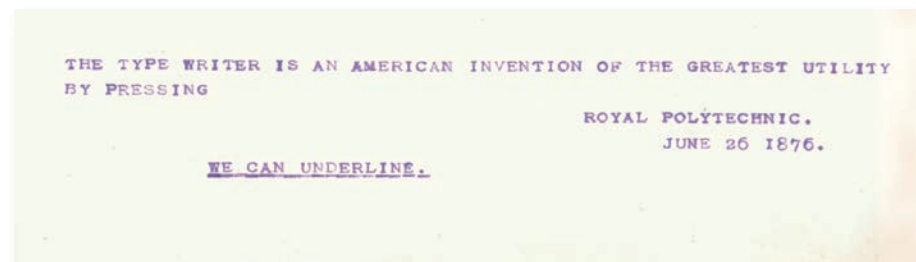


a number of them – including George Buckland, the comic singer, and Alice Barth, the singer and actress – spent long seasons at the Institution. William Stokes also appeared regularly at the Polytechnic during this period. Stokes described himself as a ‘teacher of memory’. He lectured and gave lessons at the Polytechnic, among other institutions, and also at his home in nearby Margaret Street, as well as writing a popular textbook on the subject that ran into many editions.⁹ His stage act featured ‘Illustrations of Acquired Power by his Wonderful boys’.¹⁰

Lantern slides remained an important element in the programme; in 1878 *The Times* wrote that ‘dissolving views are, so to speak, the backbone of the Polytechnic, and are capitally managed’.¹¹ In 1877 the *Penny Illustrated Paper* praised King’s lecture on the Turko–Russian War, incorporating slide images taken from the *Illustrated London News*.¹² Charles Dodgson (who wrote under the pen name of Lewis Carroll), a regular visitor to the Polytechnic, allowed

Fig. 67

This sample of typewriting from a machine exhibited at the Polytechnic has survived in a scrapbook now in the University Archive.



George Buckland to devise the first dramatisation of *Alice in Wonderland*, for which Hill painted a series of slides. The show opened at Easter 1876. The tradition of family entertainment at Christmas remained strong; one of the highlights of the season was when the portly Mr King, with his red face and rich voice, recited the poem beginning ‘Twas the night before Christmas’ while Hill’s slides showing St Nicholas delivering presents down the chimney were projected behind him.

In addition to the well-established lantern displays, it seems that new elements were beginning to appear in the theatrical programme, though in view of the lack of evidence only tentative suggestions can be offered about these. The large theatre added to the building in 1848 had been designed partly for lantern projection, but also for more conventional theatrical performances. Behind the movable canvas screen there was a deep stage. The fact that the Polytechnic was not licensed as a theatre shaped the kind of performances that could take place there.

Actors were not allowed to speak on the stage, but had to mime to words spoken by a narrator. This limitation may not have been significant during the short optical presentations of the 1860s – indeed during appearances of the ghost, actors behind the plate-glass screen would not have been audible if they had been able to speak. But after Pepper’s departure a critic in the *Penny Illustrated Paper*, with his tongue firmly in his cheek, wrote:

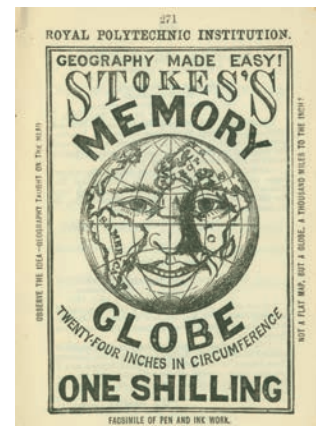


Fig. 68

This is one of the many aids to memory produced by William Stokes, who lectured at the Royal Polytechnic and other institutions.

Fig. 69

Lantern slide painted on glass by W.R. Hill for George Buckland’s dramatisation of Alice in Wonderland, which opened after Easter 1876 and was seen by the Prince of Wales and his family when they visited the Polytechnic.

