International Exhibitions, British economic decline and the technical education issue 1851-1910

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Abstract

The second half of the nineteenth century was interspersed by a series of international exhibitions which left an indelible mark on the period. In 1851 over 6 million people visited the Great Exhibition. By 1900 nearly eight times that number visited the event held in Paris to celebrate the beginning of the twentieth century. Through these exhibitions millions were '...taught, indoctrinated and mesmerised...Urban centers were re-planned to accommodate them, national economies damaged, fortunes made and wars postponed...' [1] In England they were used as a focal point for the debate about the link between industrial advance and the provision of scientific and technical education. They helped to initiate a series of public and private investigations into this theme which sometimes resulted in legislation that aided the growth of scientific and technical education. The cycle of exhibition, enquiry and action repeated itself in almost every decade of the second half of the century.

Over the past sixty years a number of historians have taken the view that lessons about the importance of this kind of education, partly resulting from the sequence of exhibition and enquiry, failed to be learned. In order to test the assumptions upon which this notion is based and ultimately its validity, a series of exhibitions held during the period between 1867-1900 are explored in this thesis. A number of key investigations that followed them will be examined for the degree to which a continuity of expectation can be identified. The extent of any legislation that emerged from these investigations and finally the economic health of Great Britain at the end of this period will also be appraised.

Of the many exhibitions held between 1867 and 1900 care has been taken to select for study only those that have a direct bearing on the debate. A number of American and French events are drawn upon because they illustrate the link

between exhibitions and industrial advance and provide a useful point of comparison. They are also particularly significant because politicians and educationists in Great Britain constantly referred to foreign examples of one sort or another throughout the period, especially as the Pax Britannica began to evaporate. The events held in England have been chosen on the basis of their proximity to major activity associated with education or trade or because they make a unique contribution to the overall development of exhibition culture.

This thesis starts with the 1851 Great Exhibition and then concentrates on the 1867 Paris exhibition followed by the Select Committee on Scientific Instruction and the Devonshire Commission; the 1876 Philadelphia and 1878 Paris exhibitions and the Samuelson Commission; the 1884 Health and 1885 Innovations exhibitions (both of which were held in London) in association with the Royal Commission on the Depression of Trade, the Technical Instruction Act and Whisky Money and finally the 1893 Chicago and 1900 Paris exhibitions, the latter contemporary with the Cockerton Judgment and the period during which the foundation was laid for the 1902 Education Act. It ends with an examination of the work of the 1909 International Exhibitions Committee. The review of each exhibition includes (where available) an account of its origin, details relating to its location, scale and scope, a description of any substantive building programme associated with it, an evaluation of the nature of the exhibits and the exhibitors (with particular reference to British participants) and an identification of any unique features or new developments. The reaction to it in England is also gauged. The evidence provided on each investigation and/or statute includes a statement about how it evolved, information on who commissioned it, a description of the skills and experiences of any individual or group (including Royal Commissions and Select Committees) associated with the enquiry or legislation, an estimate of their suitability for the task they were charged with undertaking, details of the witnesses called before the investigation with particular reference to industries

they represented and an assessment of the quality of the evidence collected and its relevance to the debate about future well being of Great Britain. Information on the report or statute and some measure of its impact is also incorporated.

Since the growth of scientific and technical education was inextricably linked to development of general education during the period under investigation, this too is it will also be explored where appropriate.

1) P. Greenhalgh, Ephemeral Vistas: The Exposition Universelles, Great Exhibitions and World Fairs 1851-1939, Manchester University Press, Manchester, 1988, p. 1

Declaration

This work is original and has not been submitted previously in support of any degree, qualification or course.

Signed.....Date.....

Acknowledgements

The author wishes to thank Dr. Robin Betts for the significant contribution he has made to the development of this work and for his continual encouragement, and Sue and Matthew Edwards for their unstinting support over the past five years.

Dedication

This work is dedicated to the memory of PETER HARRY EDWARDS and JOYCE CLARKE.

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Introduction

Michael Argles in South Kensington to Robbins , urges us not to be

> ...too ready to condemn the past for not organising a first class system of scientific and technical education; one might as well blame the medieval church for concentrating on the spirit of the life to come rather than on repairing the abuses of life on earth. [1]

The issue of British decline has pre-occupied historians, who for over a hundred years have sought to explain this phenomenon. For much of the twentieth century, particularly since WW1, the relative size of various nations has been considered a significant factor in determining who would be at the head of the industrial world. It has been assumed that larger countries, including the USA and the late USSR, would inevitably overtake smaller ones. It has also been assumed that more purposeful intervention by politicians in educational matters during the second half of the nineteenth century would have helped the British to resist this trend. It is this latter assumption, the logical basis of that which has never been seriously questioned, with which this thesis is concerned.

There is no doubt that in the early years of Victoria's reign the British occupied a position of industrial supremacy. This era was unique because of an unprecedented expansion in production that generated a period of great commercial prosperity. [2] The transformation that was taking place in the whole of society was both rapid and unrelenting. There was an '...astonishing surge forward in the capacity of Britain to create and consume wealth...'.[3] As a result the country could boast that it had become one of the richest nations on earth. [4] It is equally true that as the nineteenth century drew to a close other countries began to reduce this industrial lead and in some cases overturn it. A minority of Victorian commentators, some as early as the 1850's, claimed that a lack of scientific and technical education in England exacerbated this situation. These individuals, who are best described as the technical educationists, subscribed to the view that without it '...the industry of the United Kingdom would be overtaken by those of other countries...' [5] They argued that scientific and technical education was a necessary antidote to foreign competition. They were vigorous and persistent in promoting their ideas despite the failure of successive governments to heed their

warnings. [6] Argles regards them as prophets '...who campaigned ceaselessly against the tide of the times...' [7] Abbott in Education for industry and commerce in England refers to the efforts of a number of well qualified individuals who constantly drew the attention of those in power to the debilitating effect on British industry of superior technical education abroad. [8] He points outs that this was stated '...again and again in England , but without any action being taken to remedy the defects...' [9] He reluctantly concludes that this condemned Britain to an irreversible decline. J. W. Adamson, commenting on the indifference towards science education, noted that the men of science regarded this neglect

> ...not only as a flagrant failure to employ a great educational instrument, but also as a positive obstacle to the country's industrial progress. Collectively and individually they had done their best to compensate for the omissions of schools and universities and to arouse the country to the serious consequences of neglect... [10]

D. S. L. Cardwell, although in agreement with Abbott and Adamson suggests that the protestations of the cognoscenti did have a limited impact. He states that the technical educationist were periodically able to capture public interest in this issue, sometimes generating considerable panic. He claims that during each one of these phases

> ...a great deal was accomplished and much more was hoped for...but, after a while there came a period when the sense of urgency relaxed and things were allowed to drift until the next alarm ; the process was one of fits and starts. There was, in fact no settled policy , for orderly, evolutionary development, there was only a series of responses to awkward situations. [11]

Andy Green intimates that, despite a late injection of common sense, this cycle of alarm followed by endeavour and inaction left an enduring legacy in which '...publicly funded technical education became normatively part-time and institutionally marooned between the workplace and mainstream education'. [12] Abbott also believed that technical education had become the Cinderella of the

system. [13] He was in no doubt, as were his colleagues, that apathy on the part of successive Governments was to blame. He states that given the strength conviction of the technical educationists it is difficult to understand '...why so little was done...' [14]

Robin Betts questions the validity of conclusions based largely on the arguments of the technical educationalists. Whilst he acknowledges that the issue of technical education was mishandled by the British he contends that this failure was only marginally important. [15] He states that it was commercial rather than technical education that had a more profound impact on the economic health of the country during this and subsequent times. [16] Following chapters trace the periodic reiteration of the ideas promoted by the advocates of technical education (so readily sized upon by Abbott and his colleagues) and test them against the new analysis provided by Betts.

Any work that explores the relationship between exhibitions, technical education and industrial progress cannot afford to ignore the Great Exhibition of 1851. Besides capturing the spirit of the age it established a standard by which subsequent exhibitions were measured. It also provides an indicator of the industrial well being of United Kingdom. More significantly, it helps the uncover the complex forces that govern British attitudes towards technical education and reveal some of the main protagonists involved in the debate. Even the year in which it was held was momentous, offering a perfect vantage point for a survey of England during this period. Contemporaries were able look back

> ...across the ' hungry forties' to the antediluvian world before the railways and the penny post; before steam power, in George Eliot's phrase, had ' driven on every wheel double pace, and the wheel of fortune along with 'em'. They could look forward, too, to long years of progress, to the further expansion of production, and to the development of distribution-to what the satirists contemptuously called the ' cotton millennium...[17]

In 1849 Henry Cole, [18] who had been involved in the exhibitions associated with the Society of Arts, returned from attending an industrial exposition in Paris enthusiastic about developing a similar venture in Britain. [19] The Prince Consort, who remembered the Frankfurt Fairs of his childhood, also recognised that an exhibition might offer a means of supporting artistic and industrial causes in his adopted country. He and Cole, who had met through the Society of Arts, decided to work together to convert the idea to hold an exhibition into a practical reality. [20] Their combined objective was to use the event for '...the promotion of every branch of human industry by means of the comparison of their processes and results as carried on and obtained by all nations on earth...' [21] However, the notion of making the exhibition truly cosmopolitan belonged to Prince Albert. He was most insistent, even when challenged, to maintain this perspective. Exhibitions in other countries had claimed to have an international dimension but in reality, both the contributors and exhibits were usually drawn from the host country or its dominions. [22] Cole was dispatched to find out how the wider community might react to the concept and, despite the fact that few of the details had been worked out at this stage, he reported '...considerable enthusiasm, interest and pledges of support...' [23] This was unsurprising given the fact that the country bristled with self confidence to the extent that some believed that England '...had both the capability and the right, indeed the positive obligation to remake mankind in its own image.' [24]

The Society of Arts was asked to organise the exhibition but it soon became apparent that the scale of work required would overwhelm it. Albert urged the Liberal Government of Lord John Russell to establish an appropriate official body to take on the organisational role vacated by the Society. A Royal Commission resulted from his petition. The Commissioners were appointed by Royal warrant on

January 3 rd 1850 and a subsequent Royal charter was issued on August 15 th 1850. Members of the Government including the Prime Minister were co-opted on to its executive committee.

The initial goodwill Cole had encountered when the notion was first raised in the wider community appeared to evaporate quickly. The concept of an exhibition which was dedicated to the 'Works of All Industrial Nations' and sponsored by a foreign Prince Consort, had radical overtones that some Englishmen found unpalatable. Opponents of the event were able to marshal considerable support amongst politicians, in the pages of some newspapers (The Times in particular) and from a group of residents who lived on or around the proposed exhibition site in Hyde Park. Charles Babbage, a noted commentator on the events of 1851, disparagingly referred to these protesters as the Belgravians and their medicine men. [25] They raised many objections to the project, even questioning the need to cut down trees to make way for Joseph Paxton's glass mansion in which it was planned to hold the exhibition. [26] The Belgravians also suggested that pestilence and disease would accompany so many foreign visitors to London. Perhaps more darkly, they perpetuated rumours of anarchy and assassination. [27] Colonel Charles Sibthorp, the M.P. for Lincoln and Albert's main Parliamentary foe, went so far as denounce the exhibition as greatest trash, the greatest fraud and the greatest imposition ever pressed on the people of England. [28] When Cole was again questioned about the chance of success of this venture he admitted frankly that effect of this opposition, in conjunction with ' ...the state of indifference of the manufacturing districts rendered failure almost certain.' [29] This apparent change of heart produced consternation in government circles. Failure of the event would tarnish the reputation of the Royal family and the Queen '...was naturally uneasy.' [30] Lord Granville, President of the Board of Trade, [31] recommended that a scientist, Lyon Playfair, [32] should be appointed to address some of the problems that arose

from the internal workings of the Commission and public reaction to the concept. Playfair, who spoke German and had been tutored as a research chemist by Professor Justus von Liebig in Giessen, was employed at the School of Mines. [33] He had to be actively persuaded to take up this new position but soon established a good rapport with the Prince and all the major parties involved. He made an extensive trip around Britain to raise support for the event. He asked business leaders to endorse, and in some cases underwrite parts of the exhibition, and also took the opportunity to address the concerns of local Parliamentary representatives and civic leaders at the same time. Wemyss Reid suggests that Playfair's activities soon created enough public support for the Great Exhibition to be funded by private subscription alone. [34]

The first column of Crystal Palace was laid on September 26 th 1850 in Hyde Park. It took only seven months to construct and was finished on schedule. The building measured 851 ft by 451 ft. It contained enough space for 10 miles of exhibition frontage and was capable of accommodating 40,000 visitors at any one time. Despite ominous weather the exhibition was opened on May 1 st 1851 at 12 noon promptly in front of 25,000 spectators. [35] Technology was the common theme that linked all the exhibits in one way or another. Products were arranged into four distinct categories, Manufacturing, Machinery, Raw Materials and Fine Arts. The selection of things on display was extraordinary, ranging from an automated device for making cigarettes to steam engines. Thirty-four nations were represented including Austria, Belgium, Brazil, Bremen, Chile, China, Denmark, Egypt, France, Germany (the Zollverein States), Greece, Hamburg, Hanover, Holland, Lubeck, Mexico, Mecklenburg-Strelitz, New Granada, Oldenberg, Persia, Peru, Portugal, Rome, Russia, Sardinia, Schleswig-Holstein, Society Islands, Spain, Sweden, Switzerland, Tunis, Turkey, Tuscany and the United States. There were over 13,000 exhibitors with at least half the exhibition area being occupied by

Great Britain and its colonies. [36] Exhibits were judged by international panels and medals awarded as prizes.

At its heart the exhibition celebrated the machine '...choosing exclusively to see in it a glorious past and a chance of a blemishless future.' [37] This attitude reflected the fact that the industrial and commercial power of English at the time was partly based on the mechanisation of production. Despite this reliance on technology there was a curious ambivalence towards it amongst manufacturers. The majority firmly believed that science and technology were not vital to industrial success. The fact that in the early part of the century, when industrial practices were changing rapidly, innovation mainly resulted either from the tradesman refining his craft through constant activity or the efforts of the dedicated amateur in pursuit of knowledge for the sake of it increased their scepticism .[38] They believed that empiricism and scientific understanding had only a limited impact on the developments that were taking place. There were exceptions, particularly in Medicine and Chemistry but the two cultures of the '...educated amateur and the practical man strengthened resistance to science based innovation.' [39] In general the rule of thumb prevailed and the possession of raw materials such as coal was regarded as more fundamentally important in maintaining industrial strength.

England's unrivalled position at the head of the industrial world appeared to be re-affirmed when its exhibitors received most of the top prizes for the various categories of award. [40] However, Prince Albert believed that there was a growing threat from abroad which need to be addressed. He subscribed to an unfashionable notion that the continued supremacy of English manufacturing was not guaranteed. He was aware that improvements in transportation and

> ...the increased means offered by science for the extraction, preparation or culture of the raw materials have lessened the peculiar local advantage of certain nations, and thus have depressed the relative value of certain raw materials as an element in manufacture: while they have immensely increased the value of skill and intelligence as the other great element in manufacture. [41]

Rather than analyse and refine the skills (industrial and commercial) that made Britain the workshop of the world (the English tradition) he concluded that the future well being of industry could not be left to the practical man without technical education (the German tradition). [42] He determined that educating the working populace would help to compensate for any potential loss of 'local advantage' that Great Britain was likely to experience. He believed that a general cultural elevation and improved attitude towards business were also necessary.

It was Lyon Playfair who publicly express his anxiety about the dearth of technical education in Great Britain. He predicted that Europe would overtake England if it failed to adapt to the new industrial reality by altering her outlook and methods. [43] He articulated the feelings of some of his colleagues when, in a lecture to the School of Mines, he stated that the extension of scientific and technical education was

> ...the want of the age. The old and yet widely existing scholastic system of education, introduced by the revival of learning in the fourteenth and fifteenth centuries, is ill adapted to the necessities of the times. Erasmus would not now aid Cambridge in advancing the progress of England, nor would Vitelli make Oxford useful to the mass of its population...Euripides and Thucydides cannot make power-looms and spinning-jennies; for these Watts and Arkwrights are required. A Poggio may discover copies of Lucretius and Quintilian without thereby producing a result equal to that of the smallest discoveries of a Stephenson or a Wheatstone. When will our schools learn that dead literature cannot be the parent of living science or active industry? [44]

Playfair later became so concerned with this issue that he took the extraordinary step of embarking on his own private inquiry into technical education in Europe. He financed this investigation himself and combined his experiences and

conclusions in Industrial Education on the Continent which he also had published. He suggested that technical education should form part of the curriculum in most schools. This was a radical proposition. As yet no national system of education in England and Wales existed. What was available was, '...neither free, compulsory nor universal and the question of whether to send children to school was considered to be solely for parents to decide...' [45] The Church and charities were the main agencies who delivered education that was rigidly divided on social lines. Upper class education focused mainly on the acquisition of social graces and skills appropriate to a leisured ruling elite. Middle class education tended to mimic the education of the aristocracy. Working class education, for those who were able to take advantage of it, was largely composed of basic schooling in literacy, numeracy and religion. [46] The only technical education available in England at that time, unlike the situation in Belgium, France and the German states, [47] had grown from an initiative started by George Birkbeck in 1800. [48] Birkbeck recognized that there was a need to provide scientific training for artisans in subjects related to their trade and he started a series of lectures with this theme at the Anderson Institute in Glasgow. This gave rise to the Mechanics' Institutes movement that copied and carried Birkbeck's idea across the whole country. [49] However, the lack of basic literacy and numeracy amongst the working population meant that by the 1850's Mechanics' Institutes were unable to service the needs of the group they had originally been designed to help. They had evolved into places where those with time to spare and enough basic education could receive lectures on a variety of subjects that were not necessarily scientific. Despite this evidence an article published in the Economist soon after the exhibition closed, suggested that scientific and technical education was already better understood and better practised in England '...judging by the results, than by any nation of the continent of Europe...' [50] This was a reflection of the range of

interpretations applied to the phrase technical education rather than a boast of a poorly informed commentator. To the majority who believed that technical education was best delivered through practical activity, it was a legitimate statement. They argued that the workshops and the offices of the United Kingdom were the

> ...true technical schools. In these, the mysteries of thousands-nay, tens of thousands-of distinct employments are daily carried on, and there are no treatises that could communicate a millionth part of the industrial knowledge and skill accumulated in the hands of our work people. [51]

This idea was extended by some to include apprenticeships in government polytechnic schools where the joiner would learn about the theory and practice of carpentry and the shoe maker about the last. [52] To the technical educationists who believed in the importance of theory, it had less validity. They wanted to codify this 'industrial knowledge' and wondered how it could be imparted and to what extent it should be delivered to the general population.

The Great Exhibition was an enormous success, allowing for an uncritical celebration of English technical achievement. It elevated all things industrial to the forefront of national thinking, despite the resistance of sections of the community. Some observers have suggested that it was the only convenient point from which the history of modern industry can truly be judged. [53] To most contemporary Englishmen the exhibition had a more immediate significance. It affirmed that their country was still pre-eminent at the head of the industrial world. The prediction of imminent collapse by Playfair and his colleagues appeared to be unfounded. Hence, the campaign by the technical educationists was difficult to justify. They also struggled to implement their ideas because the scale of the cultural and social reform required was immense. This was unlikely in a nation that had continuously demonstrated an unwillingness to accept radical change.

The problems associated with defining technical education did not help their undertaking. They also suffered because the main protagonists lacked a common identity. They were a collection of individuals who shared few things except holding opinions that ran counter to accepted wisdom. They did not have a uniform set of principles and objectives. Cardwell infers that there was a curious vagueness surrounding the ideas of the leaders of the technical educationists '...which makes it difficult to specify with any precision the objectives they had in mind or to assess the ultimate effects of their movement...' [54] Despite all these problems the surplus funds generated by the Great Exhibition allowed the vocal minority who supported the development of scientific and technical education to act in a forceful way. [55] Prince Albert, on behalf of his colleagues, applied for a substantial grant from Parliament in order to supplement what he already had acquired in profit from the exhibition. He received a further £150,000 and with the combined total set about offering practical aid. At his request the Royal Commission purchased two estates and part of a third property which consisted of little more than fields intersected by narrow lanes in what is now called South Kensington. [56] The Prince Consort wanted to bring all the great institutions that existed in London at the time, including the National Gallery and the Museum of Art, to this location. The proposal to move the gallery to the site was resisted but a Natural History Museum and a new Museum of Art were established in the area. A more significant part of Prince Albert's plan was to create a practical institution for the application of science and art to productive industry. [57] He thought deeply about the nature of this institution and how to organise it. He recommended that it should reflect the four major categories into which the Great Exhibition was arranged and be dedicated to encouraging the growth of industry (internationally) in these divisions. [58] This was the origin of what later became known as the Royal College of Science. As a direct result of the exhibition in 1851 the Prince Consort,

with Lyon Playfair and Henry Cole, also established the Science and Art Department. It was formed in 1853 and was designed to be the vanguard of the technical education movement in England. The Department's main function was the instruction of students and the education of teachers in applied science and art subjects. It was unique because it enjoyed a high degree of autonomy, unlike other parts of the government. Senior personnel were chosen without reference to external agencies and policy was developed independently. Playfair was appointed with Cole to run the fledgling organisation.

Although the technical educationists were able to advance their cause as a result of the Great Exhibition some historians regarded this as a Pyrrhic victory. They have concluded that this was a temporary success which led to a series a costly oversights rather than triumph, because the political and industrial elite were reluctant to fully embrace the ideas held by Playfair and his colleagues. Correlli Barnett is one of the most vociferous supporters of this viewpoint. In The Audit of War he reflects on what he regarded as the failure of the greatest industrial nation in the world to fully nurture the capability of its people. [59] He alludes to this as the British diseases. Barnett justified this characterization by referring the 'crushing inferiority' in education and training that existed between England and other European nations just before the start Second World War. He lamented the fact that at such a precipitous moment in time a hundred years of warning about the dangers posed by a failure to embrace technical and scientific education had not been fully heeded. He notes that, '...private individuals and official bodies had attempted to convince public opinion and government that the battle for export markets was being lost in the school yards and quadrangles of Britain...' [60]

Yet by comparison with most of the nations who had already addressed this issue, the British still emerged from the conflagration victorious and intact. This

incongruity cast enough doubt on the views of the technical educationists for questions to be asked about the credibility of their analysis of the situation. Further questions are prompted by this anomaly. Were the British right to assume that comparison with other nations, particularly through exhibitions, was a useful measure of their own social and industrial health? Is it legitimate to claim that opportunities had been missed? Did industrialists, as Weiner has suggested, lose their taste for their inheritance by adopting the mores and practices of the aristocracy? [61] Has the debate been over-simplified by assuming that the fundamental relationship between technical education and wealth generation was incontrovertible and that it could be easily manipulated? Roderick and Stephens, in their thorough investigations into this subject, acknowledge that British industrial supremacy in mid century resulted from a confluence of accidental factors rather than some planned policy or by human design. [62] Finally, was the issue of free trade, ostensibly settled in 1846, more important than educational historians have previously allowed?. G. A. N. Lowndes concludes that to go on repeating that the British workman as the best in the world would be vain unless

> ...the goods he made could surmount tariff barriers because they were better designed, more skillfully advertised, more durable, and more up to date than those with which they competed. England in fact must for ever be seeking to anticipate the market or produce goods requiring a degree of scientific precision unattainable, at similar cost, elsewhere. [63]

FOOTNOTES : INTRODUCTION

1) Michael Argles, South Kensington to Robbins: An account of English Technical and Scientific Education since 1851, Longmans, London, 1964, p. 54

2) A. Briggs, Victorian People: A reassessment of persons and themes 1851-67, Penguin, London, 1965, p. 22

3) S. G.. Checkland, The Rise of Industrial Society in England 1815 -1885, Longmans, London, 1966, p. 26

4) G. Best, Mid-Victorian Britain, 1851-75, Weidenfeld and Nicholson, London, 1971, p. 21

5) M. Argles, op. cit., p.14 and G. W. Roderick and M. D. Stephens, Education and Industry in the Nineteenth Century, p. 4

6) They used the evidence from a series of international exhibitions held during the period to promote their cause

7) M. Argles, op. cit., p. 136

8) A. Abbott, A Abbott, Education for industry and commerce in England, Oxford University Press, London, 1933, p. 180

9) Ibid.

10) J. W. Adamson, English Education 1789 to 1902, Cambridge University Press,London, 1964, p. 391

11) D. S. L. Cardwell, The Organisation of Science in England, Heinemann, London, 1972, p. 175

12) A. Green, Education and State Formation: The Rise of Education Systems in England, France and the USA, The Macmillan Press, London, 1990, p. 299

13) A. Abbott, op. cit., p. 180

14) Ibid.

15) R. Betts, 'Persistent but misguided?: the technical educationists 1867-89', History of Education, Volume 27, N° 3, 1998, p.

16) Ibid.

17) A. Briggs, op. cit., p. 3

18) Sir Henry Cole (1808-1882) who had been an official at Christ's Hospital and a sub-commissioner of the Record Commission was appointed as the Assistant Keeper of the Public Record in 1838. He served on the organising committee of the

1851 Exhibition and in the same role at subsequent events in 1862 and 1871. He was made joint secretary of the Science and Art Department in 1853 and held the post by himself from 1858 to 1873. He also represented Britain as a Commissioner at the 1855 and 1867 Paris Exhibitions.

19) William Shipley (1714-1803) founded an association called the Society for the Encouragement of Arts, Manufactures and Commerce in 1754. A drawing master working in Northampton who wanted to promote innovation in commerce and industry. The Society of Arts, as it became known soon attracted a diverse membership including noted architects, artists and businessmen. It held its own series exhibitions of arts, crafts and inventions from as early as 1760. These were modest affairs but they had an intellectual vitality that that was missing from those developed later in France.

20) R. R. James, Albert, Prince Consort: A Biography, Hamish Hamilton, London, 1983, p. 194

21) T. Martin, The life of the Prince Consort, Vol. II, Smith, Elder and Co, London, 1876, p. 596

22) P. Greenhalgh, Ephemeral Vistas: The Exposition Universelles, Great Exhibitions and World Fairs 1851-1939, Manchester University Press, Manchester, 1988, p. 10-1

23) R. R. James, op. cit., p. 196

24) A. L. Friedberg, The Weary Titan: Britain and the Experience of Relative Decline 1895-1905, Princeton University Press, Princeton, 1988,, p. 27

25) Charles Babbage (1791-1871) is sometimes referred to as the father of the modern computer. A mathematician who graduated from Cambridge University in 1816, he held the post of Lucasian professor of mathematics at Cambridge between 1828-39. He helped to found the Astronomical Society in 1820 and subsequently occupied a number of key post in that organisation. Always forthright in his opinions, he published a controversial book on the decline of English science in 1831 which led to the formation of the British Association for the Advancement of Science. Concerned to remove the drudgery and human inaccuracy from computation he developed plans for a calculating machine which called the Difference Engine. He obtained government funds in 1834 to construct the machine but it proved difficult to manufacture. Babbage spent much of the next 37 years and a large portion of his family fortune trying to perfect it. His relation ship with the Government soured as a result of the withdrawal of their sponsorship and he never missed an opportunity to criticise politicians. He was the principal founder of the Statistical Society in 1834 and extensively wrote and commented upon industry and its relationship to science.

26) Joseph Paxton (1801-65) gardener and architect who was superintendent of Chatsworth gardens from 1826. He was also a friend of the Duke of Devonshire and accompanied him on his travels between 1838 an 1840. He responded to the criticism of the Belgravians by altering his Crystal Palace design so that the trees were enclosed by the glass and iron building rather than removed.

27) C. Babbage, The Exposition of 1851, Views of the Industry, the Science and the Government of England, John Murray, London, 1851, p. 6

28) Charles de Laet Waldo Sibthorp, (1783-1855) A politician who represented Lincoln from 1826-55 except for the period between 1833 and 1834. He was also a Colonel in the South Lincoln Militia and served with the 4th Dragoon Guards in the Peninsula War. Sibthorp was an able if eccentric speaker who opposed Catholic emancipation and managed to get a reduction of grant to Prince Albert. See Robert R. James, Albert, Prince Consort, Hamish Hamilton, 1983, p. 198

29) W. Reid, Lyon Playfair: Memoirs and Correspondence, Cassell, London, 1899, p. 115

30) Ibid., p. 112

31) Lord Granville (1823-89) was a close friend of the Prince Consort who had great credibility with the Royal family. He became an M.P. for Buckinghamshire between 1846 and 1857, Lord of the Treasury in 1852, Privy Councillor in 1866 and President of Council (1866 -67); Colonial secretary (1867-68) and chairman of committees in the House of Lords (1886-89)

32) Sir Lyon Playfair, first Baron Playfair of St. Andrews (1818-1898) A chemist who discovered the nitroprussides, a new class of salts and Liberal M.P. who represented the universities of Edinburgh and St. Andrews (1868-85) and South Leeds (1885-92). He studied chemistry in St. Andrews London and Giessen and was honorary professor of chemistry to Royal Institution, Manchester (1842-45), chemist to the Geological survey and professor to the School of Mines in 1845, professor of chemistry at Edinburgh University (1858-69), Secretary for science at the Science and Art Department in 1853, postmaster general in 1873, chairman and deputy speaker of the House of Commons (1880-83), vice-president of the committee of council in education in 1886 and lord in waiting to Queen Victoria, 1992. He was an advocate of technical education who wrote and spoke about this issue with continued passion throughout his life

33) Professor Justus von Liebig (1803-1873), the founder of organic chemistry, was one of the foremost thinkers of the age at the time Playfair went to study with him in Giessen. He also had one of the best laboratories in Europe which was populated by many students who were to rise, in later years to key positions across the continent.

34) W. Reid, op. cit., p. 117. The Commissioners were able to report that £65000 was available to them by the opening of the event.

35) It closed five months later.

36) A. Briggs, op. cit., p. 38

37) D. S. L. Cardwell, op. cit., P. 150

38) S. G. Checkland, op. cit., p. 73

39) M. J. Weiner, English Culture and the Decline of the Industrial Spirit 1850-1980, Penguin, Middlesex, 1985, p. 139

40) W. Reid, op. cit., p. 132

41) D. K. Jones, The Making of the Education System 1851-81, Routledge and Kegan Paul, London, 1977, p. IX

42) C. Barnett, The Audit of War: The illusion and reality of Britain as a great nation, Macmillan, London, 1986. See Chapter 11

43) L. Playfair, Industrial Education on the Continent, Royal School of Mines, London, 1852, pp. 52-57

44) The Economist November 15 th 1851, p. 1260. This article was also published in the Morning Chronicle of the same date.

45) D. K. Jones, op. cit., p. IX

46) Of the possible three million children in the population who should have been at school only about two million attended regularly enough to appear in the census of 1851. See ibid., p. 12

47) W. Reid, op. cit., p. 132. The Prince noted that in France and Germany there were '...entire systems of education devoted to those who are charged with industrial pursuits'

48) George Birkbeck (1776-1841) Founder of the Mechanics Institute movement. A Quaker physician who was appointed professor of natural philosophy, Andersonian University, Glasgow in 1799. Established Birkbeck Mechanics' Institute, London in 1824 and cofounded University College, London in 1827.

49) Mechanics Institutes were to be found in their greatest concentration in the West Riding of Yorkshire, South Lancashire, North Cheshire and Derbyshire and in smaller concentrations around the mining areas and ports. The largest were to be found in Liverpool, Huddersfield, Leeds and Halifax. By 1851 the movement had long passed its zenith)(37)

50) The Economist, November 15 th, 1851, p. 1261

51) Ibid., January 1868, p. 87

52) Ibid.

53) W. Reid, op. cit., p. 110

54) D. S. L. Cardwell op. cit., p.125

55) The event was a financial success which generated £180,000 after all expenses had been settled

56) W. Reid, op. cit., p. 141

57) Ibid.

58) T. Martin, op. cit., p. 571

59) C. Barnett, op. cit., p. 205

60) Ibid.

61) M. J. Weiner, op. cit., p 139

62) G. W. Roderick and M. D. Stephens, op. cit., p. 171

63) G. A. N. Lowndes, The Silent Social Revolution, Oxford University Press, London, 1970, pp. 102-103

Section 1 : A Matter For Serious Regret

Devonshire Commission

...if other people are educating their artisans and we do not educate ours, then notwithstanding our natural ability, others must pass us in the end. [1]

INTRODUCTION

The success of the Great Exhibition led to a number of similar events being held in cities around the world. Dublin hosted an industrial exhibitions in 1853 that attracted 1 million visitors but it made a loss of £19,000. In 1853/54 the Americans staged the World's Fair of the Works of Industry of All Nations in New York. Despite the fact that nearly 1.25 million people passed through its doors stockholders were obliged to repay a total debt of £70,000. The French held their first Exposition Universelle on the Champs Elysees in 1855. Even though the exhibition attracted over five million visitors it was also a financial disaster, losing eight million francs in seven months. In 1862 London tried to use the French experience to good effect when it formulated its own plans to stage another international exhibition, but it still made a loss of nearly £12,000. This was mainly borne by a single investor. [2] Dublin hosted another industrial exhibition in 1865 which attracted a million visitors and, for the first time made a small profit of £10,000. Regardless of their earlier experience the French decided to organise a second Exposition Universelle in 1867. Coincidentally the Schools Inquiry Commission under the guidance of Lord Taunton was also finalising its work at the same time. This unplanned concurrence had deep significance for the development of technical education in England. The Paris exhibition appeared to signal a relative decline in British industrial performance that the technical educationist claimed was linked to a dearth of technical education. The challenge to the notion that the British had an unassailable lead at the head of the industrial world shocked the establishment and generated a flurry of activity to find out if the claim was true and what to do about it. Taunton, in an extension to his original

brief, started the first of many enquiries into this issue that were undertaken in a relatively short period of time after the results from Paris were made public.

THE PARIS EXHIBITION (1867)

The event

The organisers of the Paris event, who were determined to avoid the mistakes made in 1862, used the Crystal Palace Exhibition as a template upon which to build. It was however, more than a simple clone of the original. The French were not afraid to recognise that the exhibition offered many commercial opportunities and organised their exhibits accordingly. [3] They adopted the history of work as a central theme and planned for an event at least four times larger than anything held before. It was designed so that it did not simply represent the manufacturing process, but also included the

> ...manner and customs of nations and dancing, singing, various theatrical representations, sports and shows were admitted within its scope. Shops were erected for sales, which were not merely permitted but encouraged throughout the Exhibition to the fullest extent and various means were resorted to by the Imperial Commission to increase their receipts by placing charges hitherto unusual on native exhibitors and on foreign commissions. [4]

The exhibition was organised, at the behest of Napoleon III, by Frederic Le Play. Since 1862 the Second Empire had witnessed a rapid expansion of its economy that was underpinned, in part, by the use of science and technology applied to transport. However, Napoleon's popularity had started to wane and the exhibition was regarded as an attempt to inspire support for him. The French announced their intention to hold the event as early as 1863 but it only began to take shape much later. Le Play, a Professor of metallurgy and geology from the Ecole des Mines was widely travelled and had a lasting commitment to exploring the link between industry and the economy. His interests were broadly reflected

throughout the exhibition. Funding for the event was provided by the State exchequer and the city of Paris, who jointly contributed two thirds of the overall cost. The remaining third was guaranteed by outside agencies. [5]

The principal building, located in the Champ de Mars district of Paris, was specially constructed for the event. It was a single storey edifice consisting of two semicircles joined by a rectangle which enclosed an open air central garden. It occupied over 36 acres and measured 527 x 406 yards. Enormous doorless entrances gave visitors access to the exhibition area. These took no account of the weather, which was dismal, and allowed the cold and dust born on the wind to harass the unsuspecting. [6] The structure was surrounded by restaurants which were drawn from all the participating nations including one from England where '...you could get some good cold meat with a bad salad drenched with that woeful mixture which is sold in bottles, and which looks like a dilution of putty...' [7] A giant marquee provided a further refreshment area. In the park next to the building a great metropolis of amusement was created to much public acclaim, even receiving a wholehearted endorsement from Lord Granville. [8] The attractions on offer ranged from caves, fairgrounds, gardens, grottos, money changing offices and a theatre to a multitude of examples of reproduction architecture. [9] Not everybody viewed this development sympathetically. The Times suggested that an individual must have had a mean soul if, when he entered Crystal Palace in 1851 he could not feel '...a touch of that sublime inspiration that had contrived a pacific gathering of all mankind with all that was usefullest and finest and most interesting of human work...' [10] However, it believed that because of the growing desire to providing amusement for visitors which was so evident in Paris, these noble sentiments

> ...have been trampled in gore, and the shouts of jubilee which inaugurated the Exhibition of 1851 have been exchanged in the inauguration of the present one [1867] for what has been termed the *delirium tremens*...[11]

The nature of the opinions expressed in The Times reflect English attitudes towards France during the period of the Empire. They can be best charecterised as admiration tempered by mistrust. However, the contrast between 1851 and 1867 was not confined simply to the amusements on offer. The Paris exhibition had a very distinct character. It was a strange mixture of imperial and economic ambition and Simonian paternalism. It projected a notion of society as a '...tuned machine capable of resolving conflicts and harnessing the world to its own ends. [12] It was, as near as possible, an epitome of life in which mighty industry, in all its forms, was exhibited without awkwardness alongside items designed to enhance the welfare of the poor. Few artificial divisions existed so that art, religion, science, war and benefaction '...might be seen, and might be appreciated, side by side...' [13]

The iron building provided by the Imperial Commission was divided into zones, each with its own unique focus. The curved areas of the structure were reserved for the principal parts of the exhibition, making the arrangements for displaying working machinery very difficult and costly. [14] The exhibits were further subdivided into various Galleries including those dedicated to the History of Labour, Machinery and Pictures. By far the most popular was the Machine Gallery where a vast range of working devices were housed. The Times special correspondent noted the excitement that accompanied certain exhibits in this Gallery. He described how he had seen a crowd of 20 people gathered around a little mechanical drama

> ...that seemed most important. What was it? A mousetrap. There was a little mechanical contrivance of a stuffed mouse that was always being caught in a trap, and coming out again to be caught again. It was something being done and people seemed to enjoy seeing it far more than they cared for the ceramic glories of Sevres and Staffordshire, all the jewelry of Hancock and Hunt and Roskell, all the orfeverie of Cristofle, and all the bronzes of Barbedienne. [15]

Other items on display in the Machine Gallery included looms, machines for making artificial flowers, spinning- jennies, sewing machines, printing presses, a machine for roasting coffee beans, railway signals, a mechanical device for making sweets, a travelling post office, giant steam hammers of great strength, pumps and many more items besides.

The scale of the British exhibit was considerable. However, whilst every participant was given the utmost freedom to display his wares and services ostentation was frowned upon. [16] There were 4755 exhibitors in the British section including those drawn from India and the colonies. Government agencies taking part included the Admiralty, the War Department, Trinity House, the Post Office, the Treasury, the Science and Art Department, the Board of Trade and the Irish Commissioners of Fisheries. Special buildings had to be erected in the Park and on the Berge to house the objects forwarded by the Admiralty, the War Department and others. These included a boiler room with a steam engine capable of producing 600 hours worth of power and a 180 feet rough wooden scaffold to exhibit an electric lighthouse. Space had to be provided in the main building for the displays of the Post Office, Trinity House and the Treasury. Government expenditure was approximately £120,000, which was regarded as good value for money. [17]

The exhibition was originally scheduled to open on the May 1 st and close on the September 30 th but it began a month early to accommodate the multitudes the organisers thought would rush to see it. The initial response to the event was poor but attendance soon increased. Between Easter Sunday and Monday over 162,000

people visited the exhibition. [18] By the time it closed seven months later (on November 4 th) eleven million people in total had flocked to see it. Napoleon III had originally claimed that the exhibition would remove barriers between people but the majority were simply enthralled at the scale of the technological advance it celebrated. [19] They came to see the steam locomotives, a new wonder metal called aluminum, American rocking chairs and many other things. They could also see weapons of war on display which had reached such a state of development that they heralded a new age of conflict rather than the peace desired by the organisers. [20] The Paris Exhibition was, like the Crystal Palace event, a financial success. English Commissioners to the exhibition, in a report on what they had seen, suggested that it also afforded '...more points on which the French nation may congratulate itself, than on those on which it has cause to regret...' [21]

Lyon Playfair was appointed as an international juror to the Paris exhibition. He was one of 146 people with what Henry Cole regarded as special qualifications, who accepted this role. [22] The others included the Duke of Cleveland, Lord Houghton, Lord Harding, Sir William Hutt, Sir Samuel Baker, Hugh Diamond, Charles Wheatstone, William Brookfield, Warrington S. Smyth, Richard Redgrave and Waren De La Rue. [23] Their work started a few days after the exhibition began and was largely complete by end of June. The English jury complained that despite an increase in the number of exhibitors there was less reward than in earlier French Exhibitions. It was apparent that

> ...in 1855 there were only 25,000 exhibitors, yet amongst these were distributed 112 large gold medals, 252 smaller ones, 2,300 silver medals, 3,900 of bronze and 4,000 certificates of honourable mention. In the present exhibition...there are 42,000 exhibitors, and the rewards are 100 gold medals, 1,000 silver, 3,000 bronze and 5,000 certificates of honourable mention. [24]

They could not understand this reduction but undertook their role willingly.

Reaction to the Paris Exhibition (1867)

Playfair was profoundly disturbed by what he had seen at the exhibition and heard from others in Paris. He discovered that, of the 95 classes of exhibits, hardly any English entries were awarded the top prize. More significantly he noted that, '...with very few exceptions, a singular accordance of opinion prevailed that our country had shown little inventiveness and made little progress in the peaceful arts of industry since 1862.' [25] The contrast with 1851, when English triumph was plentiful, appeared to be stark. The warnings that Playfair had issued in the previous decade seemed to have substance. His views were controversial but were widely reported in The Times. A more sanitised version of his opinions was published in a number of contemporary periodicals including the Illustrated London News. The coverage was split between the majority who agreed with his alarm and some who dismissed what he had to say as irrelevant.

Playfair judiciously sought Government backing for his views by expressing his concerns to Lord Taunton, Chairman and eponym of the Schools Inquiry Commission. [26] The Taunton Commission, the last of three established in the post Crimean War period, had been issued with letters patent on December 28 th 1864. It was asked to inquire into and report on the work of over 800 endowed schools not examined by the Clarendon Commission (1861-64) [27] and to expand upon the work already done by Newcastle Commission (1858-61). [28] The Report of the Taunton Commission, issued on December 2 nd 1867, recommended (with echoes of Clarendon) that the curriculum should be widened to include subjects such as science and more significantly that English secondary education should be unified and administered by one central body under the control of the State. [29] Collectively the Newcastle, Clarendon and Taunton Commissions provide a

complete overview of the state of English elementary and secondary provision during this period and serve as useful context in which to place the events of 1867. [30]

Though no obvious connection existed between secondary schools and technical education Lord Taunton was sufficiently moved by the observations made about the Paris Exhibition to extend the remit of his own enquiry to include the issue. This was a very quick response to the concerns raised by Playfair. It represents the first manifestation of the activities of the technical educationists. They were certain that their diagnosis of the united Kingdom's incipient economic ills was the correct one and were determined to promote measures which in their view would cure them. It was also a clear illustration of the early stages of the cycle of exhibition, investigation and action referred to in the opening segment of this thesis.

REPORT RELATIVE TO TECHNICAL EDUCATION (R.R.T.E.)

Origin

Lord Taunton encouraged Playfair to commit his opinions to paper and submit them to the Commission. Perhaps his time at the Board of Trade had made Taunton sensitive to the importance the issues raised by Playfair and provided him with the basis on which to incorporate the views of the technical educationists in the Report of the Schools Inquiry Commission. Playfair asserted in the resulting correspondence to Taunton that the apparent rapid foreign advance, indicated by the results from Paris, had a number of causes. These included the poor state of industrial relations that existed in England, and of more significance, the fact that France, Prussia, Austria, Belgium and Switzerland all possessed '...good systems of industrial education for the masters and managers of factories and workshops and that England posses none.' [31]

Personnel

In addition to Lord Taunton the Commission comprised of educationists including George William Lyttelton, 4th Baron Lyttelton, principal of Queen's College Birmingham in 1845, first president of the Birmingham and Midland Institute in 1853 who later became chief commissioner of the endowed schools and a privy councillor in 1869, Frederick Temple, examiner to the education department (1848-49), principal of Kneller Hall (1849-55), inspector of men's training colleges (1855-57), headmaster of Rugby School (1857-69) and later Archbishop of Canterbury and W. E. Forster, a Radical and a Quaker, Liberal Member of Parliament for Bradford, soon to be Vice President in charge of the Education Department; the ecclesiastical authors Walter Farquhar Hook (son of Thomas) the dean of Chichester and Anthony Wilson Thorold, author of devotional works and bishop of Rochester (1877-90) and of Winchester (1890-95); classical scholars such as Henry John Roby an educational reformer and Liberal M.P. for Manchester (1890-95) who acted as Secretary to the Commission; writers and social commentators Thomas Dyke Acland, Member of Parliament for North Devonshire (1865-85) and for West Somerset (1885-86) , who became a privy councillor in 1883 and published speeches and pamphlets on agriculture and education throughout his career and Edward Baines, journalist, economist and writer on political and social subjects who was M.P. for Leeds (1859-74) later to become chairman of Yorkshire College (1880-87). This group was not expert on the state of industrial progress but they acceded to the demand from Taunton for an additional report without protest.