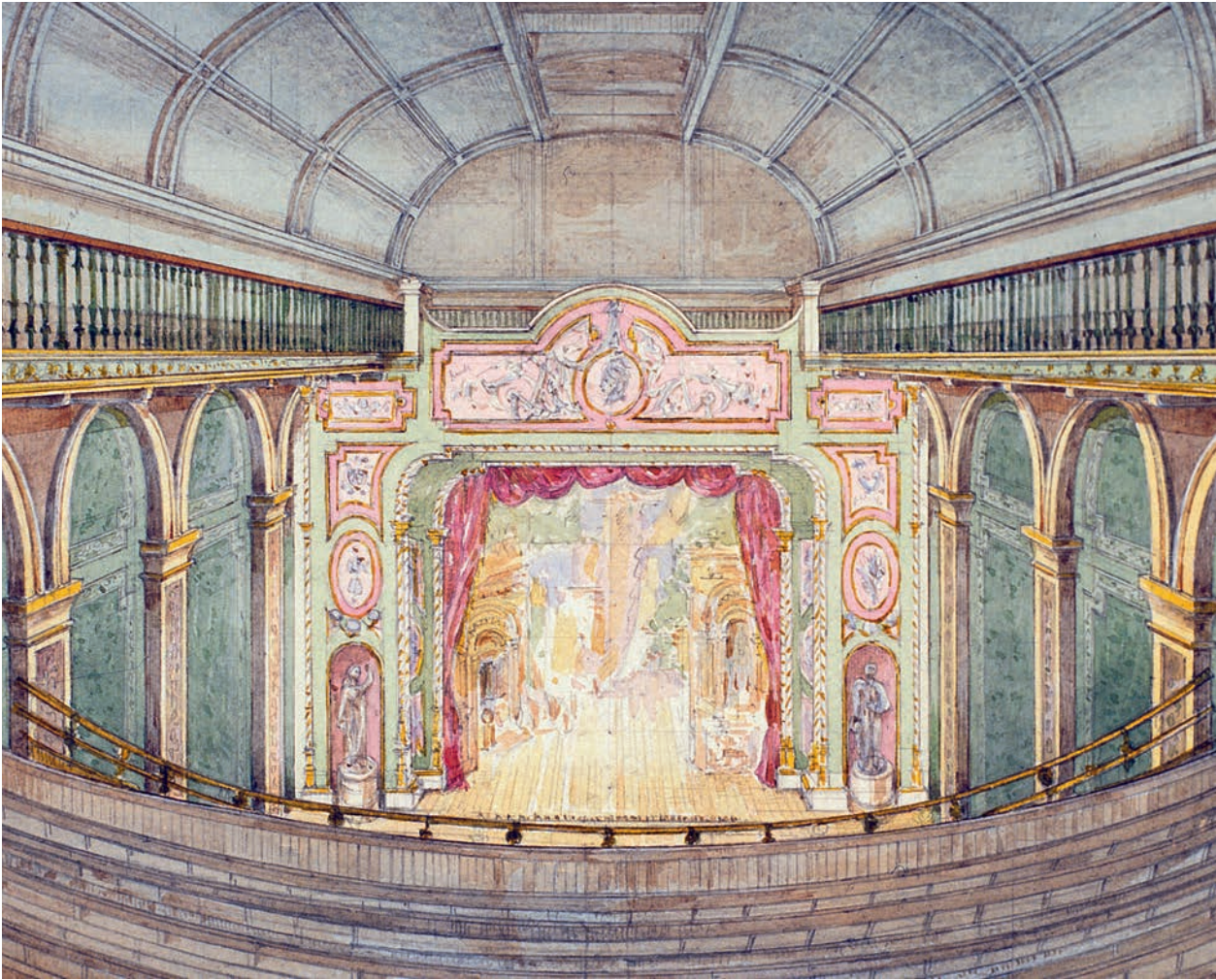


Fig. 70

This watercolour, which represents the opposite view of the theatre from that seen on page 44, shows the full depth of the stage when the screen which filled the proscenium during lantern shows was moved out of position. Both pictures were painted in December 1881, the month in which the building was sold.

Another praiseworthy feature of the new management is the work they have found for the apparently dumb at the Polytechnic. Thus, Mr. George Buckland or Mr. J.L. King stands at his reading-desk, and, as he reads with accustomed point this or that legend, gives life to the silent representatives of the story on the stage. The passion the speaker puts into the words is infused into the actor, who strives by profuse action to show how thoroughly he understands the feeling he is expected to demonstrate, and how well he would give vocal effect to them could he but loosen his tongue.¹³

The same critic goes on to mention ‘the new ghost’ at the Polytechnic, referring to Dr Croft, who had just joined the board of directors. Croft wrote and directed some new entertainments which relied upon elaborate scenery, lavish costumes, and *tableaux vivants*, rather than the optical effects which had previously been the hallmark of Polytechnic productions.