Witnesses

Taunton sent the letter to a selection of individuals (probably identified by Playfair) who had served as jurors in Paris and others eminent people who were

asked to comment on its content. Replies were received from A. J. Mundella [32], a hosiery manufacturer and future statesman from Nottingham and who later, as Vice President of the Committee of Council, introduced the Compulsory Education Act of 1880 and was the president of the Board of Trade in 1886 and between 1892 and 1894; Canon Norris, previously one of Her Majesty's Inspectors of Schools; Edward Huth, a Hudderfield woollen manufacturer and also a juror in London in 1862; Edward Frankland, Professor of Chemistry at the Royal School of Mines; James Connell, superintendent of a locomotive works; Robert Mallet, a partner in a large engineering works and civil engineer; David S. Price, metallurgist and chemist and J. Scott Russell, Fellow of the Royal Society. This group had not received the same public recognition for their role as jurors in Paris as those mentioned previously but their opinions were respected. A typical response came from Scott Russell who agreed so strongly with what Playfair had to say that he attached a memorandum to his reply. In it he stated that Prussia, Switzerland, Belgium, France, America seem to make progress in

> ...proportion to their excellence of education and training:- Prussia in steel, iron, and general engineering work, Switzerland in scientific engineering, machinery, and watch and telegraph work, and textile manufacturers, Belgium in metalworking and mechanical trades, France in metalwork, and in steam engines, engineering structures, naval architecture and steam navigation. [33]

Others more cautiously suggested that foreigners would never surpass the English

> ...but while following that which in our mechanical designs is good, they are also seeking and that not unsuccessfully to apply theoretical knowledge in a way which...shows that they will soon have little to learn from us. [34]

Edward Huth noted that foreign workmen were highly valued as individuals, partly because of their superior education. He argued that this had an impact on the quality of what they manufactured. Their products reflected '...not a machine working a machine, but that brains sit at the loom and intelligence stands at the spinning wheel...' [35]

A. J. Mundella, an enthusiastic and voluble man, made plain his fears for the future through his response to Taunton. [36] He suggested that it was the availability of primary education, as well as technical training that contributed to the advance of foreign manufacturing. He was keenly aware of what this meant in practice. He knew from his own experience that the contrast between the working population of England and Saxony engaged in the same industry

> ...is most humiliating. I have had statistics taken of the same workshops and rooms in factories in this district, and the frightful ignorance they reveal is disheartening and appalling. [37]

Even the lowest Saxon workers, in his view, were sufficiently educated to be able to seek further and more demanding training. In England over 50% of those workers Mundella encountered could not read or write. This deficiency was not only confined to the working population, it also affected the masters and managers of factories

> ...more deeply than the workmen themselves. The former have but rarely had any opportunity of making themselves acquainted with the fundamental laws and principles of physics and chemistry, they therefore find themselves engaged in pursuits for which their previous education has afforded them no preparation and hence their inability to originate inventions and improvements. [38]

However, some industrialists appeared to dismiss the importance of the changes that were taking place abroad. Many refused to accept that foreign manufacturing had advanced and when they did they claimed that it was the direct result of the slavish copying of English designs and processes. In general these men also believed that their employees were there simply to service the machine. [39] The English iron masters, who had created a vast and thriving industry through their entrepreneurial spirit were typical of this group. They were indifferent to new technology and ridiculed the need for chemical analysis. [40]

The Playfair letter and the replies to it were included as a supplement to the findings of the Schools Inquiry Commission in the form of a Report Relative to Technical Education (R.R.T.E.). It was brief, containing only two pages of text and some additional details. However, Taunton and his fellow Commissioners were willing to recognise the significance of the issue and suggested that as a question of some urgency, a special inquiry into the state and effect of technical education abroad, particularly in France, Germany and Switzerland should be convened. [41]

Summary

The last volume of the Taunton Commission was unique because it had technical education at its core. All previous inquiries had been essentially concerned with numeracy and literacy. The importance of technical education and its link with general education was publicly acknowledged in the Report for the first time. This was directly attributable to the views expressed by the majority of Playfair's carefully chosen respondents. However, the late addition of the Report itself indicated that the traditionalists who made up the Commission had seen no such association when they began their work. Indeed the strength of this link was questioned by some who replied to the letter. Playfair, ignoring the dissenters and ever true to his original conviction, urged that an official inquiry should be held through the Committee of Council on Education so that the people of England could be told what '...are the means by which the great states are attaining intellectual pre eminence among the industrial classes, and how they are making this bear on the rapid progress of their national industries.' [42]

Reaction to the R.R.T.E.

When the Derby-Disraeli ministry of 1866-68 was presented with the Report Relative to Technical Education it '...reacted with surprising energy at least as far

as trying to find out what should be done.' [43] Lord Robert Montagu, Vice President of the Committee of Council on Education, charity commissioner, Privy Counsillor and Member of Parliament for Westmeath (1874-80) played a significant role in satisfying the demand for additional inquiries. He either acted as a focal point for or participated in a number of subsequent investigations into technical education at home and abroad. [44] Montagu , in formulating his plans embraced the ideas of Robert Mallet, a correspondent of the Taunton Commission [45] who condemned the English practise of sending out roving commissions to investigate and collect information about foreign attitudes and practices. Mallet stated that from

> ...a want of familiarity with Continental tongues and habits of thought, and from other causes, my own observations leads me to think that very little information is thus obtained, and that such commissions are little more than holiday excursions at public expense. [46]

He suggested that a more effective approach would be to collect the large volume of published material that already existed abroad and compile it along with treatise by ' learned native professors' into a series of reports. [47] In the light of these opinions Montagu proposed that the best thing would be '...for the Government to collect that information by means of its diplomatic agents, condense, and publish it.' [48]

1867 Additional Inquiries

The desire for more information expressed by Montagu was satisfied by a series of official and semi official investigations that were undertaken to add to the overall understanding of the situation and widen the basis upon which

judgments could be made. A less charitable view was perhaps that they also delayed the point at which action needed to be taken.

The Stanley Questionnaire

Lord Stanley, [49] the Foreign Secretary, sent a questionnaire on July 17 th 1867 to government representatives in Austria, Bavaria, Belgium, Denmark, France, Prussia and other German states Switzerland, Spain, Sweden, Norway and the United States. It was designed to explore the connection between elementary and technical education and the bearing they had on industrial strength. A series of 12 questions were posed to the various representatives abroad which included a request for information on the nature of technical education provided, the social classes it was given to, the support for it amongst the industrial community and the commercial advantages it generated. This undertaking suffered extensive delay due to the need to translate into English the vast amount of material collected. [50] The resulting 62 reports were combined into a command paper of over 550 pages in length which was issued to both Houses of Parliament in 1868. [51] The majority of the reports were sent from Germany. Only one report came from the United States, despite the fact that it was the emerging as a central power in the region. The preoccupation with Europe illustrated by this imbalance indicates where the British felt they had the most to fear or learn.

The Levi Report

Montagu also received a paper (dated 29th November 1867) from Professor Leone Levi FSA [52] entitled a Report on Technical, Industrial and Professional Instruction in Italy and Other Countries. It was a substantial document in which Levi was moved to state that, despite the elevated nature of current British achievements, much greater heights could be reached by the spread of science and art in the wider community. [53] He was in no doubt that, amongst the means

for advancing the productive power of the nation and enabling manufacturers to compete successfully with foreign producers none was more important than '...that of increasing the skill and elevating the character of the labouring classes, and of diffusing scientific knowledge amongst all classes of society...' [54]

He made a series of 16 recommendations to achieve this including a request for

> ...a further and more systematic inquiry as to the relative positions and progress of Great Britain and other countries in manufacture and industry, and on the disadvantage to which this country is now exposed in relationship to trade and manufacture. [55]

The Montagu Questionnaire

Montagu circulated his own questionnaire to various Chambers of Commerce in a number of manufacturing towns and regions including Batley, Belfast, Birmingham, Bradford, Coventry, Dewsbury, Hawick, Kendal, Macclesfield, Newcastle, Nottingham, Sheffield, South of Scotland, Staffordshire and Wakefield. [56] He sought answers to the following questions

1) What trades are now being injured by the want of technical education?

2) How, and in what particular, are they injured?

3) How do other countries, from their greater attention to technical instruction, absorb our trade. Give instances and if possible, statistics?

4) What plan of technical education would remedy the evil ? [57]

Montagu also met a deputation from the participating Chambers of Commerce in November 1867 as part of this investigation. The Birmingham representatives provided him with a list of articles once made in the region and sold around the world but now made in other countries, particularly Germany and the United States. [58] A special committee was appointed to deal with the responses received by Montagu and the results were contained in a paper entitled Technical

Education (Chambers of Commerce) : Copies of Answers from Chambers of Commerce to Questions of the Vice President of the Council as to Technical Education. Parliament ordered it to be printed in March 1868. [59]

The Samuelson private enquiry

Bernhard Samuelson, Liberal Member of Parliament for Banbury, [60] undertook his own enquiry into the provision of technical education abroad. This resulted in a 58 page paper entitled Technical Education in various countries which he forwarded to Montagu on November 16 th 1867. Samuelson explored the relationship between industrial progress and technical education in Belgium, France, Switzerland, and Germany (Prussia and Wurttemberg). These countries had been identified by Robert Mallet as worthy of investigation in his second letter to the Taunton Commission. They contained regions which produced goods in direct competition with English manufacturers. Samuelson was also familiar with some of them through his business activities He discovered, amongst other things, that in Manchester and Leeds some of the industries uniquely associated with those towns were

> ...suffering from foreign competition, and that in Leeds especially the depression in the woollen trade, from the large importation of the Belgian products, deterred the most enterprising young men from engaging in that manufacture. [61]

The difference between the provision for education in Leeds and that found in the Swiss canton of Winterthur was, in his view, striking. The canton, with a population about equal to Leeds maintained

> one University, one cantonal school, one training school, one school for the deaf and dumb, one veterinary school, 66 secondary schools and 370 primary schools. [62]

The Economist wondered what the city fathers from Leeds might have to say about this. [63] Samuelson also observed and recorded a phenomenon which Prince Albert had alluded to sixteen years earlier. He noted that foreign managers were employed with increasing frequency in England to undertake the more scientific and technological industrial activities. He described how the Monkbridge Iron Company of Leeds had to use a French engineer to oversee the production of cast steel for the rolling stock of railways, because an Englishman possessing the required combination of scientific and practical qualifications simply did not exist. [64] He concluded that foreign advance had been facilitated by the superior technical knowledge of managers everywhere, and by the comparatively advanced elementary instruction of the workers in some industries. However, he was aware that other factors, such as the cost of labour, had a bearing on this situation. [65] Samuelson recommended that as far as elementary education was concerned no child under twelve should be allowed to work unless he or she could read and write and that every parish council should be empowered to make this possible. In relationship to technical education he advised that the limits on capitation grants to science teachers for their working class pupils should be abolished and that local efforts to extend higher scientific education be supplemented by introducing building grants or loans. [66] He also advised that the Education Department should be consolidated.

Summary

Collectively these accounts and investigations appeared to confirm the suspicions raised in Paris of rapid foreign industrial advance. Playfair must have hoped this would encourage the British to take the technical educationists and their message more seriously. However, despite the momentum created by the Paris exhibition resistance to their ideas was still widespread. It was based on a

number of factors including a common belief embodied in the views of the Duke of Marlborough, Lord President of the Council [67] who, whilst freely acknowledging the importance of technical education, cautioned that, '...although it was desirable that assistance should be given for the promotion of this object, it would not be sound policy for the Government to step in and initiate expensive measures on the subject.' [68] Political instability and an enthusiasm for other reforms (this was also the year in which the Bill that became the Second Reform Act was passed) helped to perpetuate the uncertainty. [69] The potency of the conclusions drawn by these accounts and investigations were also further diluted because they were largely circulated amongst politicians. They lacked the public exposure of the last volume of the Taunton Commission.

Reaction to the various inquiries in 1867

The interest created by these other investigations that followed the Report Relative to Technical Education resulted in a proposal by Bernhard Samuelson for the appointment of a Select Committee of the House of Commons, to be charged with investigating the Provision of giving Instruction in Theoretical and Applied Science to the Industrial Classes. [70]

THE SELECT COMMITTEE ON SCIENTIFIC INSTRUCTION (S.C.S.I.)

Origin

On March 24 th 1868, the motion to establish a Select Committee was debated in the Commons. [71] Samuelson was careful to avoid the term technical education in his submission because of the confusion the phrase generated. He acknowledged that it could mean education delivered in the factory through practical activity, in

which some had already stated that the English were equal to the best in the world. It could also mean education delivered in the school where theory and practice could be combined, as it was abroad. In his view science education was the heart of the issue. [72] In support of his motion he argued that England had little to compare with the provision found in other countries and that the teaching, the curriculum and the aid in support of this form of education required yet more investigation. He was also concerned that the needs of all the industrial classes including the masters and managers should be explored. [73] George Dixon, Liberal Member of Parliament for Birmingham, [74] hoped that, '...the results of the inquiry would be practical legislation and a disposition on the part of the Government to grant supplies necessary to carry out the recommendations of the Committee.' [75] Lord Robert Montagu, in a long and informed reply to Samuelson's motion, acknowledged that competition from abroad was responsible for the growing demand for technical education, and that the series of exhibitions since 1851 had helped to emphasize this trend. [76] He reflected that England

> ...possessed more coal and iron, a cheaper transit, a seaboard, everything in short except technical education. Where the effect was different it was due to the only difference in cause. In England trade was a tradition, it was a rule of thumb passed down from father to son. Abroad it varied with varying circumstances, and adopted new improvements. [77]

Moreover, unlike George Dixon, Montagu was in no doubt that the Government had only a very limited role to play in redressing any imbalance that might exist. He was unsure how far technical education could alter a country stating that the faults of a nation would not be altered by training to add '...grace in a cup and saucer...' [78] He also believed that if the want really existed '...those middle classes who were not ignorant of their interests, nor too poor to attain them, would surely supply it.' [79]

At the end of the debate a Select Committee was appointed to inquire into the provision for giving instruction in theoretical and applied Science to the Industrial Classes. It was common practice that the Member of Parliament who proposed the investigation usually chaired the Committee and nominated its membership. The House rarely challenged such arrangements. This sometimes led to manipulation for political ends. A determined M.P. who successfully proposed a select committee on an issue which interested him was in a strong position to pick the committee with sympathisers, tailor the witnesses and the evidence, and procure a report in accordance with his own views. [80] Samuelson was appointed chairman of this Select Committee. It seemed to be a sensible choice. He was an experienced parliamentarian and loyal government servant who had made his sympathy for the development of technical education clear through his previous actions. He was also a successful businessman with interest in and experience of industry on the Continent. He could be relied on to advance what was becoming the establishment position. He was deeply committed to traditional industries such as iron production and agriculture and could not be said to hold the radical views apart from those associated with technical education.

The Select Committee on Scientific Instruction (S.C.S.I.) sat variously between April 2 nd 1868 and July 14 th 1868. It was commissioned to report on two related area including the state of scientific instruction of those engaged industrial activity including workmen, foremen, managers and proprietors and the relationship between industrial progress and what it termed as industrial education. [81]

It sought information from a number of agencies including the Department of Science and Art, the Committee of Council for Education, the Colleges of Science and Naval Architecture, the Universities, a limited number of secondary schools in which science was taught, the managers and teachers of science classes, Mechanics

Institutes and those engaged in ' the great staple industries carried on in the principal manufacturing towns and districts.' [82]

Personnel

Knowledge and experience of foreign systems of education and the impact they had on commercial life should have been pre-requisite for participation in the inquiry. However, the majority of the members of the Select Committee appear to have lacked this expertise. They were predominantly drawn from the world of politics, commerce and manufacturing. [83] The politicians comprised Lord Frederick Cavendish, the second son of the Duke of Devonshire and Member of Parliament for Yorkshire, West Riding (1865-82) who was murdered in 1882 by members of a secret political society in Dublin whilst serving as chief secretary for Ireland; George Gregory, Conservative M.P. for East Sussex from 1868; Sir Charles Lanyon, a civil engineer and architect of some of the principal buildings in Belfast who also became Mayor in 1862 and Member of Parliament for the same city in 1866; William Lowther, M.P. for Cockermouth (1808 -13) and selected for Westmorland in 1813, 1818, 1820, 1826 and 1832, who entered the House of Lords in 1841; Peter McLagan, Justice of the Peace and Vice Lieutenant for Edinburgh, Member of Parliament for Linlithgowshire (1865-93) and participant in a number of Royal Commissions including the investigation into Scottish landlords in 1864 and Lord Robert Montagu. The industrialists included Edward Akroyd, a worsted manufacturer who held the Liberal seat Hudderfield from 1857 to 1859 and Halifax from 1865 until he died in 1874; Charles Bagnal, an ironmaster and magistrate who represented Whitby as a Conservative M.P. in 1865; Sir Thomas Bazley, manufacturer, cotton spinner, chairman of Manchester Chamber of Commerce (1845-59) and Member of Parliament for Manchester (1858-80); George Skirrow Beechcroft, an ironmaster, magistrate, Deputy Lieutenant of the West Riding of Yorkshire and moderate Conservative M.P. for

Leeds from 1857 until he retired in 1868 and Edmund Potter, a calico printer and the president of Manchester Chamber of Commerce who became the Deputy Lieutenant of Derbyshire and sat as a Liberal M.P. for Carlisle (1861-74). Merchants numbered Charles Reed, Liberal M.P. for Hackney and later Chairman of the London School Board and Samuel Robert Graves, a shipowner who stood for the Conservatives as an M.P. in Liverpool from 1865 until his death in 1873. Participants were also drawn from other fields. Writers and social commentators included Thomas Dyke Acland, fellow of All Souls Oxford and Member of Parliament for West Somerset (1837-41) and (1885 -86) and North Devon (1865-85) who wrote extensively on agriculture and education and Thomas Hughes, Liberal Member of Parliament for Lambeth in 1865 and Frome (1868-74), author of Tom Brown's School Days (which he had published anonymously in 1857) who was principal of the Great Ormond Street Working Men's College (1872-83). Educationists comprised Henry Austin Bruce, Member of Parliament for Merthyr Tydvil (1852-68), stipendiary magistrate who became Home Secretary (1869-73), lord president of the council (1873 -74) and the first president of University College Cardiff in 1883 and George Dixon.

Witnesses

The fifty witnesses called before the Committee were drawn from such varied backgrounds that most of the evidence they provided was of very limited value. Establishing the investigation was a hasty response to the issues raised by the last volume of the Taunton Commission and possibly little thought was applied to choosing who, from the limited number of qualified people available, to consult. Over half were either associated with the Science and Art Department or involved in some form of higher education. Henry Cole, the archetypal civil servant was typical of the former and the gifted scientist Thomas Huxley who lectured, researched and published on medicine, biology and geology, an original member

of the London School Board (1870-72) and president of the Royal Society (1883-85) was typical of the latter. The remainder mainly worked for the government through such agencies as the navy (Edward J. Reed, Chief Constructor of the Navy) or were affiliated to the Mechanics' Institute movement (Henry H. Sales, agent of the Yorkshire Union of Mechanics' Institutes). Those with a direct connection to industry like Calvert Clapham (Walker-on-Tyne) and George Lloyd (Birmingham) were typically the owners or managers of large concerns which manufactured various products including chemicals, dyes, glass, iron, jewellery, lace or undertook processes such as bleaching. Few originated from the artisan class or could claim a direct link to it. Consultation with teachers of science was also limited to men such as George Jarmain (Huddersfield) and John Mayer (Glasgow) who had a direct connection to the Science and Art Department. All the witnesses were subject to oral examinations. They took place over twenty three sessions with only a small number being examined at any one sitting. These were conducted fairly and sympathetically. [84] Nevertheless, it must have been a daunting experience for those not already well versed in the procedures of such an enquiry. However, most witnesses appeared to relish what appeared to be the opportunity to influence Parliament. Some even submitted additional written testimony that was later compiled into a series of appendices.

A strong case for the connection between improved industrial production and education was made by Charles Hibbs, a working gunsmith who had been selected by the Birmingham Chamber of Commerce to attend the Paris Exhibition in 1867. He believed that where foreign manufacturing was found to be superior, the production methods used were guided by those with a knowledge of science. [85] He noted that this contrasted with the situation in England where tradition dominated practice. The English he explained, were not prepared to try new ideas and processes: '...unless the advantages of the new system are very plain indeed.'

[86] Hibbs was also in no doubt that there was a paucity of scientific instruction in England. He was adamant that regardless of the findings of the Committee, superior scientific education and not low wages elevated the level of competition from abroad. He recommended that compulsory primary and secondary education, which included science, should be introduced for all, regardless of status or occupation. He felt that to in order to expedite this change, direct financial assistance was required from the State. He believed that because there was a lack of public spirit to provide it by private means

> ...and as it is a matter of national interest, the Government should take it up, and do for us that which we are not inclined to do for ourselves, inasmuch as every trade that leaves this country is a loss to the whole nation, and diminishes our capacity for bearing taxation. [87]

However, Fleeming Jenkin, Professor of Civil Engineering at the University of Edinburgh [88] was sceptical about the value of any science education for the lower classes at all. He suggested that artisans might benefit from special evening classes but where civil engineers were concerned

> '...the lads are very seldom for a long time in one place, they are sent about the country to different works...As to mechanical engineers they have such hard physical work during the day they are very little inclined to attend lectures at night...' [89]

Some of the advocates of technical education were faced with reconciling the need for change with a blind faith in the unique qualities of the British workman. A. J. Mundella was typical of this group. Despite his enthusiasm for the achievements of European education systems, he retained what would now be regarded as an untenable stereotypical view of national ability. He believed that English workmen and artisans were superior in natural intelligence to those found in almost all other countries. [90] He stated that there were '...no workmen in the world except, those of America who can compete with ours...' [91] James Kitson, a Leeds iron master [92] supported this viewpoint. He believed that in the production of

machinery, locomotives and general mechanical work '...English workmen are superior...' [93] Most other witnesses believed that the acquisition of practical experience and manipulative skills was of paramount importance and suggested that the English excelled in this area. Lord Robert Montagu adjudged the English labouring classes to have energy and talent in abundance. [94] In contrast, Alfred Field, Chairman of the Birmingham Chambers of Commerce, [95] pointed out that although the Englishman might make a great artisan

> ...has not got the ductility of mind and the readiness of apprehension for a new thing which is required: he is unwilling to change the methods which he has been used to...[96]

Field contended that an American workman understood everything said to him as readily as a college graduate in England would and

> ...in consequence, he readily attains to any new knowledge, greatly assisting his employer by thoroughly understanding what is the change that is needed, and helping him on the road towards it. [97]

Henry William Ripley, a dyer from Bradford also had strong opinions on the relative intelligence of English, French and German manufacturers. He stated that he had come into contact with foreign manufacturers

> ...whose friendship I could claim and, from my point of view, those are superior in scientific knowledge to gentlemen of similar class in England, they have appeared to me to be more in earnest than our manufacturers are on this subject: and I am ready to use the word 'alarmed', the only thing that has alarmed me, is the earnestness with which these foreign manufacturers are conducting their business, and the attention they give to every point of detail: comparing them with our own manufacturers, I see a great want of earnestness here in many cases. [98]

Ripley noted that foreign manufacturers took great pride in their work and regarded it as a much more honourable pursuit than the English did. [99] He added that they also went to great lengths to protect their own industries through

punitive import tariffs. This was in direct contrast to the free trade attitudes of the British.

The Report of The S.C.S.I.

The Report of the S.C.S.I. contained information on the state of scientific instruction of workmen and foremen, the managers and proprietors of small industrial concerns and the managers and proprietors of large industrial concerns. It also sought to identify the relationship between industrial education and industrial progress. The Committee acknowledged that workmen were given only rudimentary education during their school age years, and what little they had learned was not retained when they entered work. Illiteracy was widespread. The Revised Code was blamed by some for the diminution of the efficiency of elementary education. Despite the cause they contended that this was not a very good basis for later studies. [100] There were other influences on the quality of science education available to workmen and foremen. The difficulty of finding suitably qualified science teachers and the paucity of colleges in which to train them was a significant factor. It reflected poorly on the Science and Art Department. John Frederick Iselin, a science school inspector, admitted that he could only identify one teacher in the whole of Yorkshire who taught science. This teacher, a Mr. Jarman, was self educated and was typical in this respect of the majority. In Nottingham the few Science and Art classes that existed were run by a surgeon, at least until his death when two of his pupils took over. [101] Some evidence was offered that the Science and Art Department had made progress since the previous decade. In 1860 there were only nine science schools with 500 scholars in the whole of the country, in May, 1867, 212 schools, with 10230 scholars, and in January, 1868, 282 schools, with 12,800 scholars. [102] However, out of the 200 science teachers who worked in association with the Science and

Art Department, only six had received any special training. The situation was further compounded because only a limited number of institutions offered this training. [103] The financial rewards for teaching were poor. The income from pupil fees and from the Science and Art Department payments which were determined by the results obtained by students was

> ...with few exceptions so scanty that science teaching is scarcely ever followed as a profession, but only in addition to some more profitable employment. Hence classes are frequently suspended whenever the more important occupations of the teacher demand increased attention...[104]

Literary and mechanics institutions were the principal locations through which the little science instruction that was available was delivered. They were not widespread. None were located in the north eastern, eastern, west midlands and southern counties of England. [105] The students in these institutions followed a set syllabus compiled by either the Society of Arts or the Science and Art Department.

The Select Committee recognised that reporting on the scientific education of the managers and manufacturers of small businesses was difficult. Most still worked in small concerns which only employed a limited number of people. [106] It was therefore hard to find willing individuals who could be considered to be truly representative. Thus, the evidence on which the Select Committee was able to base its conclusions regarding this section of the industrial community was very limited. However, John Skirrow Wright, a button and dress ornament manufacturer from Birmingham suggested that scientific and technical education was more important to the factory owner of a small concern because it would, he reasoned, improve quality and minimise waste. [107] Wright illustrated his point by alluding to an example drawn from the jewellery trade where it was as important to the small businessman as it was to the largest manufacturer that '...his people should be able to colour his gold articles and to compound his metals properly, or

to save what is valuable from the residuum...' [108] No special provision was currently available for the scientific instruction of this group during normal schooling. The Committee suggested that if they stayed at school until they were 15 or 16 they would gain enough basic education to acquire further knowledge of science if they wished to do so. [109]

The managers and proprietors of what the Committee referred to as great industrial undertakings were singled out for special attention. [110] Their education was generally provided through higher secondary schools. On rare occasions this basic education was supplemented by further training in such institutions as Owens College in Manchester, the Royal School of Mines, the Royal College of Chemistry, Edinburgh and Glasgow University, King's College and University College London. Some of the witnesses in this section believed that in order for Britain to retain industrial pre-eminence, managers and masters as well as workmen should have access to general and scientific education as they did in other countries. Robert Bellamy Clifton, Professor of Experimental Philosophy at Oxford University was in no doubt that the best education for this group should involve as much knowledge of science with special reference to their future employment, as they could possibly obtain. [111] However, Clifton noted that when the majority who had completed their secondary education came to him at Owens College they were

> ...simply unprepared, their knowledge of arithmetic...they professed to have learned the whole, but their knowledge was very small indeed, to the simplest question, which is a little out of the usual course, it seems impossible for them to give a correct answer. [112]

James Chance, a glass and chemical manufacturer [113] explained that (in Birmingham at least) a high proportion of middle class children left school early. [114] The traditional course of action was to educate these children to a basic level and absorb them into business or commerce as quickly as possible. Training

through work was regarded as the best option. There was little debate about who should fund the education of this social group. Lord Robert Montagu expressed the prevailing view that the middle and upper classes had always paid for their education and implied that they always would. [115] Captain Donnelly R.E. [116] Secretary of the Science and Art Department, was in no doubt that the upper and middle classes should subsidise their own learning. [117] The British Association for the Advancement of Science, which recognised that any expansion of science education would necessitate additional spending stated that it was obvious that

> ...the money which will be requisite for both the initial and current expenses must in general be obtained by increasing the school fees. This difficulty is real but not a fatal one...parents will not be unwilling to pay a small additional fee...[118]

The Select Committee could only provide a superficial examination of the issue under review. The potential scale of the investigation was beyond such a small group of individuals, especially given the time they had to complete their task. In certain respects their findings also represented a distorted analysis. The Committee was highly selective and old fashioned in terms the industries it explored. Mechanical engineering, mining, the iron trades and the textile industry were adequately represented. Glass and jewellery manufacturing found a voice but, there was no place for the newly emerging electrical and chemical industries unless they had an association with traditional crafts such as dyeing. It only sought opinions from those in high office or professions and those who had significant responsibilities for industry. Captain Donnelly and Henry Cole from the Science and Art Department and John Platt, who was the proprietor of one of the largest mechanical and machine engineering factories in the world (employing nearly 7000 people) were typical of those canvassed. The owners of small businesses (in which the majority of people worked) and the artisan/workman were conspicuous by their absence. However, despite these limitations the Committee assuredly concluded that there were many factors governing British

industrial well being. Samuelson and his colleagues reasoned that it was built upon the possession of natural resources, geographical position and use of mechanical power and maintained by the unrivalled energy of the population. [119] The Committee sought to partly blame the current slump (highlighted through Paris) on Trade Unions, although Samuelson and his colleagues also believed that there were other reasons '...for our present evils.' [120] Changes in fashion and rising wages, as well as the state of industrial relationships, all had a contribution to make towards the difficulties facing the nation. Lord Robert Montagu (like the Prince Consort before him) noted that the development of efficient transport systems was significant. He commented that only thirty years before

> ...there were but a few manufacturers on the Continent, and but a few railways throughout Europe to distribute the produce, whereas at the present time the Continental nations had as many manufacturers as we had and their countries were intersected with railways, by means of which their productions were taken to foreign markets easily and cheaply, to compete with our own. [121]

Henry Ripley indicated that the rising scale of investment by foreigners in their own businesses had a bearing on increased competition from abroad. [122] The identification of all these addition factors made the direct link between science and technical education and the industrial well being of the country more difficult to prove. The Committee, therefore attributed only minor loss of trade to superior skill and technical education in other countries. However, they did acknowledge the extraordinary progress that had been made in manufacturing outside England.

The Select Committee on Scientific Instruction identified and published 15 conclusions in the final report which placed emphasis on education and ignored the broader issues, particularly the terms of trade. Despite their enthusiasm for technical education the most striking contrast that Samuelson and his colleagues had identified was the difference between the provision of elementary education

on the Continent and that in England. It was therefore suggested the working class would only benefit from scientific instruction if efficient elementary education was made accessible to all children and regular attendance was encouraged. [123] This factor, combined with a lack of definitive proof about the value of technical education helped to narrow the range of suggestions the Committee made. It advised that instruction in drawing should also become part of the elementary school curriculum. [124] It recognised that secondary education needed urgent reorganisation so that science instruction could be included in the curriculum. This meant that more teachers and schools in which to teach science would be required. To facilitate this expansion the Committee suggested that certain endowed schools and colleges should be converted for this purpose. [125] However, it was impractical to expect them to be funded by fees alone. The Committee therefore recommended that they should be supported by money from the exchequer as well as from the more tradition sources such as endowments and other benefactions. Samuelson and his colleagues indicated that the best location for these schools and colleges was in the centres of industrial activity. [126] This would allow those who most need them to benefit directly and avoid the problems of access .[127] They were in no doubt that science teachers in elementary day schools should be paid by results, suggesting that a slight increase in the fees would have a direct bearing on the number of theses classes and their permanence. [128] This approach, which placed great reliance on the contribution of the Science and Art Department, was highly recommended given the reluctance of the government to invest in education directly. The Committee noted that education of higher science teachers would be encouraged if Oxford and Cambridge and other Universities granting sciences degrees increased the number of fellowships in natural science. [129] It advocated that specialised instruction should also be available in training colleges for science teachers, Finally,

Samuelson determined that it was necessary for the whole of England, including the provinces and the agricultural districts to benefit from any State subsidies, and Government institutions for scientific instruction in London should be more coordinated. [130]

Reaction to the report of the S.C.S.I.

Public reaction to the findings of the Select Committee was muted. It was reported in the press and specialist publications such as the Economist but resulting debate was restrained. Even in Parliament, where the Report should have had the greatest resonance, it had a limited impact because a unique set of political conditions prevailed. Between 1855 and 1865 English affairs had been dominated by Lord Palmerston who, despite his patrician origins, embodied the character and outlook of the commercial and industrial classes. [131] However, the majority of those returned to parliament in 1865 came from the same background (landed and aristocratic) as their forebears had done 25 years earlier. [132] The Conservative government of 1866-68 attempted for various reasons to address this imbalance. It promoted change in parliamentary representation through the 1867 Reform Act. [133] This act enabled those owning, leasing or renting houses, to vote if they could meet certain financial criteria. In effect the franchise was extended to the very group in society who were intimately connected to the expansion of commerce and industry. It is hardly surprising therefore that the Derby/Disraeli ministries responded so promptly to the request for an investigation into technical education. However it did not last long enough to act on the recommendations of the Select Committee. Their drive to pursue the cause of technical education was halted by the general election of 1868.

When Gladstone formed his first Liberal ministry in the same year non technical education became a central focus of Government activity, yielding the

Elementary Education Act of 1870. The legislation did not introduce free or compulsory education but it made them possible. It provided for the establishment of School Boards in areas where school provision was at its weakest. They were designed to address the deficiencies in the elementary system created by the dependence on voluntary provision. School Boards were ad hoc bodies consisting of between five to fifteen members who were elected by local rate payers and were given significant powers. They could start new elementary schools or take over control of voluntary ones, levy a local rate to finance their work, acquire land for building schools through compulsory purchase and moderate in religious questions affecting education. They could also remit the fees of the poor, enforce compulsory attendance and appoint their own officials. Compulsory attendance at school between the ages 5 and 13 was feasible under the terms of the Act although this had to be decided in each locality. Parents could also withdraw their children from religious instruction on the grounds of conscience.

Summary

The nature of the groups that made up the Committee had a direct bearing on its findings. Those drawn from the world of politics were liable to be guided by a rigid view of society based on role and rank. Governments, both Conservative and Liberal were dominated if not by the aristocracy, then by those with sympathy for the landowning class. Neither Conservatives recovering from the Free Trade split in 1846, nor the Liberals were interested in changing the terms of trade.

The representatives of industry were as likely to adopt a conservative attitude towards change as their aristocratic counterparts. They either represented the interests of general commerce or traditional manufacturing such as cotton and textiles. They cared little for new and emerging industries except where they had a bearing on those long established. Thus, both of the main groups that constituted the Select Committee were likely to counteract the more radical proposals of Hibbs

and others. Consequently it did not fully exploit the momentum created by the events in Paris. The Committee produced a report which merely tinkered with the notion of scientific and technical education, despite recognising the apparent deficit of this form of provision in England. What was available was voluntary and certainly not national. [134]

Samuelson and his colleagues did acknowledged the need for very limited State aid for education. Subsidy was at odds with the Victorian notion of individual choice and the concept of free trade. Indeed, some argued that it meant unnecessary involvement of the Government in the lives of the individual. In contrast direct state intervention was evident in France and Germany. The populations in imperial France, with a highly centralised administrative hierarchy and in the various Germany states where the mechanisms of government were bound up with the military, found no difficulty with this concept.

Statistical information on the relative performance of various industrial economies was vital to prove the case for or against technical education. The absence of such material in the evidence of the Select Committee on Scientific Instruction was a serious defect. [135] Even though the discipline of gathering and interpreting statistical data was still in its infancy, Birmingham Chamber of Commerce found the means to overcome this difficulty. It managed to collect and publish its own information on the comparative decline of certain key trades in its area as a result of foreign competition. However, the dangers of relying uncritically on this form of proof was illustrated by the Select Committee itself. They based their conclusion that notion of foreign advance was bogus on data that indicated that the balance between the export and import of fabrics to and from France had tilted dramatically in favour of England between 1860 and 1866. [136] Henry Ripley pointed out that like a great many other figures

> ...those statistics are very fallacious, the export of worsted and woollen goods and yarns in 1860 was £16,000,000 and in 1866 it was £26,000,000, but between the two periods there was an advance in price of least 25 per cent, so that the apparent increase is not a real one by any means. [137]

This helped to add to confusion surrounding the introduction of technical education. Whilst some could argue that that Britain's economy was under attack, thus making the demand for technical education irresistible, others could dismiss this viewpoint as alarmist.

A number of historians have contended that the plethora of activity culminating in the S.C.S.I. was a decisive turning point in the development of the technical education issue. However, as the 1860s ended it appeared that the impetus had stalled because effort was diverted towards other forms of education. The technical educationists, though disappointed at the apparent lack of progress, did not give up. When Mundella was elected to the House of Commons in 1868 he concentrated mainly on elementary education, but behind his observations lay the technical education question. [138] There were also additional efforts to instigate further enquiry.

THE ROYAL COMMISSION ON SCIENTIFIC INSTRUCTION AND THE ADVANCEMENT OF SCIENCE (THE DEVONSHIRE COMMISSION)

Origin

The Liberals partly satisfied the need for action by establishing the Royal Commission on Scientific Instruction and the Advancement of Science (R.C.S.I.A.S.).The Commission sat variously between June 14 th 1870 and June 18 th 1875 when the final of eight reports that it produced was published. It resulted from a campaign by Colonel Alexander Strange to persuade the government to

establish facilities for scientific research in the United Kingdom. [139] Strange, an ex Indian Army surveyor of marked scientific ability who had served as a juror at the exhibitions in 1862 and 1867, was '...a natural scientist with revolutionary ideas about the role of science in society and the correlative duties of society towards science.' [140] At the behest of the British Association he prepared a series of papers on science in Britain with the help of some the old guard including Playfair, Huxley and Fleeming Jenkin. He recommended that a Royal Commission should be secured to examine the state of scientific research and identify what changes should be made to improve the situation. It was unusual that a member of the military had any influence on the development of a major inquiry into scientific instruction. Initiatives from the British Army (in contrast with the equivalent in France) had not so far impinged on the national education system. Strange condensed his own views into four key points. He believed

a) science was essential to the advancement of civilization, the development of national wealth and the maintenance of national power,

b) all science should be cultivated, even branches of science which do not appear top promise immediate and direct advantage

c) the State or Government, acting as trustees of the people should provide for the cultivation of those departments of science which, by reason of costliness, either in time or money, or remoteness of probable profit are beyond the reach of private individuals in order that the community may not suffer from the insufficiency of isolated effort and

d) to whatever extent science may be advanced by State agency, that agency should be systematically constituted and directed. [141]

This was a unique statement. Cardwell writes that Strange identified very clearly what

> ...relatively few indeed saw at the time : the possibilities of and necessity for a developed system of applied science...and it was a sad commentary on the state of science in England at the time that it was an Indian Army officer and not an academic, civil servant or an industrialist who saw so clearly what the defects were and what the remedies should be [142]

The Devonshire Commission was given a royal warrant on 18 th May 1870. Its terms of reference were to undertake an inquiry with into scientific instruction and the advancement of science and

> ...to inquire what aid thereto is desired from grants voted by Parliament or from the Endowments belonging to the several universities in Great Britain and Ireland and the Colleges thereof and whether such aid could be rendered in a manner more effective for the purpose [143]

Queen Victoria, now in the 33 rd year of her reign, invested Devonshire and his colleagues with the power to call before them and question any relevant persons who could add to their understanding of the issues described in the warrant. They were also authorised to call for and examine any pertinent books, document, papers and records. The Commission was not only guided by the views of Alexander Strange. The issues raised by the Paris Exhibition also had some bearing on its format. The proximity of the events in 1867-68 meant that elementary and technical education were bound to be considered by Devonshire. It is therefore appropriate to view it as belonging to the series of investigations which included the Taunton Commissions and the S.C.S.I. However, it was different from Taunton because science and technology were central to it and from the Select Committee because, as a Royal Commission, it was free (to a certain extent) from parliamentary constraint. Thus, a more flexible response could be anticipated.

Personnel

The Commission was composed of eight members. Whilst scientists persuaded by the technical education cause had a place and educationists from both the

university sector and others were included the aristocracy still played a decisive role. The scientists included Thomas Henry Huxley, who was both a Commissioner and a witness indicating how powerful his influence was in orchestrating the direction which this investigation was to take and George Gabriel Stokes, mathematician and physicist, Lucasian professor of mathematics at Cambridge, president of the British Association in 1869 and a writer of number of pioneering scientific works on viscosity and optics. Bernhard Samuelson was also invited to participate as a Commissioner. Norman Lockyer was appointed as Secretary. He was an astronomer of some note who subsequently worked for the Science and Art Department. He became director of the Solar Physics Observatory and professor of astronomical physics at the Royal College of Science in 1890. The educationists from the university sector were represented by William Sharpey, professor of anatomy and physiology at University College London (1836-72) and member of the general medical council until 1876 and Henry John Stephen Smith a classicist, mathematician and Savilian professor of geometry at Oxford University in place of J. William Allen Miller (who died before he could serve as a Commissioner) on December 1 st 1870. The other educationist was Sir James Philips Kay-Shuttleworth, doctor, the first secretary of the committee of council on education (1839-49) joint founder of Battersea training college for pupil teachers in 1839 and the founder (claimed by some) of English popular education. The aristocrats were represented by William Cavendish, the seventh Duke of Devonshire, a brilliant science scholar at Eton and Trinity College, Cambridge who became chancellor of London University between 1836 and 1856 and later Cambridge University from 1861 to 1869. He abandoned his political career on receiving the title of the second Earl of Burlington in 1834 and dedicated the remainder of his life to being a liberal benefactor of scientific and industrial enterprises. He was accompanied by Henry Charles Keith Petty-Fitzmaurice, the fifth Marquess of Lansdowne who was a junior lord of the Treasury in 1869, under secretary for

war between 1872 and 1874, under secretary for India in 1880 and later became governor-general of Canada (1883-88) and viceroy of India from 1888 to 1894. The final member of this group was Sir John Lubbock (1834-1913) who became Lord Avebury in 1900. He was educated at Eton and left school at 14 to work in his fathers Bank. He was Vice Chancellor of the University of London(1874-80) and Chairman of the Public Accounts Committee (1888-89) Between 1870 and 1880 he was Liberal Member for Maidstone and author of numerous books including 'Fifty Years of Science' and 'The Origin of Civilisation and Primitive Conditions of Man'.

The composition of the R.C.S.I.A.S. represented the traditional faction of the scientific community. Engineers and manufacturers, with the exception of Samuelson, were conspicuous by their absence. Thus, the confluence between science and new industries, identified by Playfair and his associates (through the Paris exhibition) as being of great significance, was in danger of being overlooked or ignored.

Witnesses

The witnesses called before the Devonshire Commission largely represented the establishment viewpoint. Convention formed by public inquiries over many years dictated that it should do so. Indeed, given the nature of the task which Commission was about to undertake, it was more likely to be guilty of this bias because English society was at best ambivalent, and sometimes even hostile towards science. Dr. A Williamson, Professor of Chemistry at University College and President of the Chemical Society perhaps unintentionally explained why the Commission was to have so little effect on British industries. Making money was not seen to have any connection with science. He stated that

> ...people do not believe that science is of any use for that [industrial] end. They say you are a set of dreamers; and that science is a sort of amusement and not real work. [144]

Nearly 170 witness were called before the Commission. The majority of them, possibly as a result of Huxley's influence, were academics from the ancient Universities and included Robert Bellamy Clifton, Professor of Experimental Philosophy at Oxford and Alfred Newton, Professor of Zoology and Comparative Anatomy at Cambridge. They were eminent men but they also had a vested interest in maintaining the status quo. A few, such as William John Macquorn Rankine from Glasgow University, were drawn from those new institutions that had a Chair of Engineering. It was from these people, who represented change, that an alternative view could be expected. Eleven individuals from various museums and gardens including Joseph Hooker, Director of the Botanical Gardens also had an opportunity to speak. Although they represented agencies of great prestige they could hardly claim to have great knowledge of the needs of the community as a whole. A number of others (6) were agents for a variety of education institutions including Thomas Coomber of the Bristol Trade School and William Ellis, founder of Birkbeck School. Amongst the five witnesses sent by the Science and Art Department were Henry Cole and Captain J. F. D. Donnelly. William Richardson, a partner in the machine makers Platt Brothers, was one of the five to offer testimony from industry and commerce. In addition there were five witnesses from the Royal Schools of Mines , five from various inspectorates, five scientists, three politicians and two from naval architecture Only one teacher of science, George Jarmain, who had previously been questioned by the S.C.S.I. and one member of the artisan classes Robert Applegarth were called before the Commission. The remainder were involved in activities as diverse as Hydrographer of the Admiralty to Warden of Standards. It is clear that working scientists and industrialist were rarely consulted. [145] Clifton, Cole, Donnelly, Huxley and Jarmain had all been previously interrogated by other inquiries

including the S.C.S.I. The testimony of the witnesses was chronicled in 1000 pages of Minutes of Evidence which were recorded over eighty separate days between June 14 th 1870 and November 21 st 1873.