On 6 July 1876 the Prince of Wales and Princess of Wales, together with their children, visited the Polytechnic. They listened to an illustrated lecture by Mr King on the Prince’s recent tour of India, and watched scenes from

¹³ *Penny Illustrated Paper*, 2 November 1872, p. 1.

Alice. The Prince (but not the children) descended in the diving bell.¹⁴ This visit shows that the Polytechnic still maintained its reputation for respectable family entertainment, but even so there are increasing indications during the 1870s that all was not well.

Complaints began to surface, and a more critical tone began to creep into the press reviews. Some of these complaints concerned overcrowding, and the discomfort and inconvenience caused when audiences were required to move around the building after each short event in the programme. The problem persisted; in 1878 a journalist complained of the ‘fearful crush’ involved in entering the theatre during the Christmas season: ‘On the occasion of our visit the police and attendants were completely overpowered, and much confusion was the result.’¹⁵ This must have often been a problem at the Polytechnic – for example during the ghost years. But whereas the earliest Polytechnic visitors were more used to visiting exhibitions than the theatre, by the 1870s theatrical performances were much more widely attended, and the accommodation in Regent Street must have seemed cramped in comparison with other much larger West End theatres that were entered directly from the street.

There were also unfavourable comments about the increasing predominance of ‘bazaar stalls’ in the Great Hall. The directors did attempt to introduce new attractions to join the diving bell and the Polytechnic’s remaining steam engine. In 1872 an aquarium was added, and Marquis Bibero performed a number of aquatic stunts in the diving tank, including eating, drinking and smoking under water ‘with an appearance of the utmost comfort and personal ease’.¹⁶ By 1878 Bibero had been replaced by a seal; its feeding times were advertised in the programme. In spite of attempts such as these to cater for popular taste – the Royal Aquarium opened in 1876, on the site now occupied by the Methodist Central Hall, opposite Westminster Abbey and the Houses of Parliament – over the years the character of the Great Hall had gradually changed from an exhibition area for new inventions into a sales area for local manufacturers, with products including rifles, ‘Polytechnic cement’ for mending broken china, and false teeth. The reporter from *All the Year Round* who wrote about the induction coil also commented, ‘The bazaar element is decidedly stronger than of yore, and it may be delicately hinted that the ladies who preside at the stalls are somewhat pertinacious in their efforts to do business.’¹⁷

A reporter from *Figaro*, who took his young cousins to visit the Polytechnic in 1874, remarked that they:

showed a decided tendency to shirk the more scientific details of the programme and to flirt instead with a rather forward young lady who sold scent and chocolate creams ... for my part, I only smiled faintly at the dissolving views, finding much more real amusement watching sundry couples ‘spooning’ in the dark recesses of the topmost seats; and eating pop-corn together with loving unanimity.¹⁸



Fig. 71

This metempsychosis illusion dates from 1879, during Pepper's brief return to the Polytechnic. The script was written by the playwright and comic journalist Francis Burnand, who became editor of Punch in 1880. The action took the form of a series of hallucinations resulting from overindulgence in curried prawns.

14 UWA RPI R53, 182, p. 1.

15 UWA RPI R82, p. 60.

16 'Opinions of the Press', *Royal Polytechnic Institution, Programme for Week Commencing 15 January 1872*, BL 8710 cc1.

17 *All the Year Round*, 29 May 1869, p. 618.

18 *Figaro*, 21 February 1874, p. 3.

19 UWA RPI R9, p. 1.

The Polytechnic had moved a long way from being a ‘place of social resort for the lovers of Practical Science’.¹⁹

‘DIVIDED COUNSELS’

There are increasing indications of growing discord within the Polytechnic community between staff, directors and shareholders. It is not possible to give a precise and coherent account of the Royal Polytechnic’s final years. There is insufficient information about both the sequence of events and also the interests and motives of those involved. Two overall impressions however emerge from the sources that are available. The first is of the absence of a shared vision to unite the different individuals; it is difficult, for example, to imagine any common ground between George Buckland the entertainer and the strait-laced Samuel Morley. The second is of an Institution that was constantly looking back to a scientific golden age, but had little idea of how to go forward.