The extent to which the State should provide science education, with a view to increasing industrial output, appears to have been the main issue that exercised the minds of the Commissioners. Henry Cole, apparently looking to consolidate the position the Science and Art Department of at the heart of the issue, acknowledged the need for State to subsidise science schools. [146] Edward Henry Stanley, the fifteenth Earl of Derby conceded that State aid for what he referred to as higher science teaching was acceptable. However, he urged that an awareness of the dangers of public support for one cause as opposed to another needed to be maintained. He also suggested that caution regarding the impact of such aid on the public tax burden was also necessary. [147] Robert Arthur Talbot Gascoyne Cecil, the third Marquis of Salisbury [148] believed in Adam Smith's doctrine that

> ...the State is perfectly justified in stimulating that kind of industry which will not find its reward from the preference of individuals, but which is useful to the community at large...[149]

Salisbury noted that where scientific activity had a direct commercial value such as research related to telegraphy, it thrived, but struggled otherwise. [150] Sir William Thomson, Professor of Natural Philosophy at the University of Glasgow was concerned about what the aims of education should be. In this context he raised a commonly held objection to the introduction of technical education in schools and colleges by stating he thought that it was morally better

> to let pupils feel that they are learning for the intrinsic value of the learning, and that they should enter a profession ultimately, and take a professional position when their school and colleges education complete. [151]

He also suggested, as others had done in 1868, that every workshop should be considered to be a technical school for the young people in it. [152] Henry Enfield Roscoe, Professor of Chemistry at Owens College Manchester, advanced the premise that it was more important to teach basic scientific principles than offer technical training. He remarked that he was often approached by the fathers of prospective students who would state that

> ...'I wish you to teach my boy the principles of calico printing', or, ' He is going to be a calico printer and I want him to learn the applications to that particular trade or calling.' and I always answer that I can teach them chemistry, upon which their art or manufacture is founded, which is the first thing for them to direct their attention to, without any regard to the application to special industries. [153]

In contrast George Gore, scientific researcher and teacher linked science and industry together. He observed that a failure to support original research would

> ...greatly retard the future extension of our trade, and, combined with other causes, has already produced a marked effect in the gradually transferring portions of our manufacturers to more scientific nations...[154]

However, Edward Frankland, one of those canvassed by Taunton in the previous decade, observed that scientific research in Germany and France was more advanced than in Great Britain. He noted that a large proportion of the scientific papers originating in the United Kingdom were the work of Germans residing in this country. [155] William Richardson issued a warning that a failure to embrace the new scientific/industrial culture would disadvantage England. He noted that on the continent managerial opportunities were generally closed to those who had not passed

> ...the polytechnic training; and the consequence is, that by that method no doubt they will in time, if we do not step out, equal us, and I should say pass us too, and I do not see why they should not if we keep neglecting our duty as we have done. [156]

Fleeming Jenkin, once again called as a witness, predicted that in the future

> ...a man without theoretical knowledge will be at a considerable disadvantage; in the early days of a profession a man of sound common sense will only rise to the top but the engineering profession is becoming more and more complex...[157]

Robert Applegarth, a working artizan, provided an objective and dispassionate analysis which complimented the testimony of Alexander Strange. He was the secretary of the Amalgamated Society of Carpenters and also one of the founders of National Education League [158] of whom it could be truly said represented the interests of the working man. Applegarth was untypical of the majority of the witnesses examined by Devonshire in a number of ways. He believed firmly that the workmen of the country should not allow the government (the members of which knew little or nothing about manufacturing) to trifle with their education. [159] His *cri de coeur* was that both general and technical education were one of the greatest wants of the artisan class of the country. [160] Applegarth was well informed and quoted from a French Report on Technical Education to press home his case for greater access to education stating that they '...have a very admirable mode on the continent, of which Mr. Samuelson knows something, and about which we have had blue books without end...' [161] His own experiences in Switzerland had shown him that a knowledge of production processes and the science behind them was common amongst working population in that country. He had also observed that they clearly understood the markets into which their goods were sold. [162] His prescription to redress this imbalance was simple- compulsory schooling for all until the age of 14, to include science and specialist industrial training in conjunction with local firms. [163] This would be enacted through legislation which compelled employers to participate. Applegarth was above all a pragmatist who simply did not believe

> ...in that cry, of which we have heard so much, about English workmen being qualified to beat the whole world, but as I have a very favourable opinion of the working classes of my own country, and I am quite sure that they would they would be able to do far better if they had a good education; but it will not do for us to depend any longer upon that inborn ability which English workmen are said to possess, because even that can be overmatched by workmen who have a fair share of natural ability and every facility to obtain education [164]

The Reports of the Devonshire Commission

The First Report, consisting of two very brief pages was published on the 9 th March 1871. It focused on an investigation into the Royal School of Mines, the Geological Survey of Great Britain and Ireland, the Mining Record Office, the Museum of Practical Geology and the Royal College of Chemistry. It recommended a series of minor changes be made to the way in which some of the agencies operated and related to each other in order improve the services they provided. As a consequence of its inquiries it was also able to note that that the overall quality of instruction offered by the Science and Art Department would improve if science teachers received practical instruction in elementary science. [165]

An equally brief Supplementary Report to the First Report was issued on 28 th February 1872 which dealt with the organisation and accommodation of what the Commissioners referred to as the Science School. This was a new institution (proposed in the First Report) which was to be formed by a union between the Royal School of Mines and the Royal College of Chemistry.

Almost immediately afterwards the Commission produced a more substantive Second Report. It was issued on 22 nd March 1872 and explored the scientific instruction in training colleges, elementary day schools and in science classes under the Science and Art Department. In the opening pages it commented on the impact both the Revised Code of 1861 and its successor the New Code of 1871 had on scientific instruction. It acknowledged that the first of these measures had the

effect of narrowing instruction in the elementary school to reading, writing and arithmetic and consequently '...exercised a prejudicial effect on the education of the country...' [166] The Commission also held out little hope of expansion as a result of the New Code believing that '..it will practically have little effect in widening the range of education in elementary schools...' [167] Both these measures also had a detrimental impact on the nature of the curriculum for teacher training. [168] Despite these findings, which Devonshire acknowledged were by no means based on exhaustive researches, they recommend that the teaching of physical science to elementary aged children should receive more substantive encouragement. [169] They further recommended that there should be corresponding modification in the curriculum of teacher training institutes to include physical science. [170] The Commission presented a detailed description of the work of the Science and Art Department. Whilst recognising the support afforded by this organisation to elementary scientific teaching throughout the United Kingdom it pointed out that the efficiency of the instruction given in the science classes had been diminished

> ...on the one hand by the imperfect organization of the classes, whether considered separately or in groups, and the absence of practical teaching; and on the other, by the irregular and unsystematic manner in which scholars have taken up the subject taught. [171]

L .C. Miall, secretary of the Bradford Philosophical Society and science class organiser went even further in his criticism of those in South Kensington, when he stated that if the Science and Art Department classes were

> ...to go on for the next 50 years as they are doing at present, I do not think they would produce any perceptible effect upon the industrial occupations. [172]

However, the Commission made 17 recommendations which were designed to keep the Science and Art Department (which made little demand on the treasury) at the centre of science teaching, improve its efficiency and make the emerging

education system work in harmony with it. It recognised that the antagonism between the Science and Art Department and the Educational Department, concerned with elementary education, was counter productive. [173] More notably Devonshire proposed that institutions delivering science teaching of suitable quantity and quality should be recognised as Science Schools, thus becoming eligible to receive assistance for the supply of equipment and encouragement of teachers. [174]

There were an additional five reports produced by Devonshire and his colleagues that examined the position of science and how it was being fostered in the old and new universities and in various parts of the government. They are important because they help to complete the contemporary picture of British science and by association, that of technology. They also help to establish how the various groups related to each other and where government priorities lay. The Third Report explored the Universities of Oxford and Cambridge and was published on August 1 st 1873. Devonshire received information from each institution on the courses and examinations they offered, the composition of their professoriate, any scientific institutions they supported, the college structure, their relationship to technical education and scientific professions and the nature of their duty with regard to the advancement of science. In the section devoted to exploring the relationship between the Universities, technical education and the scientific professions (which was very limited) the prevailing view of the Universities was offered by Robert Clifton. He believed that Universities should not provide teaching related purely to the professions or industry. [175] Alfred Newton expanded on the notion when he stated that if science was to be present in the Universities it would be '...advanced by those who are working at it purely for its own sake, and not with a view to making it pay...' [176] The Reverend H. W. Cookson, master of St. Peter's College Cambridge added that Universities were not

good places to study applied science. However, he did recognise the importance of establishing schools of science in all the great manufacturing centers stating that he considered it '...absolutely necessary if this country is to hold its place amongst the nations of the world...' [177] Devonshire, in contrast admitted that the Universities had a role to play beyond simply using science as part of a liberal education. [178] The training of science teachers was identified as a key contribution which they could make. However, with regard to professions such as medicine, consulting and manufacturing chemistry and civil, mechanical and telegraphical engineering they acknowledged the practical difficulties. Nevertheless they held that '...the Universities should provide to the fullest extent for the theoretical instruction of such professional students...' [179] In their conclusions the Commissioners attested to the unanimity of the witnesses on most points but noted the divergence of opinion on a few critical issues, particularly with regard to the status and application of science. They stated categorically that although much had been done in the Universities towards

> ...the Promotion of Scientific Education and Research much remains to be done; and that changes, or at least extensions, of no inconsiderable importance have now become indispensable, if the work, which has so well begun, is to be continued successfully. [180]

Questions of detail regarding how these changes would be achieved were, they suggested, best left to the universities themselves.

The Fourth Report concentrated on the national scientific museums and their collections and the scientific element of general museums. This included the British Museum, the Museum of the Royal College of Surgeons, the National Botanical Collections, the Museum of Practical Geology, the South Kensington Museum and other scientific collections and lectures in connection with museums. The Report was published on 16 th January 1874 and contained a number of

conclusions and recommendations that were designed to make these agencies more efficient and clearly identified the State's responsibility to them. [181]

The Fifth Report explored the scientific instruction offered in London in University College and King's College, Owen's College in Manchester, the College of Physical Science in Newcastle-upon-Tyne and the Catholic University of Ireland. These were all recently formed institutions that were voluntary in origin and funding. [182] Both Owens College and the College of Physical Science directly reflected the needs of the industrial and manufacturing communities in which they were based.

In general the Commission felt that despite their obvious success these colleges were involved in an unequal battle with the highly endowed and long established schools and colleges. The competition for staff, students and government patronage was fierce, particularly in London. [183] In order to partly address this problem they recommended that funding from the State should be directed towards the two Metropolitan Colleges and Owens College for capital developments and annual working grants. [184] In the case of the College of Physical Science they acknowledged its success and stated that it would soon be eligible, in the same way as the other colleges, for State aid. [185] However, they regarded the Catholic University as unsuitable for government support because of its religious nature. [186] The Report was published 4 th August 1874.

The Sixth Report explored the teaching of science in the public and endowed schools. The Commissioners recognised that the scale of this undertaking was considerable and co-opted J. Norman Lockyer as an Assistant Commissioner. He was asked to make personal visits to schools and the collection and organisation of data. Amongst the public schools special attention was paid to Eton, Rugby, St. Peter's, Westminster, Harrow, Winchester, Charterhouse, Marlborough, Dulwich,

City of London, University College School, King's College School, Taunton, Wellington, Rossall, Clifton, Cheltenham, Christ's Hospital and Manchester. Of the 202 endowed schools consulted 128 replied to the Commission's enquiry. Devonshire concluded that '...in our Public and Endowed Schools, Science is as yet very far from receiving the attention, to which in our opinion, it is entitled...' [187] Where it was being taught it only received at best very limited curriculum time and was accessible to only a few. The evidence from the returns provided by the Endowed Schools indicated that only 63 taught science and of these, only 13 had any kind of laboratory. [188] The reason given for this situation was the doubt that still existed over the educational value of science. [189] In the light of their findings the Commission were compelled to note that

> ...the Present State of Scientific Instruction in our Schools is extremely unsatisfactory. The omission from a Liberal Education of a great branch of Intellectual Culture is of itself a matter for serious regret; and, considering the increasing importance of Science to the Material Interests of the country, we cannot but regard its almost exclusion from the training of the upper and middle classes as little less than a national misfortune. [190]

The Devonshire Commission recommended that at least 6 hours a week should be devoted to the study of natural science in the public and endowed schools. [191] The Report was published 18 th June 1875

The Seventh Report investigated the Universities of London (1836), Edinburgh, Glasgow, St. Andrew's, Aberdeen, Trinity College Dublin (1591) and Queen's (1850). The Scottish Universities had been examined in some depth by a Royal Commission in 1858 and an Inquiry in 1863. Consequently, a significant amount of detail about their organisation and operation was already in existence. It indicated that they had achieved the balance of Science in Arts and Arts in the Sciences. The Commission suggested that this should be a guiding principle for all universities. [192] A large proportion of their student body entered university as

preparation for a profession and the courses offered reflected this. They also had smaller endowments and a poorer students to cope with. Devonshire recommended that all the Scottish Universities receive additional help from the State in one form or another. The Report was published on 18 th June 1875.

The Eighth Report was the final document produced by the Devonshire Commission. It examined the relationship between the Government, science and scientific research. Devonshire and his colleagues remarked that

> ...whilst we have reason to be proud of he contribution of some great Englishmen to our Knowledge of the laws of nature, it must be admitted that at the present day Scientific Investigation is carried on abroad to an extent and with completeness of organization to which this country can offer no parallel. [193]

They also concluded that was State was deficient in its support for such activities and should contribute more. [194] This Report, like it predecessor was published on 18 th June 1875.

Reaction to the reports of the Devonshire Commission

Two years elapsed before the Devonshire Commission produced even a rudimentary first report and five years before the overall task it was asked to undertake was complete. It concluded that the State should have an increasing role in both the subsidy and promotion of all things scientific, a notion that had become easier to promote because since 1851 the idea had become more widely debated. However, it interested parliament even less than the Select Committee. Perhaps this was because there was a common membership between the two investigations. The concentration of views and opinions from such a narrow clique was also very limiting. The R.C.S.I.A.S. provided an unremarkable record of scientific provision in the United Kingdom with very little new to say. This can be explained to a certain extent by the political climate into which it was to be received. Gladstone wasted no time on his election in 1868 in trying to establish

what David Thomson refers to as the foundations for the modern State. [195] The civil service, the military and the judiciary were subject to major change thorough which their power of patronage and influence was to be diminished. As Thomson points out, 'all these reforms, regarded as a major attack on the most deeply entrenched oligarchic interests had to be forced through by any device available against bitter opposition...' [196] A further potential threat to the status quo would have been an inevitable consequence of a more radical Royal Commission. Hence, Devonshire could not fully embrace the opinions of Applegarth or Strange. State energy was directed towards the elementary education. W. E. Forster, Vice President of the Committee of Council on Education, observed that

> ...we find a vast number of children badly taught, or utterly untaught, because there are too few schools and too many bad schools, and because there are large numbers of parents in this country who cannot or will not send their children to school. [197]

He translated this concern into the Elementary Education Act of 1870. It is notable that Applegarth judged the Act to be a disappointing compromise but it was to form the basis of a State education system. [198]

CONCLUSIONS

By 1867 the general public had become familiar with the concept of the exhibition and the messages emanating from them were treated seriously. The technical educationists in particular were confident that they would allow for the legitimate comparison of the industrial health of participating nations. William Aitken, a director of Messrs. Hardman and Co. (a Birmingham metalworks) and a representative on the Council of the Midlands Institute had opinions typical of this group. He stated to the Select Committee on Scientific Instruction that, having been present at the French Exhibition in 1849, the great Exhibition in 1851, the second exhibition in 1855 and Paris in 1867, he had concluded

> ...it must be perfectly evident that a large advance has been made by Continental countries, by France among others within that period of years. It is apparent that what they made in 1849 was chiefly ornamental, in 1855 they went in for substantial work and in 1867 they have advanced upon that again. [199]

The success of this series of exhibitions ensured that they would increasingly act as focal point for the debate about science and technology. Exhibitions now held a unique place in the early development of popular mass culture and this ensured that any issue emerging from them would receive wide publicity. In particular the Paris event, at which British manufacturers performed relatively badly, had a significant impact because the poor results were used by Playfair and others as a means of promoting technical education. To advance their cause they had to challenge the notion that the industrial might of England was unassailable. For the first time evidence to support their claim appeared to be available and was widely circulated. However, the forces of conservatism sought to restrain their excesses. Caution was urged by a few who suggested that it was not wise to make statements about matters affecting national prestige based on evidence draw from an international exhibition. Henry Cole warned against taking the deliberations of jurors too seriously. He said that it was absurd that they were expected to investigate the most trifling details including passing judgment on the quality of a lady's corset as well as determining '...the merits of the discovery of electro-magnetism.' [200] He also pointed out that jurors suffered from an unfortunate bias. In theory the best work should have been rewarded without concern about where it originated from but

> ...the steps taken do not ensure this result. On the contrary the estimation of the goods of each country is ultimately determined very much in proportion to the number of its jurors...[201]

Despite these misgiving the views of jurors proved to be a significant catalyst. Their findings prompted the initiation of a number of private and official investigations the two most exacting of which were the S.C.S.I. and the R.C.S.I.A.S..

Although the Select Committee largely concentrated on what was happening abroad and Devonshire commented on events at home they had a number of similarities. Both explored the connection between science, technology, education and industry. They were composed of individuals drawn from a particular background and experience who generally failed to elicit opinions of the industrial classes. Few radical ideas could be expected to emerged from those so steeped in the ways of the establishment. Indeed, neither managed to convince a largely sceptical ruling elite fully of the scale of foreign advance or what to do about it. However, their very existence and relative proximity to each other was a reflection of the seriousness with which this issue was regarded. They both commented on the significance of general and scientific/technical education but advocated incremental rather than wholesale change. This was acceptable to a Government that was ever mindful of the effect of any initiative on the public purse. However the reforms they suggested, including the provision of limited aid for technical education and the expansion of the work of the Science and Art Department, were not implemented. In practice they made little difference.

During the eight years between Select Committee and the Devonshire Commission, little changed in relationship to the provision of scientific and technological education. It is possible that political events such as the Second Reform Act of 1867, the Elementary Education Act of 1870, and Gladstone's zeal for other issues throughout the early seventies could explain this inertia. Perhaps more powerful forces were at work. Gouge Greenwood, Principal of Owens College and fellow of University College noted that the great branches of manufacturing industry

> ...which rest, in a greater or less degree, on a scientific basis have been (as was to be expected) much more slowly recognised as *liberal professions* in England than on the Continent. It is of course quite true that most eminent engineers, for instance, civil and mechanical, being almost always men of excellent natural parts, and attaining to great wealth, rapidly acquire high social position and great influence. But these are given to them as *individuals*, and the result is not, save in a very slight degree, to raise the *status* of their professions as such, which are continually entered by men who are inadequately fitted to practise them. [202]

The radical shift in thinking that was necessary to address the issue of technical education was proving difficult to achieve, despite the evidence from abroad and the contribution of Playfair, Huxley, Mundella, Applegarth, Hibbs and Strange. Robin Betts notes that the conclusions reached in a few months of hectic enquiry in 1867-68 were put aside. [203] As Dr. Williamson had warned, the Devonshire Reports were regarded as the work of a set of dreamers.

FOOTNOTES : 1

1) Select Committee on Scientific Instruction, Minutes of Evidence, p. 6288. Statement by W H Aitken

2) The death of Prince Albert in the pervious year had an impact on the number of visitors)

3) P. Greenhaulgh, Ephemeral Vistas: The Exposition Universelles, Great Exhibitions and World Fairs 1851-1939, Manchester University Press, Manchester, 1988, p. 48

4) British Parliamentary Papers, Paris Universal Exhibition, Report by the Executive Commissioner, Vol. 1, p. viii

5) K. W. Luckhurst, The Story of Exhibitions, The Studio Publications, London, 1951, p. 132

6) The Times, April 16 th, 1867

7) Ibid., April 23 rd, 1867

8) Ibid., November. 5 th, 1867

9) Ibid., April 30 th, 1867

10) Ibid.

11) Ibid.

12) P. Greenhaulgh, op.cit., p. 35

13) The Times, November. 5 th, 1867

14) British Parliamentary Papers, Paris Universal Exhibition , op.cit., p. ix

15) The Times, April 23 rd, 1867

16) British Parliamentary Papers, Paris Universal Exhibition , op.cit., p. ix

17) The Egyptians spent over £60,000

18) The Times, April 23 rd, 1867

19) P. Greenhaulgh, op.cit., p.41

20) The Illustrated London News , 13 th April, 1867

21) British Parliamentary Papers, Paris Universal Exhibition , op.cit., p. xxvii

22) British Parliamentary Papers, Paris Universal Exhibition , op.cit., p. ix

23) Duke of Cleveland, (Harry George Powlett) was Liberal M.P. for first South Durham and then Hastings before his succession to the Dukedom in 1864. His family estates covered over a 100,000 acres at 11 prime locations in England; Lord Houghton, (Richard Monckton Milnes) well travelled poet, composer, prose writer and dilettante who entertained the great and the good; Lord Harding, (Charles Stewart) Under Secretary for War from 1858 to 1859 and trustee (and later) Chairman of the National Gallery from 1874; Sir William Hutt, M.P. for Gateshead between 1841 and 1874, Paymaster General and Vice President of the Board of Trade from 1860 to 1865; Sir Samuel Baker; Hugh Diamond, noted photographer and secretary to the London Photographic Society; Charles Wheatstone, a celebrated scientist and inventor who was active in developing systems for measuring electrical forces and improving the equipment for telegraphy; John Tyndall, a mathematician, railway engineer and natural philosopher who did much to popularize science through his writings which were translated into most European languages; William Brookfield, chaplain in ordinary to Queen Victoria and Inspector of Schools; Warrington S. Smyth, geologist and mineralogist and President of the Geographical Society from 1866 to 1868; Richard Redgrave, a subject and landscape painter who was inspector general for art in the government school of design in 1857; Waren De La Rue, inventor, chemist and astronomer who received gold medals from the Astronomical and Royal Societies for his various researches and scientific papers.

24) The Times, April 25 th, 1867

25) Schools Inquiry Commission, Report Relative to Technical Education, p. 6

26) Lord Taunton (1798-1869) was formerly known as Henry Labouchere and had variously been president of the Board of Trade, 1839 and 1847 to 1852 and under secretary of state for the colonies (1855-58)

27) The Clarendon Commission (under the chairmanship of the Earl of Clarendon) examined the education found in the nine major public schools. Charterhouse, Eton, Harrow, Merchant Taylors, Rugby, St. Paul's, Shrewsbury, Westminster and Winchester catered for the needs of a very influential minority and exercised a significant influence on the whole of English education. They were all closely linked to Oxford and Cambridge.

28) The Newcastle Commission investigated elementary education.

29) Schools Inquiry Commission, Report, Chapter V11, pp. 576-85

30) Royal Commissions emerged from ancient traditions dating back to the early Middle Ages. They were the prerogative of the crown which sometimes acted under the instruction of Parliament were chosen on a non partisan basis. They could be made definitely expert or impartial or when needed they could be packed to any degree desired. They were not restricted to Members of Parliament, by time or to a particular location. The 19 th century was described as the great era of the Royal Commission, particularly after 1850. Between 1830 and 1900 there were 388 Royal Commissions. Between 1853 and 1860 there an average of 7 per year and 74 in total. Between 1861 and 1870 there were an average of 6 per year and 54 in total .Between 1871 and 1880 there were an average of less than 5 per year and 45 in total. Between 1880 and 1900 there were an average of 4 per year and 40 in total. See H. D. Clokie and J. W. Robinson, Royal Commissions of inquiry: the significance of investigations in British politics, Stanford University Press, Stanford, 1937

31) Schools Inquiry Commission, Report Relative to Technical Education, p. 6

32) Mundella, (1825-1897) became a Radical M.P. for Sheffield, (1868-85) and for the Brightside division of Sheffield from 1885 to 1897. He was credited with responsibility for the 1870 Education Act. He was made a privy councillor in 1880, Vice President of the Committee of Council on Education (1880-85), established the Labour Department in 1886 and became chairman of the Department Committee on Poor Law Schools between 1894 and 1895

33) Schools Inquiry Commission, Report Relative to Technical Education, p. 25

34) Ibid., p. 15

35) Ibid., p. 11

36) Ibid.

37) Mundella owned a number of factories in Saxony and was therefore in an excellent position to comment.

38) Schools Inquiry Commission: Report Relative to Technical Education, p. 13

39) Ibid., p. 11

40) S. G. Checkland, The Rise of the Industrial Society in England 1851-1885, p. 154

41) Schools Inquiry Commission: Report Relative to Technical Education , pp. 3-4

42) Ibid., p. 7

43) Robin Betts (A), The Issue of Technical Education 1867-68, History of Education, Vol 48, 1991, p. 31

44) Lord Robert Montagu, (1825-1902) educated at Trinity College was Vice President of the Committee of Council on Education and charity commissioner, 1867. He was also M.P. for Westmeath between 1874-80

45) Schools Inquiry Commission, Report Relative to Technical Education, p. 18

46) Ibid., p. 19

47) Ibid., p. 18

48) Hansard Vol. CLXXXIX, August 1 st, 1867, col. 598

49) Lord Edward Stanley (1826-93) was M.P. for Kings Lynn between 1849 and 1869. He was appointed Colonial Secretary (1858-59 and 1882-85) and Foreign Secretary (1874-78). He was also offered the crown of Greece in 1863.

50) Hansard Vol. CXCII, 1868, col. 1560

51) Parliamentary Accounts and Papers: Education (cont'd): Scientific Education, Technical and Primary Education, Vol. L1V, 2-14, Circular to Lord Stanley to Her Majesty's Representatives Abroad ; together with their Replies, p. 4085

52) Professor Leone Levi (1821-80) jurist and statistician was born in Ancona and settled in Liverpool. He published his chief work on statistics on a periodic summary of British Parliamentary Papers(18 Volumes) between 1856 and 1868 and the History of British Commerce and Economic Progress in 1872

53) Robin Betts (A), op.cit., p. 33

54) Professor Leone Levi, 'Report on Industrial and Professional Instruction in Italy and Other Countries', Conclusion xvi, p. 5, House of Commons Parliamentary Accounts and Papers , 74 638-39

55) Ibid.

56) The questionnaire assumed that the benefit of the approach to technical education found in other countries was not in doubt

57) Parliamentary Accounts and Papers: Education (cont'd): Scientific Education; Technical and Primary Education, Vol. L1V, pp. 2-14

58) The list helped to illustrate how the United States was making and selling articles such as locks, guns, farming implements and various devices including pumps and sewing machines, how Germany had replaced Birmingham in the production of chains, woodworking tools and cutlery and how France was producing optical instruments and electroplated wares. See ibid.

59) J. W. Adamson, English Education 1789 to 1902, Cambridge University Press, London, 1964, p. 319

60) Bernhard Samuelson (1820-1905) had wide experience of the workings of industry in a number of different countries. Born in Liverpool, he trained in the same city as an engineer in an workshops of an English based Swiss company. In 1842 he became the manager of a Manchester firm of engineers (1842-46) and established his own railway company in the French city of Tours in 1846. He moved to Teesside as an iron master in 1853 and spent £300,000 on adapting the Siemens-Martin process for the production of iron and steel from Cleveland ores. He transferred his activities to Newport in 1863 and in 1867 built the Britannia Ironworks, which became famous for its vast output of iron and tar. His other commercial interests included an agricultural implements factory in Banbury. He represented Banbury as Liberal Member of Parliament in 1859 and from 1865 to 1885 and North Oxfordshire for ten years from 1885 onwards. He was made a baronet in 1884 and a privy counsillor in 1897. His other notable achievements included becoming a Fellow of the Royal Society, member of the Institute of Civil Engineers, founder member and president (1883-85) of the British Iron and Steel Institute and also president of the British Iron Trade Association, an Alderman, a Justice of the Peace and chairman of Technical Committee of Oxfordshire. See Anthony David Edwards, Foreign Influences on the development of technical education in England 1867-1902, (M.Ed)University of Liverpool, Liverpool, 1988p. 11

61) The Economist, February 1 st, 1868, p. 116

62) Ibid., p. 117

63) Ibid.

64) Ibid., p. 116

65) Bernhard Samuelson, 'Copy of Letter from B. Samuelson, Esq., M.P., to the Vice President of the Committee of Council on Education concerning Technical Education in various Countries Abroad', pp. 55-57, House of Commons Parliamentary Accounts and Papers, 74 638-39

66) Ibid., pp. 57-8

67) Duke of Marlborough (1822-1883). John Winston Spencer-Churchill was educated at Eton and Oriel College, Oxford. He was Conservative M.P. for Woodstock (1844-1845) and (1847-1857). He took his seat in the House of Lords in 1857. He was appointed Lord Steward of the Household(1866-1867), Lord President of the Council (1867-1868) and Viceroy of Ireland (1876-1880).

68) Hansard Vol. CXCI, 3rd April 1868, col. 824

69) N. McCord, Norman McCord, British History 1815-1906, Oxford University Press, Oxford, 1991 , pp. 262-269

70) Robin Betts (A), op.cit., p. 33

71) Select Committees were essentially ad hoc bodies created for a specific piece of work such as the consideration of private or public bills or all manner of inquiries. They were usually a prelude to public legislation. There was a certain amount of criticism associated with the procedures employed by Select Committee about their membership, tenure and politics. It was alleged that select committees were often resorted to by the Government as a means of satisfying the proponents of a policy with a promise of inquiry. However, they could not always be controlled in a guaranteed way. See Clokie and Robinson, op.cit., p. 54

72) Hansard, Vol. CXCI, March 24 th, 1868, cols. 160-161

73) Ibid., cols. 163-165

74) George Dixon (1820-98) Liberal M.P. for Birmingham (1867-76) and M.P. for Edgbaston from 1885 until his death. He was a merchant who helped to form the Birmingham Education Aid Society in 1868 and the National Education League in 1869. He became a member of the first Birmingham School Board in 1870, was re-selected in 1873, and acted as chairman between 1876 and 1897.

75) Hansard ,Vol. CXCI, March 24 th, 1868, col. 165

76) Ibid., col. 175

77) Ibid., col. 172

78) Ibid., cols. 179-80

79) Ibid.

80) N. McCord, op.cit., p. 197

81) The Select Committee had a great opportunity to make an impact on both of these areas

82) Select Committee on Scientific Instruction, Report, p. 111

83) Hansard Vol. CXCI, March 24 th, 1868, col. 166

84) Occasionally the prejudices of the questioners were apparent. This bias surfaces in a number places throughout the Minutes of Minutes of Evidence but is clearly illustrated in the exchange involving Henry Ripley

85) Select Committee on Scientific Instruction, Minutes of Evidence, para. 6484

86) Ibid., para. 6496

87) Ibid., para. 6531

88) Fleeming Jenkin was educated partly in France and Germany and was a practising civil and mechanical engineer. He was appointed to the post of Professor of Civil Engineering at the University College London

89) Select Committee on Scientific Instruction, Minutes of Evidence, para. 2443-2447

90) Ibid., para. 4571

91) Ibid., para. 4682

92) James Kitson was a partner in his fathers firm, Kitson and Company, which was involved in the manufacture of large locomotives. He was the honorary secretary of the Yorkshire Union of Mechanics Institutes and attended the Paris exhibition

93) Select Committee on Scientific Instruction, Minutes of Evidence, para. 4943

94) Hansard Vol. CXCI, March 24 th, 1868, col. 172

95) Field had wide experience of manufacturing in the United States

96) Select Committee on Scientific Instruction , Minutes of Evidence, para. 6722

97) Ibid.

98) Ibid., para. 4267

99) Ibid., para. 4269

100) Ibid., para. 4602

101) Ibid., para. 4635-4685

102) Hansard Vol. CXCI, March 24 th, 1868, col. 176

103) Select Committee on Scientific Instruction, Minutes of Evidence, para. 1355-1364

104) Select Committee on Scientific Instruction, Report, V

105) Ibid., Section IV, p. 16

106) N. McCord, op.cit., p. 317 and Select Committee on Scientific Instruction, Minutes of Evidence, para. 6851-6854

107) Select Committee on Scientific Instruction , Minutes of Evidence, para. 6904

108) Ibid., para. 6900

109) Select Committee on Scientific Instruction, Report, VI

110) Ibid., p. 18

111) Select Committee on Scientific Instruction , Minutes of Evidence, para. 2615

112) Ibid., para. 2617

113) Chance was a graduate of Cambridge University and a noted scientist

114) Select Committee on Scientific Instruction, Minutes of Evidence, para. 6645-6647

115) Ibid., para. 288

116) John Fletcheville Dykes Donnelly was a decorated soldier who served in the Royal Engineers and assisted Henry Cole in reorganising the science and Art Department who became Director for Science in 1859

117) Select Committee on Scientific Instruction, Minutes of Evidence, para. 1 -10

118) Schools Inquiry Commission, Vol. II, Miscellaneous Papers, p. 218. Reprinted from the British Association Dundee Report, 1867

119) Select Committee on Scientific Instruction, Report, V11

120) The Economist, February 1 st. 1868, p. 116

121) Hansard, Vol. CXCI, March 24 th, 1868, col. 170

122) Select Committee on Scientific Instruction, Minutes of Evidence , para. 4256-4273

123) Select Committee on Scientific Instruction, Conclusions 1 and 2, vii

124) Ibid., 3, vii

125) Ibid., 5 and 6, ix

126) Ibid., 7 and 8, ix

127) Select Committee on Scientific Instruction, Report, IX, No. 8

128) Ibid., No 11

129) Select Committee on Scientific Instruction, Conclusion 14, ix

130) Ibid., 15, ix

131) D. Thomson, op.cit., Penguin Books, Middlesex, 1963, p. 121

132) Ibid., p. 122

133) Ibid., p. 129

134) Robin Betts (A), op.cit., p. 34

135) Charles Babbage, the scourge of British Government with regard to its policy on innovations in science and technology was at the forefront of the development of science of statistics

136) The free trade Cobden Treaty was signed in 1860

137) Select Committee on Scientific Instruction, Minutes of Evidence, para. 4202-4205

138) R. Betts (B), 'A. J. Mundella, Robert Wild and the Continental systems of education 1884-1899: conflicting views on the status of teachers', History of Education, Vol. 17, Nº 3, 1988, p. 222

139) D. S. L. Cardwell, The organisation of science in England, p. 122

140) Ibid., p. 120

141) Royal Commission on Scientific Instruction and the Advancement of Science, Vol. 1, Minutes of Evidence, para. 10314

142) D. S. L. Cardwell, op.cit., p. 122

143) N. Maclure , op.cit., p. 106

144) Royal Commission on Scientific Instruction and the Advancement of Science, Vol. 1, Minutes of Evidence, para. 1174

145) Ibid., Vol. 1, XXXI and Vol. 2 , III. See list of witnesses

146) Ibid., Minutes of Evidence, para. 118

147) Ibid., 13508

148) The Marquis of Salisbury was Member of Parliament for Stamford between 1853 and 1868, chairman of Great Eastern railways (1868-72), secretary for India in Disraeli's government (1874-78), foreign secretary (1878-80) and subsequently Prime Minister from 1885 to 1886, 1886 to 92 and 1895 to 1902.

149) Royal Commission on Scientific Instruction and the Advancement of Science, Minutes of Evidence, para. 13555

150) Ibid., para. 13553

151) Ibid., para. 2819

152) Ibid., para. 2859

153) Ibid., para. 7367

154) Ibid., Vol. 2, Appendix X

155) Ibid., Minutes of Evidence, para. 5866

156) Ibid., para. 1848

157) Ibid., para. 1584

158) The National Educational League was a long established pressure group dedicated to promoting learning amongst the working classes

159) Royal Commission on Scientific Instruction and the Advancement of Science, Minutes of Evidence, para. 2040

160) Ibid., para. 115

161) Ibid., para. 1945

162) Ibid., para. 2010

163) Ibid., para. 1946

164) Ibid., para. 1971

165) Ibid., Vol. 1, First Report, Point 13

166) Ibid., Vol. 1, Second Report, Point 8, XII

167) Ibid., Point 17, XV

168) Ibid., Point 12, XIII

169) Ibid., Point 35

170) Ibid., Points 1-3, XIX

171) Ibid., Point 41, XIX and Point 83, XXVI

172) Ibid., Minutes of Evidence, para. 6302

173) Ibid., para. 2039

174) Ibid., Vol. 1, Second Report, Points IV-XX and XXIX and XXX

175) Ibid., Minutes of Evidence, para. 3042

176) Ibid., para. 4706

177) Ibid., para. 5109

178) Ibid., Vol. 1, Second Report, Section V, LIV

179) Ibid., Vol. 3, Third Report, Point 181, Section V, LIV

180) Ibid., Point 196, IX

181) Ibid., Fourth Report, Conclusions I-XV, 23-24

182) University College, 1826: King's College, 1828: Owen's College, 1846 College of Physical Science, 1871: Catholic University of Ireland, 1869)(156)

183) Ibid., Vol. 3, Fifth Report, Point 37

184) Ibid., Recommendations 75, 21

185) Ibid., Fifth Report Point 86, 2

186) Ibid., Point 102, 28

187) Ibid., Sixth Report, Point 5, 1

188) Ibid., Point 6, 1

189) Ibid., Point 17, 4

190) Ibid., Point 46, 10

191) Ibid., Point 49, 10

192) Ibid., Seventh Report, Point 33, 5

193) Ibid., Eighth Report, p. 24

194) Ibid., Conclusions and Recommendations, p. 47

195) D. Thomson, op.cit., p. 131

196) Ibid. p. 133

197) J. S. Maclure, Educational Documents, England and Wales, 1816-1968, Chapman and Hall, London, 1969, p. 99

198) J. Lawson and H. Silver, A social history of Education in England, Methuen, London, 1973, p. 316

199) Select Committee on Scientific Instruction, Minutes of Evidence, para. 6280

200) British Parliamentary Papers, Paris Universal Exhibition, Report by the Executive Commissioner, p. xxv

201) Ibid. p. xxv

202) Royal Commission on Scientific Instruction and the Advancement of Science , Minutes of Evidence, para. 7283

203) Robin Betts (A), op.cit., 36

Section 2 : The Season of Enthusiasm

Montague

Millions flocked to the exhibitions as pilgrims once did to a holy place. The new pilgrims came to renew their faith in their own nations, to experience the miracles of Science, to worship at the shrines of Progress. Even the great exhibition halls with their 'naves' and 'transepts' were patterned after medieval cathedrals. These halls resounded with organ music and they were sometimes called 'Temples of Industry...' [1]

INTRODUCTION

Between 1871 and 1874 London was the venue for a number of small annual exhibitions which were arranged by Henry Cole. He limited their scale and scope thus trying to avoid some of the financial problems associated with larger events. However, the Franco-Prussian war (which restricted the level foreign participation) and a power struggle between the various oraganising committees at home reducing their impact. As a result they barely managed to attract two million visitors in total and made a combined loss of £150,000. [2] In 1873 an international exhibition in the grand tradition established by Prince Albert was held by the Austrians in Vienna. Despite attracting over seven million visitors it also made a spectacular loss of nearly £3,000,000. [3] Regardless of the financial difficulties most organisers of exhibitions faced there was great competition amongst nations to create bigger and better events. They were credited with many positive features including the capacity to encourage '...the growth of industrial art and the development of technical skill' .[4] Two further important exhibitions were held in this decade, the first in Philadelphia and the second in Paris. Both re-ignited some the alarm of the late 1860s and had a bearing on the Samuelson Commission, regarded by some as the definitive investigation into technical education.

THE PHILADELPHIA EXHIBITION (1876)

The event

The notion that the centenary of American Independence should be celebrated by holding an international exhibition in Philadelphia was first suggested at the

Smithsonian Institution by John Campbell, a College professor from Indiana, in 1864. There was a great deal of enthusiasm for exhibitions in political circles because Americans had attended a number of European events and recognised their potential. [5] Official backing for the Campbell proposal came in the form of a Congressional Act to establish a United States Centennial Commission in 1871. However, by the end of 1873 it appeared that the prospects for the exhibition were very poor. Daniel J. Marrell, an iron master and chairman of the Centennial Executive Committee ventured that the government had

> ...refused aid; local jealousies were powerful, the newspapers of the country, with few exceptions, were lukewarm or openly hostile, and the mass of the people could not be interested in an event which seemed far away in the future ... I am ashamed to say, I shall strive to forget, and I hope that history will not record, how few had faith in the success of our enterprise. [6]

This was similar to the difficulties encountered by Prince Albert a quarter of a century earlier. In order to address this malaise a Centennial Board of Finance was established to oversee the task of fund raising. It estimated that $10,000,000 was needed to underwrite the project. [7] The Board faced a difficult time because of a stock market crash in 1873, but it still managed to raise significant amount of money from shares sold to individual citizens by various participating States. The House of Representatives, somewhat reluctantly, allocated $1.5 million for the exhibition in February 1876. This support made the completion of the exhibition buildings possible , which were in danger of remaining unfinished without it. [8]

The Centennial Exhibition was seen as an unparalleled opportunity to commemorate the independence and unity of a relatively young country, especially after the Civil War. Concern was expressed by some about the potential threat to foreign participation that this uniquely American celebration might pose, but these worries proved to be unfounded. They were advised not to make the same mistake as some Europeans had done by creating an event which consisted of

interminable galleries, hard floors and perpetually recurring staircases lined by miles of objects which were too familiar to be attractive. [9] The organisers were urged to avoid obstructive crowds and what the English in particular regarded as the greatest error all, that of '...suffering such displays to become too frequent and too common, so that they sink from the level of an Exhibition to that of a bazaar. [10]

H. J. Schwarzmann, a 25 year old Bavarian immigrant, was made chief engineer of the Philadelphia exhibition. He oversaw the conversion of 284 acres of fields and ravines into parkland during the two year period it took to construct. The landscaping of the site, which was one of the exhibitions finest features, necessitated removing 500,000 cubic yards of earth, transplanting 20,000 trees and laying 154 acres of lawn. The resulting open spaces of what became known as Fairmount Park encouraged wide distribution of the event buildings. The exhibition opened on 10th May 1876 with an inaugural speech by President Grant. Nearly 200,000 people visited it on the first day it was open to the general public but attendance quickly began to fall. [11] However, by November it had risen to 115,315. When the event closed on November 10th nearly 10,000,000 had attended Fairmount Park despite not opening on Sundays. [12] Visitors were transported around the site by two special railway lines, installed by the Pennsylvania and Reading Companies. They carried 557,100 passengers on 66,467 trains over a 159 day period and were universally admired by all who used them.

On Fairmount Park there were nearly 260 large and small buildings. [13] Pre-eminent amongst them were the Main Building, the Agricultural Hall with its vaguely Gothic arches, [14] the Horticultural Hall which was the largest conservatory in the world and the Memorial Hall, a massive granite building crowned by a dome of glass which housed 3,256 painting, 627 sculptures and an

extensive photographic exhibition. Other principal structures included the Machinery Hall, the Judges Hall and the United States Building. The Machinery Hall, regarded by some as the most important and valuable area in any exhibition. [15] was dominated by the massive Corliss Engine. It had a 56 ton fly wheel, reputed to be the largest in the world at the time, and was designed to be the source of motive power for all the appliances in the building. [16] The hall also contained the Walter printing machine which produced 11,000 folded copies of the New York Times every hour, much to the amazement of the crowds who stood intently watching it. [17] Equipment for refrigeration, the railway, farms and machine tools for working with wood and metal were also on display. The rapid development of new electrical instruments was reflected by the plethora of signalling devices present at the exhibition. These included appliances for submarine telegraphy , mostly designed by the British, a new strain of generators by the Belgian Zenobe Gramme and the American William Walace and alarms of all shapes and sizes. Professor Alexander Graham Bell demonstrated his new telephone which remained on display for about 2 weeks. The Judges Hall was dedicated to providing for the needs of the 115 American and 118 foreign judges (drawn from 23 countries) who made up the international juries. In order to avoid the criticisms made of previous exhibitions they only presided over the distribution of 13,104 bronze awards. Gold and silver medals were abandoned because judges in the past had been too frequently accused of bias and inconsistency. [18] The contents United States Building became the nucleus for the collection in the Smithsonian Institute. [19] Perhaps the most unusual structure was the towering arm and torch of the Statue of Liberty created by the French sculptor Frederic Auguste Bartholdi. [20]

A number of foreign nations took the opportunity to erect their own buildings on the exhibition site. The British chose to build St. George's House and two adjacent structures in an Elizabethan style created by Thomas Harris. These

edifices were designed to reminded the Americans of the age and standing of their English forebears. [21] It was claimed that they set a new fashion in domestic architecture in the United States. [22]

The Centennial Exhibition was the first to have a Woman's Pavilion, which was overseen by Elizabeth Gillespie (the great-granddaughter of Benjamin Franklin) and a women's section in the main building. [23] In both venues there was an overriding concentration on domestic products but all disciplines within the arts, sciences and humanities were represented. [24] Of particular note was the section devoted to women inventors which housed work by Martha Cooton, who designed the Pyrotechnic Night Signal used by the Federal Government, G. L. Townsend who created hand operated sewing machines and Elizabeth French who designed electric therapy equipment. [25] The Women's Pavillion acted as a focus for much condescension and heated reaction, particularly from European commentators.

The Americans readily seized on the concept of building amusement parks which had been exploited by the French in 1867 and frowned upon by the English in equal measure. [26] The entertainment provided in connection with the exhibition also included concerts, parades, fireworks, regattas shooting matches and a series of special days such as Pennsylvania Day which attracted 274, 919 people.

The British section was directed by Colonel Herbert Sandford R.A. Professor Thomas Archer was Executive Commissioner and A. J. R. Trendell appointed as the Secretary. This was a key position which embraced a highly specialised role. The Secretary acted as a Commissioner General and was usually in overall charge. Archer and Trendell were supported by five official superintendents, twelve assistants and clerks, twelve policemen and five Royal Engineers. [27] Only the host country had more space than the British. [28] All the major manufacturers were

represented. Silverware, porcelain, terra-cotta and ornamental tiles, furniture (all considered to be outstanding) jewelry, hardware, cutlery carpets and specimens from the Royal School of Needlework were on display [29] although the amount of machinery present was notably less than had been in Paris and Vienna. [30] The British complained that import taxes deterred wider participation, even though the United States encouraged foreign manufacturers to submit their wares for exhibition by making them temporarily free of duty. [31] This placatory measure was not enough to appease those who were aware of the impact of the American legislation. It had been designed to exclude foreign competitors from

> ...their markets, and there are no adjoining markets of much importance to be annexed by success at Philadelphia. Thus the ordinary inducements which prevail with European manufactures to send their goods to these competitions are wanting on this occasion. [32]

The discontent this generated amongst British exhibitors was an indication that tariffs, the underlying issue affecting economic activity in the late 19 th century, was beginning to be accorded its true significance.

There was less resistance to participate amongst the representatives of other countries , despite the problems with import duty. They allocated considerable official funds to support those wishing to exhibit and also those wishing to visit the event. The French paid $36,000 for a 120 workmen (two from each major trade) to attend the Philadelphia Exhibition as delegates. The money was raised by the Paris Municipality, the Chamber of Commerce and from other sources. Their endeavours were celebrated in print by Louis Blanc and Victor Hugo. [33] The Brazilians also recognised that exhibitions acted as an incentive for the development of industry and were equally keen to extract as much from them as they could. [34] Their government provided assistance for individuals wishing to go

to Philadelphia. [35] Even countries such as Japan and Sweden offered subsidies to those wanting to attend the event. [36]

In total the Centennial Exhibition attracted 30,000 exhibitors from over fifty different nations. Some believed that the quality and diversity of produce they displayed would convince American consumers of the good things which were beyond their reach because of tariffs, thus challenging the assumed benefits of '...duties for protecting native manufactures...' [37] There was evidence that gave this belief credibility. The various Paris exhibitions (particularly 1855) were instrumental in altering French protectionist tendencies and at the time there was no reason to suggest that America would be different.