Fig. 72

This view shows the Great Hall in 1872. The newly installed aquarium is behind the stall in the centre front, and the great induction coil is behind that. The queues on the ground floor and in the gallery on the left of the picture are waiting to go into the adjacent theatre.



The Polytechnic's financial position was steadily deteriorating. Apart from a few exceptionally good years – such as 1863, the year of the ghost – it had always operated within very narrow margins. From the mid-1860s profits and dividends had failed to reach the promised levels, and by the mid-1870s they had almost disappeared.

Evidence of the acrimonious atmosphere comes from a press report describing a half-yearly shareholders' meeting, chaired by the Rev. C. Mackenzie, who had become chairman of the board. Mackenzie wanted to open the meeting with a prayer: 'The ground of objection raised was that the meeting was held for commercial and not religious purposes. On this the rev. chairman requested permission to pray himself in silence, whereupon a shareholder cried out "Pray away, and I shall go out till you have done." (Laughter, amidst which the shareholder went out.)'²⁰

Nevertheless, it would not be true to say that all the shareholders were primarily concerned about profit. The sequence of events focused around two crises, the first in 1875 and the second in 1879. On both occasions, the shareholders forced the appointment of committees of inquiry that investigated the management of the Polytechnic and made recommendations for improvement, which could not be successfully implemented. Yet the majority of the shareholders showed a marked reluctance to wind up the company – even though in business terms this was the obvious course of action. Few people had ever regarded the Polytechnic as a business, though strictly speaking that is exactly what it was. This ambiguity is reflected in the *Report* produced by the 1879 committee of inquiry:

the need for such an Institution as the Polytechnic still exists ... Besides, the question remains whether, even if winding-up were the best course financially, it would satisfy the desires of those who did not embark in the undertaking with a purely commercial object, but who prized its pecuniary success mainly as an index of public utility and appreciation.²¹

Changes in the membership of the board followed both reports, but little else was resolved. One repeated recommendation was that a manager be appointed and given enough authority to sort out all the problems but, apart from the fact there was not sufficient money to pay an appropriate salary, it is difficult to see how that arrangement could have worked in practice. The relative roles of managers and directors had never been clearly defined at the Polytechnic; energetic directors had often taken the lead. In the early years personal relations between Cayley, Nurse, Sievier and Longbottom had been difficult at times, but fundamentally they shared a common purpose and together contributed to the Institution's success. That common purpose had disappeared by the end of the 1870s. It is perhaps remarkable that the Royal Polytechnic survived for as long as it did.

Bad luck played its part towards the end. In the early hours of 8 March 1879 fire broke out in the building, which was reported to be blazing furiously.

20 UWA RPI R82, p. 78.

21 UWA RPI R61, p. 7.

A director, E.A. Owen, wrote to *The Times* a few days later to make it clear that only the small theatre had been destroyed; the rest of the building remained intact and the Polytechnic was open as usual.²² He went on to praise the courage of the fire brigade in preventing the fire from reaching the chemical laboratory, suggesting that had it done so the whole building and others in the neighbourhood would probably have been destroyed. His words were well meaning but unfortunate. They created such alarm that a second director had to write a few days later to assure residents that there were no dangerous chemicals stored in the Polytechnic, and that they could sleep safely in their beds.²³

A few weeks later *The Times* reported another accident, this time to that most enduring of Polytechnic attractions, the diving bell.²⁴ A link in the gear gave way and the bell plunged into the tank, imprisoning its passengers. The rescue procedure which had been in place since 1838 was successfully implemented and nobody was hurt, but the incident does bear out the complaints of the shareholders that the plant was becoming antiquated and worn out.

The new board of directors appointed in 1879 was committed to re-establishing the ‘technical authority’ of the Institution, to restoring the Great Hall as an exhibition space and to abolishing unsuitable ‘theatricals’. In practice it was able to achieve very little, having to concede that it had become the theatre that attracted audiences into the Polytechnic.

LAST DAYS



Fig. 73
This cartoon of the illusion ‘The Bottle Imp’ accompanied a critical review that appeared in *Punch* on 25 September 1880.