Reaction to the Philadelphia Exhibition (1876)

The Centennial Exhibition helped to address the difficult question surrounding the relationship between America and Europe. [38] When the Philadelphia event was first proposed many in Congress doubted if American had anything worthwhile to show to other nations. Post contends that they were probably thinking about their lack of venerable traditions and painting by old masters but, he argues that they had something more important to display, the nation. [39] A new image of United States was created by the exhibition and transmitted around the world. It was characterised as a vibrant and vital country. The Times proclaimed that in '...felicity and fecundity of invention, in audacity of enterprise and persevering energy the Americans show themselves at Philadelphia among the foremost, if not the first.' [40] This superiority was not only evident in the special goods it manufactured but was also found in mass produced items. Great care and attention to detail was paid by workmen who, at every stage undertook their work with '...intelligence and with zeal...' [41] The three volume British report on the

exhibition concluded that American acuity would, despite British money, inevitably lead to industrial pre-eminence for the United States. [42] The French in their own report also came to the same conclusion. The Germans acknowledged the superiority of their hosts in Philadelphia. They believed that the quantity and quality of American production had been raised by the intelligent use of machine tools. In contrast, Franz Reuleaux stated that German industry was being tarnished by its addiction to producing cheap and shoddy goods. [43] Perhaps Reuleaux was the German Lyon Playfair.

The degree of political unity that existed in America after the Civil War , as well as superior intellect and education, was considered equally important in the rise of the United States. [44] The new world appeared to be superseding the old and The Times urged that this phenomenon deserved '...the closest attention of those who are interested in the future well being of the nation...' [45] The ensuing debate was not extensive or wide spread but it did focus in part on those issues raised in 1867. However, a new element was introduced into the discussion. For the first time since 1846 Free Trade was being attacked. The Times believed that British energies had often been wasted and, chances were '... thrown away under the strong delusion of a false but plausible economic theory...' [46] The movement to introduce protectionist legislation was gaining in strength, indicating how seriously some regarded the threat of competition from aboard.

THE PARIS EXHIBITION (1878)

The event

After the ravages of the Franco-Prussian War and the loss of Alsace-Lorraine the government of the Third Republic was anxious to use every opportunity to restore the country and its trade. The effect of the war had been profound. In its wake

political ascendancy had been transferred from France to Germany, thus breaking a pattern that had been established for two centuries. [47] The French government regarded holding an exhibition as an ideal opportunity to show foreigners and the home population that the recovery from the war and the commune was complete. They were keen to use it to re-establish their international reputation. This was a bold gesture considering that the estimated cost of the event was thirty two million francs, which the State could ill afford to pay. [48] However the exhibition could not restore broken relationships although some claimed it could. The German government refused to send any official exhibitors or exhibits and implemented similar restrictions on private citizens. [49] Despite these difficulties the central theme of the exhibition was peace and the plans for it generated excitement and cynicism in equal measure. The Times was certain that international exhibitions had '...not the slightest effect on checking the tendencies which break out in war, and sometimes culminate in ruin.' [50]

John Fernie, a Member of the Institute of Civil Engineers and French resident noted that the preparations for the 1878 exhibition were extensive and full of promise. He stated that he had seen

> ...all the great Exhibitions, beginning with 1851, except the Vienna one, and served on the Mechanical Committee of our own in 1862, and I think that, so far as the plan on which it is built and its appointments go, this promises to be one of the most perfect. [51]

He also predicted when the attention of the world was drawn to Paris an opportunity would again be provided to test '...what country, what nation stands pre-eminent in its art and manufacturing.' [52] His fellow countrymen in Britain believed that Paris would enable them to both show the world what advances they had made and indicate to their workforce

> ...what there is yet to be done. Others have not been sleeping because we have been active, and the unceasing energy of the human fancy has fresh trophies with which to surprise us. [53]

The exhibition was divided into two unequal parts by the river Seine. The principal site was located on the Champ de Mars. The subsidiary site was on the other side of the river on the Trocadéro hill, already famous for its fountains. They were connected to each other by means of an open iron bridge. Those who were familiar with the huge oval structure of the 1867 exhibition would have been surprised to find plans to cover the whole of the enormous area of the Champ de Mars (except a small space near the river devoted to a garden) in a series of sheds of various widths, running from the Seine to the Ecole Militaire. These buildings were constructed in masonry and covered with strong iron roofs. At each end of the sheds a large hall was

> ...built transversely to them, and those form entrance halls to the different departments. Iron towers of an ornamental character are being fixed at these entrance halls, and they being most economically but effectively decorated by means of large plaques of ornamental plasterwork, which are cast in huge molds and then hoisted up and fixed between the iron ribs of the roof. [54]

The main exhibition building on the Champ de Mars site (over 53 acres) was rectangular in shape, decorated with statues and bisected by two uncovered walk ways. Gustave Eiffel was partly responsible for many of the key features of the structure. [55] It had no similarity to the vast cathedral like edifices that dominated at other events. [56] It was designed to be more like a village or a city.

The buildings were generally divided into four categories, administrative and official, foreign annexes and pavilions, French mechanical industry and places for refreshment. In the central courtyard was the Rue des Nations where exhibitors were allowed to construct an array of the frontages of houses reflecting national character. The English contribution was a half timbered, terra cotta town house. [57] They also chose to build a heavy black and white Tudor palace style for their

national pavilion. [58] The Machine Hall was designed by a French engineer, Monsieur De Dion, who died just before the opening of the exhibition.

The Palais de Trocadéro, located on the subsidiary site, was a white brick and stone structure consisting of a rotunda supported by columns and crowned by a dome and was flanked by two loft towers. A semi-circular colonnade extended from each side of the building. A flight of steps emerged from its base and a cascade of water poured down them on Festive occasions. It was described by Greenhalgh as a '...flamboyant piece of eclectic styling ...' [59] The Trocadéro overlooked one of the most commanding and beautiful in views in Paris and was purported to be a great attraction to the ordinary sightseer

> ...with its picture galleries, concerts, aquarium, fountains, cascades and rockeries. It was noted that they were '...conceived in the best French style and are being executed with the most perfect taste and skill.' [60]

It was also built as a lecture and concert hall '...to receive within its walls the members of the numerous learned societies and industrial congresses who propose to assemble here during the exhibition period...' [61] Accordingly it was used as a location to hold over 30 specialised international conferences and became a unique meeting place for agencies such as the Red Cross, the Universal Postal Union and the International Bureau of Weights and Measures. [62] The opportunity to hold meetings that enabled the scientific, economic and industrial questions of the day to be examined by delegates from many nations was one of the most interesting features of the exhibition. [63]

The Paris Exhibition opened at 2 p.m. on Wednesday May 7 th by the President of the French Republic, the Duke of Magenta, Marshal MacMahon, in the presence of a large assembly of distinguished visitors including the Prince of Wales. Education was given a high profile at the event and even featured as a

conference theme at the Palais de Trocadéro. [64] This was a relatively new development. It had no place in Great Exhibition and only began to emerge as a separate category in Vienna in 1873. [65] A number of countries prepared education exhibits including the Russians, who sought to demonstrated the improvements they had made to their system, particularly in technical education. [66] The English contribution was more prosaic. The School Board Chronicle claimed that it could best be described as plain with a notable absence '...of the strange fancies and eccentricities of educational theory and practice which may be seen in some foreign courts...' [67] It was probable that they neglected to take it seriously as an exhibition theme because of the novelty. However, The Times stated that it would be a great mistake if England

> ...so flattered herself or considered that that she had no interest in taking part in an educational exhibition. No such exhibition would we trust, take place in future in which England would not take her proper place. They had to remove a great reproach and to repair the neglect of generations. [68]

The British commercial exhibit represented a significant presence in the main building. It was by far the biggest foreign display. [69] The Indian court alone covered 20,000 sq. feet and cost of £3,278. [70] It was suggested that Paris was an important opportunity for British manufacturers to show the world that they had '...not fallen behind the position they once occupied...' [71] More than 1,500 exhibitors responded to this challenge, coming from all parts of Britain. [72] There were 530 who manufactured machines, 292 from the textile industry, 244 from the furniture trade, 241 representatives from mining industries, 208 from education and the liberal arts, 98 involved in alimentary products and 25 from the world of horticulture. This led to some classes of exhibit being over subscribed whilst others such as class 7 (Organisation and Appliances for Secondary Education) had little representation. There were 32 entrants in the

brewers class, 108 in mining and metallurgy, 89 in chemical and pharmaceutical products, 81 in civil engineering apparatus, 79 in machines and apparatus, 69 in woollen yarn and fabrics, 68 in agricultural implements and 44 in clothing. The Illustrated London News boasted that English preparations had been extensive and among foreign countries it stood '...foremost, both for the extent and excellence of its productions.' [73] The British section was overseen by a Royal Commission specially constituted for this event. It was not a traditional Commission but followed in the wake of the one established for the Great Exhibition by Prince Albert. It had a diverse membership including :

Advocates of technical education

Lyon Playfair, A J Mundella and Henry Ripley who had been associated with the issue from the earliest times.

Politicians

Charles Robert Barry Q.C. (1824-97), Liberal M.P. for Dungarvan (1865-68) and Lord Justice of Appeal for Ireland (1883-97).

Joseph Chamberlain (1836-1914), Mayor of Birmingham (1874-76), chairman of the Birmingham School Board and the National Education League, president of the Board of Trade (1880-85), Secretary of State for the Colonies (1895-1903) and Liberal M.P. for Birmingham (1876-85) and Liberal Unionist M.P. for West Birmingham (1885-1914).

George Victor Drogo Montagu, Eighth Duke of Manchester (1823-90), Conservative M.P. for Huntingdon between 1877 and 1880.

Samuel Morley (1809-1886), Liberal M.P. for Bristol (1868-86) and member of the London School Board (1870-76).

George Leveson-Gower, Earl Granville (1815-91) a prominent politician and manipulator of British foreign policy who spoke French like a Parisian and played a significant part in promoting the Great Exhibition.

Industrialists

Sir Isac Lowthian Bell (1816-1904), ironmaster, coalmine owner and scientific author who was President of the Iron and Steel Institute (1873-74) and M.P. for Hartlepool between 1875 and 1880.

Hugh Birley (1817-83), manufacturer and Conservative M.P. who sat for Manchester between 1868 and 1883.

Sir Andrew Fairburn (1828-1901), chairman of a Leeds machine making company, a magistrate and Deputy Lieutenant of the West Riding of Yorkshire and M.P. for Yorkshire between 1880 and 1886.

William Holms (1827-83), partner in a textile company with factories in Glasgow and London and M.P. for Paisley (1874-83).

Sampson S Lloyd (1820-89) manufacturer, chairman of Lloyds Bank and M.P. for Plymouth (1874-80) and Warwickshire (1880-85).

Prominent individuals

Philip Sidney the Lord de l'Isle and Dudley (1828-98) officer in the Royal Horse Guards

Sir Alfred Horsford (1818-85), soldier who fought with distinction in India and was made the secretary at the Horse Guards between (1874-80).

Admiral Sir Alex Milne (1806-96), admiral of the fleet in 1870 and member of many commissions including those associated with the 1851 and 1869 exhibitions.

Sir John Rose (1820-88), statesman and financier of Canadian origin who served as a member of the royal commissions on copyrights in 1875 and extraditions in 1876 and for the Fisheries, Health and Colonial and Indian exhibitions between 1883 and 1886.

Thomas George Baring the Earl of Northbrook (1826-1904) held various posts in the Admiralty, the Board of Trade, Home Office and the India Board and became First Lord of the Admiralty (1880-85), the Lord Provost of Edinburgh and the Lord Mayor of Dublin.

Merchants

William Rathbone (1819-1902) Deputy Lieutenant for Lancashire and Liberal M.P. for Liverpool (1868-80), Carnarvonshire (1880-85) and Arfon (1885-95) was a typical of this group.

Artist

William Calder Marshall (1813-94) a member of the Royal Academy who was appointed chevalier of the Legion of Honour in recognition of his work as a Commissioner in 1878 was also asked to participate.

Collectively they had many duties including controlling how the £50,000 allocated to the exhibition was spent. Out of this they committed only £100 to assist English citizens to visit Paris. There were many request to augment this sum but Lyon Playfair (Chairman of the Finance Committee) was adamant that it could not be increased. He pointed out that funding had significantly diminished since 1867, when Parliament had voted £130, 000 and argued that prudent management. was necessary. [74] However, Sir Henry Selwin Ibbetson (under Secretary of the Home Department) stated that workmen would be officially allowed to take time off from their employment to visit the Paris Exhibition. [75]

Even though attendance reached 16 million, and despite remaining open for nearly seven months, the exhibition was a financial disaster. [76] The Minister of Commerce stated that the cost was equivalent to 43.3 million francs, which was approximately 25% more than the original projection drawn up two years earlier. Total receipts were estimated to be 34.5 million francs. This comprised 14 million francs from the sale of buildings in Champ de Mars, 3, million francs for the purchase of the Palais de Trocadéro by the City of Paris, 3.5 million francs from the sale of refreshments and 1 million francs from concerts in the Trocadéro. [77] However, despite this difficulty and even though German participation was limited, the accolades bestowed on Paris were many. The Times claimed it a was the most comprehensive event ever and that the French '...had come to understand that Empire or Republic she must rely upon the cultivated intelligence of her people. [78]

Reaction to the Paris Exhibition (1878)

Details of the Paris event were recorded for the British public in a number of different ways. Selected artisans were sent by the Council of the Society of Arts to France to report on various aspects of the event including the sections containing pottery, glass, art workmanship, mechanical engineering, agriculture and horticulture, building trades, cabinet work, watchmaking, jewellery and optics, printing, textiles, leather and rubber goods and mining and metallurgy. The Society believed that skilled visitors to exhibitions '.. learn their special lessons which they carry away with them to diffuse among their neighbors and countrymen.' [79] The artisans produced detailed and technical accounts of what they saw, which were published in book form as The Society of Arts; artisan reports on the Paris Universal Exhibition of 1878. The Economist printed a number of articles on the elements of the textile industry that had been displayed

in Paris. [80] They contained accounts of how French designer and weaver had achieved a technical mastery over their materials and processes because they had '...for nearly three generations systematically and continuously educated their foreman weavers and dyers in the application of mechanical and chemical science to their special industries...' [81] They also concluded that '...progress of a most marked and important character is shown in the production of several other countries. [82]

The scale of British participation in Paris may have appeared to be impressive but the exaggerated claims that resulted from it were ill founded. [83] David Walker, in a report for the Society of Arts suggests that the reality was less impressive. He contends that they simply put in an appearance whilst the French and other nations '...put forth their whole strength.' [84] This difference can be partly explained because the British, unlike their foreign counterparts who regarded exhibitions as an opportunity to celebrate industry, still viewed them as a threat similar to that experienced by '...the travelers who exhibit their money-bags or their jewel-cases to populations of professional brigands...' [85] The great capitalists who owned and directed the principal industries of Britain also had little interest in making use of the capacity of exhibitions to test the relative industrial strength of nations. Continued prosperity had made them insensitive to the need for this form of comparison. Yet manufacturing and commerce dominated the French event to such an extent that the small exhibitor, for whom there had always been a place in previous exhibitions, was replaced '...by great Companies and great Firms solicitous of orders...' [86] This new materialism brought into question the potential for exhibitions to spread good practices, promote international cooperation and foster peace. [87] The high ideals generated by the 1851 event appeared to have

been lost. Many commentators were quick to signal this change in print. However, The Times claimed that this kind of retrospective wisdom was

> ...in truth no sagacious at all, as it is certainly not generous. The show in Hyde Park left its mark upon our manufacturers and drew us into closer relations of amity with the nations of western Europe. The exhibitions of 1855, 1862, 1867 and 1878 have been successive steps in the promotion of intercourse between England and France and the friendship between the nations is now so close that we are entitled to believe it would be impossible to stir up the ignorant jealousies and antipathies that so long made each regard the other as its natural enemy. There has been much visiting and going to and fro and this has been in a large measure due to these successive Exhibitions. [88]

The Conservative government was coming to the end of its period in office and was not interested in engaging in the debate. However, British politics during the first half of the decade, beginning with Gladstone's second ministry in 1880, was dominated by the Liberal Party. The Party, which stood for democracy, equality and social improvement, was bound to explore the issue raised by the Paris Exhibition. [89] It did so through the Samuelson Commission.

ROYAL COMMISSION ON TECHNICAL INSTRUCTION (SAMUELSON)

Origins

> 'Seven Commissioners Royal are we
> Who have gone abroad the schools to see
> To learn how they teach the A.B.C.
> And apply it to works of industry
> And all for the sake of our good country [90]

The Royal Commission on Technical Instruction (R.C.T.I.) sprang from a recognition the recurring suspicion that British industry was vulnerable to competition from abroad. [91] The technical educationists had long argued that advances evident in the material on display by foreign manufacturers at a number

of exhibitions (including Paris in 1878) were attributed to better technical education and training available in particular to the American, French and German workforces. Even The Times embraced the notion that the British workman in comparison with his foreign counterpart suffered from a willful neglect of his education. [92] Now a powerful new minority of Liberal Members of Parliament rediscovered the concerns originally raised by Playfair and his colleagues. Despite previous efforts they felt compelled to agitated for more investigation. George Anderson, a merchant and publisher who represented Glasgow in Parliament from 1868 to 1885, was responsible for putting a motion before the House that called for a Royal Commission to investigate the provision of foreign technical and agricultural education. He made plain his feelings about the urgent need for this inquiry in speech to the House of Commons on April 1 st 1881. Anderson stated that the origin of this conviction was partly based on the experiences of a deputation to the Paris Exhibition in 1878 from the Bradford School of Arts who, he said, '...were obliged to confess that the results of the training workmen received in foreign countries was such that we were defeated on all hands...' [93] He also cited what he recognised as the limitations of his own training. He stated that those educated like himself (at Edinburgh High School and St Andrews University) in the pre-scientific era received a classical education or nothing at all. It was a commonly held that such an education was suitable for anybody '...and that if that did not succeed in bringing out a young man's brains nothing else would do...' [94] In contrast Anderson believed that '..a great many of those who in youth were pronounced dunces at the school turned out to be the most capable men in the practical business of life...' [95] This was despite the fact that their training in business might have begun with them being sent to sweep out the offices. [96] He complained that education was still largely based on voluntary efforts despite the recent attempts to implement a national primary

system. Foreigners, in contrast, appeared to readily accept the limitations of their own education systems and made great efforts to remedy the deficiencies. [97] Anderson warned that his fellow countrymen

> ...would have to do a great deal better yet, because on the Continent, not only was primary education national, but technical science was national. They were supported by the States and Municipalities; and unless they copied the Continental system they would not be able to carry out the work as it ought to be done. [98]

He firmly believed that every career required some form of specialist training including, where appropriate, scientific instruction. [99] A tangible result of the neglect of this at home was that foreign engineers, draughtsmen, designers and foremen dominated life in English factories. [100] Educated American machine makers who readily embraced new technologies, now had the ability to come to Britain, buy steel or iron, carry it across the water, pay 33 per cent for bringing it into America, pay higher wages, and carriage back to this country and yet undersell the manufacturers here. [101] Anderson suggested that Parliament should investigate of the balance of trade figures. He believed they would indicate a disturbing trend that he and others had warned about. They would, he contended, reveal that

> ...our exports of manufacturers were diminishing enormously in those very articles which technical education would improve, while at the same time, our imports of the same articles were increasing. [102]

He noted that between 1872 and 1879 British manufacturing exports decreased by 25 % from £256,257,000 to £191,531,000. [103] He was adamant that the central driving force behind the development of foreign industry and apparent decline of British industry was the superior technical education given in other countries. [104] He recognised that information on this issue was readily available

but felt that a further public inquiry would bring it to the attention of the general population. [105]

This was an interesting speech, even though it did not extend or add any new insights to those already identified by the technical educationists in 1867. However, the fact that the request to Parliament was made by someone not directly related to earlier investigations was significant. It meant that the issue of technical education was being adopted by new and powerful converts. Robert William Cochran-Patrick, who sat for North Ayrshire from 1880 to 1885, believed that it was of the utmost importance that manufacturers should know about the state of foreign industry in relationship to their own and be able to identify what factors influenced their success. [106] He went further by adding that the appointment of a Royal Commission in itself

> ...would attract the attention of the country to those important matters; and the evidence which the Commission would have it in its power to put before the House in an accurate, authentic, and authoritative form, would constitute a most perfect basis for consideration, and if necessary, for future legislation. [107]

Cochran-Patrick pointed out that at the Paris Exhibition in 1878, which he claimed was the last great opportunity for undertaking international comparisons, those with the necessary ability to draw meaningful conclusions were convinced that British industrial progress was not satisfactory. He argued that it would be interesting '...to ascertain, by means of the Royal Commission, the cause of this state of thing...' [108] He strongly encouraged parliament to accede to Anderson's call for a public enquirey.