This story began with an account of *Punch*’s first visit to the Polytechnic, when it was full of enthusiasm for all that it saw. It must end with a less happy report from the same paper in September 1880, when another reporter came to see how far the new management had managed to fulfil its promises. He found the lectures dull and the variety acts poor. His long review ends with a description of an illusion called ‘The Bottle Imp’ which was currently topping the bill:

Upon this a mournful lad, in an eccentric costume, was introduced upon the stage, to be locked in a box, and to appear (with the aid of a pane of glass that was very visible to the audience) in a gigantic bottle. This ended the entertainment so far as I was concerned, as I refused the kind and pressing invitation of an official ‘to wait and go down with a party in the diving bell’.

As I left the building, I could not help recalling the past glories of the old place. The new Directors may have secured ‘economy’, but they have certainly not achieved success at the Royal Polytechnic Institution – ‘Limited!’²⁵

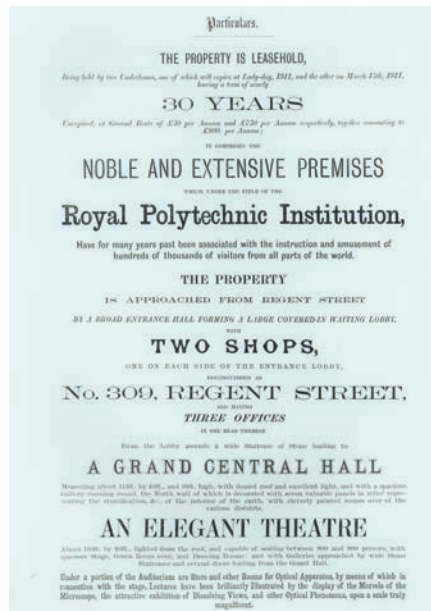
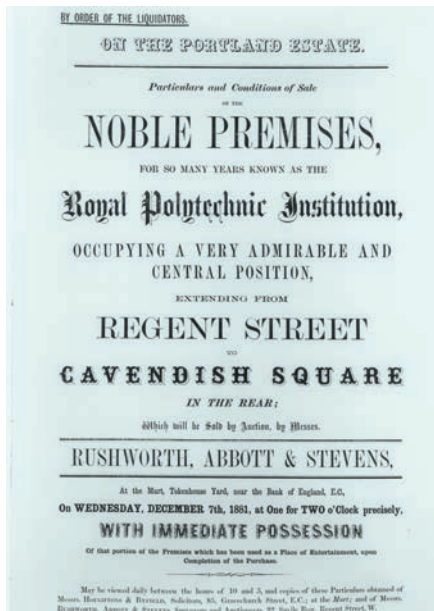
Early in 1881 the board had to acknowledge that it had failed in its attempts to turn the Polytechnic round. The directors had reached the bleak conclusion that it would be better to lease out the building than to continue

²² *The Times*, 12 March 1879, p. 7.
²³ *The Times*, 15 March 1879, p. 12.
²⁴ *The Times*, 26 May 1879, p. 8.
²⁵ *Punch*, 25 September 1880, p. 133.

as a ‘public company with divided counsels’.²⁶ They had held initial discussions with Samuel Morley, which led them to hope that he would take over the building to establish a school of art, design and technology that presumably would have absorbed the Polytechnic College. No definite proposal was made however, and in July 1881 the decision was finally taken to wind up the company. Mackenzie and Samuel Morley were two of the liquidators.

When the final week’s programme was announced, so many people came to see their old favourites – including the great electrical machine powered by the remaining steam engine, the induction coil, the automata Blondin and Léotard and the diving bell – that the show ran for three weeks instead of one.²⁷ The last performance was on Saturday 10 September 1881. The staff had not given up hope; George Buckland was trying to raise the money to purchase the Institution. Malden later suggested that Morley did what he could to prevent Buckland’s syndicate from succeeding.²⁸ Whether or not there is any truth

Fig. 76, facing page
This programme arranged for the Polytechnic’s final week proved so popular that it ran for three weeks.



Figs. 74 and 75
These pages are from the sale particulars for the Polytechnic building, prepared for the auction on 7 December 1881.

in this suggestion it is impossible to say, but it illustrates once again the bitterness between the factions within the Polytechnic, and also the regret still felt by the lantern community at its loss nearly thirty years on.

The property was put up for auction on 7 December, and was bought by the liquidators for £15,000.²⁹ It was then sold by private treaty to Quintin Hogg, the wealthy businessman who wanted the building to provide a new home for his Young Men’s Christian Institute. Hogg had been actively involved in philanthropic work for nearly twenty years, and moved in the same circles as Mackenzie and Morley; he must have known them both. Even if Morley somehow engineered the sale to ensure Hogg was successful, it was not part of Hogg’s plans to maintain the Polytechnic College. He needed an empty building for his purposes.

26 UWA RPI R62, p. 1.

27 UWA RPI R59.

28 *The Kinematograph & Lantern Weekly*, 23 September 1909, p. 970.

29 *The Times*, 8 December 1881, p. 6.

PRICE ONE PENNY. *W. H. W. a*

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Patron:—H. R. H. the Prince of Wales. *R59*

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GOOD BLACK TEA, 2s. PER POUND, ABSOLUTELY.

The Polytechnic assets were sold off early in 1882; Hogg reported to Institute members that the sale:

went off better than expected. The slides fetched enormous prices, something like £900 in all, so nobody got much of a bargain out of them except the sellers. The mechanical Blondin went to the North of England, selling for £84; while L'éotard, who brought £20, is to cross the Atlantic and exhibit in America. Our old friend the diving-bell, with its pumping apparatus and crane, fetched £60; while the electric organ only fetched £58.³⁰

Hogg allowed the Royal Polytechnic staff a final benefit season, which opened on Boxing Day and ran for four weeks. Malden wrote that this gave the secretary, James Howell, an opportunity to introduce changes into the programme free from the restrictions imposed by the directors which showed 'how it might probably have been kept alive', but it was too late.³¹ The end had finally come. Gifts were distributed from the Christmas tree for the last time, and the following advertisement appeared in *The Times*:

Royal Polytechnic. Closing for ever. With this week will pass away an institution that has been the friend and mentor of two generations. All who have pleasant memories of happy hours spent in its halls and theatres should avail themselves of this last opportunity to revisit the scenes that will now cease to exist save in history.³²

30 *Home Tidings*, March 1882, p. 37.

31 *The Kinematograph & Lantern Weekly*, 23 September 1909, p. 970.

32 *The Times*, 18 January 1882, p. 1.

Epilogue

Hogg had been intending to build a new home for the Institute in St Martin's Lane, but he changed his mind when the Polytechnic building came onto the market. He realised – just as Charles Payne had done in 1837 – that the central position in Regent Street 'would be sure to challenge attention', and would help him to further his ambitious plans, declaring, 'The premises are surpassed by those of no other Young Men's Institute or Association in the world.'¹

In the early 1860s Quintin Hogg had worked as an evangelical missionary in the slum areas of Covent Garden, driven by his determination to rescue street children from both poverty and ignorance of the Christian faith. His background was one of privilege; he was born into a wealthy and influential family and educated at Eton, where he excelled at football. When he left school to work in the City he was soon given a business opportunity by a family connection that enabled him to build a lucrative career. At first glance Hogg appears to fit the stereotype of a Victorian do-gooder, but the reality is more elusive and more complex.

The defining characteristic of Hogg's philanthropy was that he made a very real attempt to understand the young people whose lives he sought to improve, in order to find the most practical ways of helping them. The winter of 1863–4 was his first in London after leaving school; he was 19 in February 1864. During the day Hogg worked in the City, but after work he regularly changed into ragged clothes and slept rough on Thames barges or under the Adelphi arches. He also attempted to earn a few pence doing casual jobs, as homeless children did. His first philanthropic venture was to open a ragged school, followed by a boys' home, in the disreputable area between the Strand and the river. He combined his business life with his voluntary work, teaching classes in the evenings, spending nights sleeping at the home, arranging informal games of football and taking the children on excursions into the countryside.

Hogg's earliest educational work involved teaching children to read so that they could read the Bible for themselves. As the provision of elementary education began slowly to improve after the Education Act of 1870, the focus of his interest began to shift towards enabling young people to escape from poverty by equipping them with the skills necessary to secure

¹ *Home Tidings*, March 1882, p. 3.

permanent employment. This led him to experiment with creating a model for ‘technical education’ best suited to the needs of the young men he knew so well.

Hogg came to Regent Street determined to make the Institute ‘a centre of education for the artizans of this great city’.² Initially he funded the work himself, and the development and ethos of the Institute were shaped by his beliefs. Regent Street Polytechnic, as it was later called, was different from the Polytechnic College because much of the education it provided was practical, suited to the needs of young working people who found it easier to learn in the workshop than in the classroom. The trades taught were those requested by the members, and the teachers were experienced practitioners, ensuring that Hogg’s Polytechnic was closely linked to the local economy from the beginning.

Hogg also provided for the spiritual, social and physical needs of the members of his Institute. One of the first changes he made to the Regent Street building was to convert the Great Hall into a gymnasium. The 1848 theatre, confusingly, was renamed the Great Hall and was used for all large gatherings. So many young people flocked to join the Polytechnic that the building was constantly altered and expanded before it was finally rebuilt in 1910–12. The gymnasium and the theatre were retained in the new building and, despite many refurbishments, are still recognisable today. The iron rail around the gallery in the gymnasium, clearly visible in early prints of the Great Hall (*see* p. 17) was uncovered in 2006, though modern health and safety regulations mean that it is now backed by a transparent screen. Below the floor there is still a section of large-diameter pipe, which is surely the one used to drain the diving tank in case of emergencies.

The Polytechnic theatre is generally known in the University as the ‘old cinema’; recent refurbishments have retained a sense of the space as it appears in images from the 1920s. The full story of the development of the theatre after 1881 is outside the scope of this book, except for a brief explanation of the transition from lantern theatre to cinema.

Hogg arranged evening entertainments for members, and the programmes included some of the popular attractions that had previously featured at the Royal Polytechnic. B.J. Malden, for example, returned to give a number of lantern lectures, including a ‘grand popular astronomical entertainment’ as part of the Christmas programme in December 1888. Malden’s advertisement contains an echo of the past. Among the special effects he exhibited was ‘the Great Planetarium, showing in one view all the Planets in actual motion (by complicated machinery) on a scale of grandeur and completeness never before produced away from the Polytechnic Institution.’³

The London County Council, established in 1889, imposed the need to comply with fire regulations. Hogg’s purchase of the Marlborough Rooms which occupied the front part of the site at 307 Regent Street in 1891 finally made it possible to access the theatre from the street (*see* p. 43). In an attempt to generate much needed income, the theatre became available for hire. A

Fig. 77

These performances of Pepper’s ghost illusion took place during the annual Industrial Exhibition held at Hogg’s Polytechnic. Pepper had recently returned to London after ten years in Brisbane, Australia.

² *Home Tidings*, March 1882, p. 42.

³ UWA YCI Polytechnic Young Men’s Christian Institute, *Syllabus and Prospectus 1888–89*, p. 49.

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309, REGENT STREET, W.

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CHILDREN UNDER 12, HALF-PRICE.

UNNUMBERED SEATS, 1/6 & 1/-

(1889)

Frenchman, Félicien Trewéy, chose it as a venue to bring the Cinématographe-Lumière to London, and the first display of moving film to a paying audience in Britain famously took place in the Polytechnic on 21 February 1896. Trewéy's season ended in July, but it had created a demand for cinema among Institute members. By October of the same year the Polytechnic was arranging its own shows, which were also open to the public. Within a couple of years it was making its own films and regularly describing itself in *The Times* as 'the Home of Animated Photographs'.⁴ The new Polytechnic had revived the theatrical tradition of the old, and London audiences continued to be drawn into the building for a variety of popular entertainments.

One such occasion will bring this story to a close. At Christmas 1889 the ghost walked again on the Polytechnic stage. Pepper had recently returned from Australia, and Hogg invited him to present the illusion in its former home. The performance formed part of the annual 'industrial exhibition' which took place in the two weeks after Christmas. The building was lavishly decorated, there were displays and demonstrations by students, club members provided side shows, and the public were invited to come in. In later years this event was renamed the New Year's Fête.

The ever optimistic showman hoped this appearance might revive his stage career, but, although the event was popular it seems to have been generally regarded as a nostalgic interlude.⁵ The ghost illusion was never widely adopted in the theatre because it was cumbersome to produce. Its future lay in fairgrounds and eventually in cinema and special effects. After the Polytechnic season was over, Pepper retired into private life.

During this visit Hogg arranged for the publication of *The True History of the Ghost*, preserving for posterity the great showman's account of his most famous illusion, and a curious episode in the history of the Polytechnic.⁶

4 *The Times*, 23 December 1896, p. 1.

5 John Henry Pepper, *The True History of the Ghost; and all about Metempsychosis* (London: Cassell, 1890), p. 46.

6 *Polytechnic Magazine*, 9 January 1890, p. 18.

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