A. J. Mundella, one of the original proponents of technical education, was now Vice President of the Committee of Council on Education. His concern for this cause, possibly renewed by his experiences a juror at the Paris Exhibition in 1878, was well known. He was intimately aware of the importance of making reasoned

judgments about this issue. The hosiery trade in Nottingham, in which he had a commercial interest, was subject to a vigorous challenge by manufacturers from Chemnitz in Saxony whose competitiveness had been improved by technical education. [109] It was Mundella's responsibility as a member of the government to respond to the Anderson request. He was not convinced that

> ...technical education requires to be bolstered up by arguments directed to show the decadence of British manufacturers. For my part I do not believe in the inferiority or the decadence of British manufacturers. [110]

He questioned the value of the statistical data provided by Anderson, whom he felt had gone too far in trying to advance his arguments. He believed that exports had been at an unprecedented all time high and if there was a problem it was only the result of a minor fluctuation. He stated unequivocally that if there was

> ...any nation in the world that has to depend for its progress, and almost for its existence, upon its manufacturing industry and commercial spirit, it is this country of ours. [111]

He was aware that in the race between competitors Britain could ill afford to lose a single point and it was of the utmost importance that science '...be applied to maximizing the use of its resources in order to maintain manufacturing and commercial superiority...' [112] He added that

> ...for a long time I was like kicking at a dead horse, and even at this moment the value and importance of technical education are hardly understood and realized by our countrymen generally. It is hardly realized in this House what and important influence it has already exercised upon the manufacturing industry of other nations. [113]

However, Mundella rejected the notion, contained in the Anderson speech, that technical education should be given to the whole of the working classes. It was an impossibility and ought never to be attempted. He believed that you could only '...place technical training within the reach of those who possess the natural talent

to use it and apply it...' [114] In summarizing his feelings he suggested that it was not necessary to

> ...appoint a Royal Commission to visit the various technical schools all over France, Belgium, Germany, and Switzerland-because, to appoint a roving Commission to travel all over Europe, would be very expensive and, I think a needlessly tedious process. [115]

As an alternative he hoped to persuade his friend

> ...the member for Banbury [Samuelson] once again to take up this work, and associate with himself two or three other gentlemen representing the various manufacturing industries of the country, I believe that the greatest possible advantage to the country would follow their labours...[116]

He promised the help of the Foreign Office, the Science and Art Department and assistance of a paid secretary to whoever participated in this scheme. In justifying this stance Mundella boasted that '...what Englishmen do for themselves is better done than what a Government does for them...' [117]

He was completely satisfied that as a result of this voluntary effort Parliament should have before it

> ...as complete a statement of what is being done, how it is done, and the advantages which are derived from doing it by Continental nations as we could possibly obtain from the best Royal Commission we could appoint...[118]

Bernhard Samuelson, perhaps mindful the call for volunteers observed that

> ...although he could not agree with all the reasons advanced by the hon. Member for Glasgow in favour of appointing a Royal Commission, he believed that the work of such a Commission would be of considerable service to the country. On the other hand, he differed almost entirely from the hon. Member as to the decadence of English manufacturers...[119]

Sir John Lubbock [120] in summing up the debate commented that

> ...they had much to learn, both as the to the kind of technical education which should be given, and the best system of giving it. Upon that point, also, information from abroad was most desirable. [121]

Several months later (25 th August 1881), despite Mundella's doubts, the Royal Commission on Technical Instruction was formed to

> ...inquire into the Instruction of the Industrial Classes of certain Foreign Countries in technical and other subjects for the purpose of comparison with that of the corresponding classes in this country; and into the influence of such Instruction on manufacturing and other Industries at home and abroad. [122]

It also had the difficult task of finding a substitute for the apprenticeship system which Mundella and others including Henry Broadhurst were convinced '...had finally broken down...' [123] Henry Broadhurst, was a Liberal M.P. and one of the few truly working class individuals to reach high political office before the emergence of the socialist party. [124]

Personnel

Samuelson was asked to undertake the role of chairman and his fellow appointees were Henry Enfield Roscoe, Philip Magnus, John Slagg, Swire Smith and William Woodall. He probably decided the membership of the Commission with the help of his old associate Mundella. [125] Gilbert Redgrave was seconded from his post at the Science and Art Department to act as secretary to the Commission. [126]

Philip Magnus (1842-1933) was the son of Jacob Magnus, a Jewish wine merchant from Chatham. He was born and raised in London, attended University College School and subsequently the Gower Street College (University College) where he read Arts and Sciences. He graduated with a First Class Honours degree in 1863 and furthered his scientific studies in Berlin until 1866. On his return to England he became a minister at the Reform Synagogue in Portland Place and a

member of the Senate and Fellow of London University. In 1880 he was appointed as the secretary and organising director of the City and Guilds Institute, a post he held for 35 years. He was elected as the President of the College of Preceptors, Chairman of the Secondary Schools Association and Member of the Council of the Royal Society of Arts, knighted in 1886 and made a baronet in 1917. He was a member of the London School Board (1890-91) and a Justice of the Peace for Surrey. He was a Unionist who sat for London University from 1906 until he retired in 1922. Magnus has been referred to by Frank Foden as '...splendidly Victorian; virtuous, optimistic, enthusiastic and industrious...' [127] The City and Guilds Institute was keen to allow Magnus to act as a Commissioner because of the invaluable experience he would gain from his involvement.

Henry Enfield Roscoe (1833-1915) was a native of London and the son of barrister and grandson of the historian William Roscoe who wrote the Lives of Lorenzo de Medici and Pope Leo X. He maintained a lifelong connection with University College London where he was educated. He graduated with a BA in chemistry in 1853, taking the prize for science and also studied under Robert Bunsen in Heidelberg for two years. He received honorary degrees from the Universities of Cambridge, Dublin, Heidelberg, Montreal and Oxford. He became Professor of Chemistry at Victoria University (Owens College) Manchester in 1857 and held the post until 1886. In Owens College he applied the German approach to scientific studies known as Wissenschaft that involved analytical thinking, dedication and patience. He wanted his students to expand the boundaries of science. [128] He published a number of books including Elementary Chemistry, Lectures on Spectrum Analysis and a Treatise on Chemistry and many other works, some of which were translated into various European and Oriental languages. In 1887 he was to become President of the British Association meeting in Manchester. He sat for Manchester South (1885-95) as a Liberal member of

Parliament and was characterised as a Home Ruler who opposed the maintenance of a State Church. His other significant achievements include becoming a member of the Senate of London University, a contributor to the Royal Commission for the Scottish Universities, Vice Chancellor of London University (1896-1902) and Privy Councilor in 1902.

John Slagg (1842-89) a Manchester Liberal who was noted for his support for Gladstone's Irish policies. He was elected Member of Parliament for Manchester (1880-85) and for Burnley (1887-89). Slagg was a cotton magnate and president of the Manchester Chamber of Commons who accompanied Cobden on his mission to Paris in 1860 to establish tariff free trade between England and France. He served as an Administrator of the Suez Canal and was dedicated to the notion of Free Trade. He took every opportunity to promote it stating

> ...how can it be urged that there is any better method of raising revenue and increasing trade than by giving to commerce the utmost freedom, is to me incomprehensible. Indeed, instead of more duties being required, we stand in need of greater exemption from them, nor can we justly describe ourselves as a Free Trade country so long as we continue to raise half our revenue from Customs and Excise...[129]

He also believed that '...in order to secure the maximum efficiency for production, workpeople should attain and maintain the highest possible state of social, moral, intellectual and physical well being...' [130] He suggested that restricting the hours people worked would make this state achievable.

Swire Smith (1842-1918) was educated privately and at Wesley College in Sheffield. Elected Liberal Member of Parliament for the Keighley division of the West Riding of Yorkshire in June 1915, a seat which he held until his death in 1918. He wrote many pamphlets and articles on technical education and free trade and was credited with the vision and imagination which 'inspired much of the thinking of the eighties and nineties in the field of technical instruction...' [131]

His business activities included woollen manufacturing and he had a long association with the Yorkshire Union of Mechanics Institutes. He was to serve as Vice Chairman of the Royal Commission on International Exhibitions which sat from 1909 until 1912. The Clothworkers company made him an honorary freeman of in 1886 and its Warden in 1914. He received an honorary Doctor of Law from Leeds University in 1912 and was also a Justice of the Peace. He was the youngest Commissioner and was given a subsidy of £100 from Bradford Chamber of Commerce towards his expenses.

William Woodall (1832-1901) who was a Liberal and Home Ruler in favour of extending the franchise on suitably qualified women, disestablishing the Church from the State and a veto on the licenses of victuallers by local inhabitants. A member of Parliament for Stoke -on Treat 1880-85 and for Hanley from 1885 until he retired in 1900, he also served as a Justice of the Peace for Staffordshire, chairman of the Sneyd Colliery Company and the Wedgwood Institute Committee. He contributed to the Royal Commission for Inquiring into the Blind, Deaf and Dumb and presided over the Municipal Corporation Association and the North Staffordshire Association of Mining and Mechanical Engineers. He was later appointed a Chevalier of the Legion of Honour and Surveyor General of Ordinance (1892-95). Smith, Slagg and Woodall were all in Cobdenite in outlook but by the same token were converts to idea of more aggressive methods of foreign trade and hence technical instruction. [132]

Magnus was given the task of recording the organisation and curriculum of the schools the Commission visited. Roscoe was asked to investigate higher education and research. Industry was dealt with by Swire Smith and William Woodall. The copious notes made by Smith were used as the basis for the foreign reports compiled by the Commissioners. Samuelson had responsibility for editing all the material collected by his colleagues. Each Commissioner was asked to meet his own

expenses. The Government, in line with the thoughts expressed earlier by Mundella, was only prepared to pay for a secretary and meet the cost of the printing. [133] Snowden suggests that this meanness indicates how little the House understood the scale task they were asking the Commission to undertake. He states that Parliament

> ...had so little sense of it that these men, if they wished to prove their foresight good, could only do so by a sacrifice of time and money which he, for one might find ruinous. [134]

The cost to each Commissioner was significant. Swire Smith made four journeys on the Continent '...and was to be led into a trip to the United States, moreover, during four years he travelled on this business incessantly in England, Scotland and Ireland...' [135] Despite this obstacle Foden claimed that few of the 350 Royal Commissions sitting between 1839 and 1900 could have had such an interesting and enjoyable time. [136] Roscoe provides evidence to support this viewpoint. He states that every where they travelled abroad they received the greatest hospitality and kindness even in the commercial and industrial centers. [137] Even the wife of Philip Magnus, Katie, travelled with the Commission on some of their foreign trips (particularly to Austria). Harry Furniss, a Punch illustrator also accompanied them as an unofficial artist. [138] At the end of their travels various Commissioners, particularly Samuelson, isolated themselves in the countryside to undertake difficult and tedious task preparing the reports.

Witnesses

The number of witnesses the Commission examined was considerable. By their own admission they valued the opinions gathered from the many countries they visited, a fact which is attested to by the relative space accorded to the reports from abroad. However, it was the views of home grown witnesses that had the greatest

impact on them. For the first time significant numbers of all those with a vested interest in technical education were consulted. Some including Donnelly, Huxley and Islen had appeared before a number of previous inquiries. In total Samuelson and his colleagues sought the testimony of nearly eighty individuals from England. They were composed of thirteen artizan/skilled workers drawn from a number of commercial areas including one from printing, two from pottery, one from cabinet making, one from carriage building, one from bricklaying, three from metalworking, one from tailoring, one from shoemaking and one from glassmaking; nine manufacturers and managers including from two from general industry, one from iron, two from pottery, two from textiles, one from printing and one chandelier makers; two from Mechanics Institutes; five members of industrial organisations representing one from mining, one from house decorating, one from glassmaking and two from mechanics; fifteen from educational agencies including seven from schools of art, three from colleges, four from school boards, and one from the inspectorate; four agents of the City and Guilds; eleven from the university sector including two professors of chemistry, one from engineering, one from manufacturing, one from natural philosophy, one from physics, one from art and two workshop supervisors and a secretary; two lecturers; three engineers; four from the Science and Art Department; two designers; one museum director and two local politicians. However, the evidence presented to the Commission was distorted because the city of Sheffield and University College had a disproportionate number of representatives amongst those called to testify. The lack of novelty in the investigation was emphasised by the fact that witnesses with industrial connections were drawn from very old established trades. New ones were completely ignored.

The material the witnesses provided was contained in the Minutes of Evidence in Volume Three. Albert A. Jowett, a master cutler from Sheffield summed up the views of those from the artizan class who were convinced of the need for

technical education when he commented on the establishment of the Commission by stating that he was glad that the Government were

> ...really taking this to heart. In our own works at the present moment we are making crucible cast steel as our grandfathers made it. We know by mixing certain brands of iron with certain preparations of carbon we can and do produce a certain effect. The finest steels in the world are made in Sheffield at this moment but we do not know why it is. We do it but it is really by rule of thumb. [139]

He went on further to explain that generally an older foreman superintending the mixing and melting had made steel all his life by rule of thumb and it had served his purpose. It was therefore unlikely that this foreman would believe in technical education but his son, who wanted to consistency of production, probably did. [140]

H. R. Paul, a cabinet maker was convinced that British manufacturers were still equal to their foreign counterparts. He used his experiences at the Paris exhibition to point out that an English company, Messrs. Jackson and Graham received the gold prize for furniture making. However, he indicated that new employment practices underpinned this award. The winning article had been designed by a Frenchman, the marqueterie was cut by a German and the cabinet making was done by a Dane accompanied by another German. [141] Was this an indication of the emergence of new industrial reality, one dominated by internationalism in which the British were rich enough to employ the best artisans regardless of their origin, or a sign of weakness?

August Umbach, a London tailor believed the foreign practitioners of his craft were better than those found in England. He argued that the difference was due entirely to a lack of scientific principles employed in his trade [142] On the continent shifting fashions had accelerated change and the application of new techniques but in England tradition stifled innovation. [143]

T. C. Barnes, a glass worker and general secretary of the Glassmakers Association believed that artizans working in the glass industry in Germany had a thorough education, involving technical and scientific instruction. He was in no doubt that the result was a more productive and profitable trade. [144] C. J. Woodward, a lecturer in chemistry and physics at the Birmingham and Midland Institute believed that chemists working in industry would make willing and competent part-time teachers but trade jealousies would interfere with such an initiative. [145] Giovanni Cucco, a civil engineer trained at the Royal Polytechnic for Civil Engineers in Turin came to England, partly at the behest of the Italian government, to explore its industrial resources and institutions. He wanted to base his researches on practical experiences which he could report on when he returned to Italy. Few workshops would accept him on this basis because of the prevailing attitudes towards foreigners and he was forced to work as a labourer with Great Eastern Railways making locomotives. He subsequently went to work as journeyman for Platt Bros. who made equipment for the textile industry and sent him to France to install new machinery. The Commission acknowledged that he was uniquely placed to comment on the state of British and foreign industry and sought his opinions on a range of topics. He was in no doubt that English workshops were superior to those found abroad but had rather curious attitude to labour saving devices. He believed that they diluted the practical skills of new initiates to the engineering profession. [146] However, he regarded the young foreign workmen more highly than those in English because they generally displayed superiority in the handling of formulae, sketching and the technical knowledge of his trade. [147] Cucco believed that English engineers depended on instinct and experience too much rather than theoretical understanding. This led to over engineering products with little regard being paid to weight saving and efficiency. [148] He was persuaded that technical knowledge was required by mangers and

proprietors and also that the ' ...more intelligent are the workman you have, the greater are the advantages you will derive...' [149]

Many references to both the Philadelphia and Paris exhibitions were made in the evidence presented to the Commission by English witnesses. Henry Mitchell, a Bradford manufacturer and merchant was convinced that sending artisans to international exhibitions helped to spread new ideas and influence working practices. The information they gained from their visits was included in various publications and had a demonstrable impact on all those who read it. The material helped to generate a very strong collective wish that the Government '...would help technical education, as it now does elementary education in science and art...' [150] George Hooper, a London carriage builder held similar views to those of Mitchell. He had participated in official capacity at exhibitions since 1855 and regarded them as a good point of comparison for various trades. [151] When canvassed by his colleagues about how to improve their calling he had no hesitation in suggesting that they send their workmen to international exhibitions. [152] Mitchell and Hooper were continuing a tradition, established by the Society of Arts over a number of years, of sending artisans to exhibitions to develop and disseminate new ideas. Sir Philip Cunliffe-Owen, director of the South Kensington Museum believed that the gains made by British furniture and pottery industries over their competitors from other countries was clearly demonstrated in both America and France. He cited the experiences of porcelain manufacturers who achieved great honours for their efforts at the Philadelphia Exhibition of 1876. He also felt that great progress made glass manufacturers exhibiting in Paris was clear for all to see. [153]

The Reports of the Samuelson Commission

Samuelson and his colleagues produced a voluminous amount of material over a three year period. It contained two Reports. The short First Report concentrated on the instruction of what was euphemistically called the industrial classes in France and Northern Italy. France was of particular interest because of the recent changes in French law regarding public instruction and the subsequent controversies it aroused. The material gathered was analysed using the same criteria as the Select Committee on Scientific Instruction. [154] The Report contained only sixty two pages and was published very soon after the investigative work had finished. [155] Samuelson explained his anxiety to make public the findings of the Commissions, stating that they should have refrained from making any report at such an early stage had they not

> ...thought it advisable to show, how great has been for some time and how much more strenuous than ever now, the endeavour on the part of the French nation to supply the defects of their system of elementary education...of the working population as well as to place within their reach increased opportunities for technical education...[156]

The Second Report was divided into five volumes. Volume One was subdivided into five parts. Part one was 218 pages in length and concentrated on technical education on the continent and began with a brief account of primary and secondary education in France, Switzerland, Germany, Austria, Belgium, Holland and Italy. It contained descriptions of visits to 112 special trade and technical schools including those providing education for artizans and apprentices, the building trade, mechanical engineering, weaving, mining, metallurgy, industrial art and those providing education for pupils and students studying technical subjects in the higher elementary secondary, higher and polytechnic sectors. The Commissioners also paid much attention to schools that had the facility to offer education in the evening. They visited or received reports from French cities of

Amiens, Chalons, Croix, Douai, Guebwiller, Lille, Limoges, Lyons, Rheims, Roubaix, Rouen, Sarreguemines, St Etienne and Toulouse; the Swiss cities of Basle, Winterthur, Zurich; the German cities of Aachen, Barmen, Berlin, Bochum, Bonn, Chemnitz, Coblentz, Cologne, Crefeld, Dresden, Dusseldorf, Elberfeld, Freiberg, Gladbach, Hanover, Heidelberg, Hohr, Iserlohn, Meissen, Mulhouse, Munich, Nuremberg, Remescheid, Reutlingen , Strassburg and Stuttgart; the Austrian city of Vienna, the Belgian cities of Antwerp, Brussels, Ghent, Liege, Louvain, Maestricht, Nismes and Verviers; the Dutch cities of Rotterdam and the Italian cities of Biella, Como, Milan, Udine, Turin and Venice.

Part two of this volume contained 145 pages and focussed upon accounts of visits to factories and industrial concerns involved in cotton spinning, wool and worsted manufacture, the production of silk, weaving, dyeing, engineering, machine making, the production of turbines, calico printing, paper, water wheels, hosiery, glove making, electrical engineering, iron industries and zinc works.

Part three contained 110 pages, recording the visits made by the Commissioners to institutions in various cities in Britain including London, Oxford, Cambridge, Manchester, Liverpool, Oldham, Barrow in Furness, Birmingham, Leeds, Sheffield, Bradford, Keighley, Saltaire, Nottingham, Bristol, Bradford, Kendal, Glasgow, Edinburgh and others in Ireland. Elementary schools, teaching in Science and Art Department and City and Guilds classes, Mechanics Institutes, Museums, technical and polytechnic schools, universities, evening classes, schools of art and grammar schools were examined.

The fourth and most important part containing 34 pages, which summarised the conclusions and recommendations of the Commission, placed emphasis on the lessons derived from the Paris Exhibition in 1878. The display of continental manufactures in France , it stated, led to an expectation of great progress but

> ...we were not prepared for so remarkable a development of their natural resources, nor for such perfection in their industrial establishments; as we actually found in France; in Germany; in Belgium and in Switzerland. Much machinery of all kinds is now introduced abroad equal in finish and in efficiency to that of this country, and we found it in manufacturers with as great a skill and intelligence as with us. [157]

On their trips abroad they had seen numerous examples of enterprise, vigour and business efficiency. [158] They concluded, as Playfair had done in 1867-68, that the success they observed in a number of manufacturing establishments, engineering workshops, and other businesses could not have been achieved without a system of high technical instruction in schools, the facilities for carrying out original scientific investigation and a general appreciation of the value of both by the wider community. [159] They also found that the sums of money provided for education on the Continent by the state and the municipality were far in excess of those applied in Britain. [160] Samuelson discovered that the difference was at its most acute in Switzerland. An elementary school in Zurich could rely on funding equivalent to a unit cost of £66 per pupil whereas in England a similar school operated at £12 per pupil. Evening classes were also widespread. This led the Commissioners to conclude that there was no doubt that

> ...the instruction thus given, is already exerting a considerable influence on the capacity and intelligence of the workmen, and that this influence will be increasingly felt in the future. [161]

The Continental attitude towards general education was best summed up by a German manufacturer who was often quoted by Henry Roscoe. He said that as a poor nation

> ...we cannot afford to throw away our money; but we are quite convinced that not only is the money well spent on technical instruction and education, but that it repays the country tenfold. [162]

The return that this anonymous individual spoke of was generated through the creation of profitable new industries by chemists and engineers trained at the

expense of the State. Samuelson and his colleagues were convinced that German organic chemists would soon become world leaders in their field. [163]

Despite the attractive nature of what they had seen abroad the Commissioners warned that the imposition of a foreign solution to solve the problems associated with the spread of technical education in Britain was not advisable. [164] This caution was partly the result of an underlying fear that education would create an intellectual elite which might overturn the hereditary leadership, or migrate to America and then drive the British manufacturers out of business. [165]

A number of confusing messages about the relative performance of British and foreign industries emerged . Even though both the German and American chemical industries were in their ascendancy the British chemical industry was continually expanding. [166] The number of machines made in England and exported was greater than at any other time. Samuelson and his colleagues also noted that machines constructed abroad were made largely from English designs. [167] This was either flattery or a signal of growing technical competence that contained a hidden threat. The Commissioners observed that general condition of labour on the Continent, rates of pay, hours of work and the provision made for their health and safety were far behind those found in England. [168] They suggested that these differences provided an unfair commercial advantage but drew no conclusions about the future of Free Trade.

The combination of theses elements undermined the validity of the call for technical education as the panacea for all commercial ills. Indeed, Samuelson writing only three years later asserted that it was a fallacy to suppose that foreign workers had

> ...received better technical education than our own. The contrary rather is the case, thanks to training which our people have received for several generations in our workshops...[169]

He based this conclusion partly on an awareness of the fact that the English were proud of being a practical nation and were '...rather in the habit of looking upon professors and schoolmasters as theoretical people, who are not up to much in the battle of life...' [170] The majority of Commissioners felt that general education was more important than technical education. [171] It is ironic that this should emerge as a significant conclusion from the group who were regarded as the authors of the definitive treatise on technical education . It weakens the case of a number of contemporary observers and their successors (including Argles) who claim that it was primarily technical education which benefited from foreign exemplar, especially as a result of the work of Samuelson and his colleagues. [172] Yet it can be argued that it was the need for efficient elementary rather technical education that was true beneficiary of this form of comparison.

The view that successful technical education was dependent on good general education was gaining in credibility. The workman, the chargehand , and the employer could only profit by the former if he had

> ...been first trained to use his mind and to feel pleasure in using it. Technical training merely directs into channels of the various industries that activity of intellect which is called forth by a good general training in literature, science and art. The first step, therefore, in establishing a complete system of technical education is to supply as far as possible the deficiencies in our system of general education; and more especially to perfect our elementary and intermediate schools...' [173]

The Commission noted that only a few years earlier the link between continued industrial supremacy and good technical education would have been contested. [174] However, they were now convinced that the argument had been settled and felt that the country needed

> ...to take care that our managers, our foremen, and our workmen, should in degrees compatible with their circumstances, combine theoretical instruction with their acknowledged practical skills. [175]

In their view this meant that technical education for the majority of the working population should be provided, at a rudimentary level, through instruction in science in elementary schools. [176] Those from the foreman classes who were in higher elementary education should receive practical science teaching in laboratories attached to these schools. The provision of evening classes would also cater for their subsequent education. Technical instruction for managers and proprietors was a more complex issue for Samuelson and his colleagues. Again the debate about the value of practical experience versus theoretical study was apparent. The Commissioners were reluctant to advocate keeping young men at school

> ...as is the case in the polytechnic schools of the Continent, till they are 22 or 23 years of age, thereby losing the advantage of practical instruction in our workshops which, they say are really the best technical schools in the world, during the years from 18 or 19 up to 21 or 22- the age at which young men are best able to profit by workshop instruction. [177]

They also believed that prolonged school attendance might be desirable for analytical chemists or for the manufactures of fine chemical products but young men training to be managers of

> ...metallurgical works, of textile factories, and of rougher chemical works, should, in the opinion of the Commissioners, go to a good modern school like that of Bedford, or the modern side of Manchester Grammar School, or the Allan Glen's School at Glasgow, till they are 16, then attend University College or King's college or the Owens College for two years or so, and enter into practical life not later than at the age of 18 or 19. [178]

These notions were translated by the Commissioners into a series of direct proposals which they recognised would require the intervention of the legislature. They recommended that

- Drawing be regarded as an essential component of technical education in the public elementary schools and equipment, including casts and models, be made available to help in its delivery.

- Science should be introduced in the lower divisions through the study of geography and that metalwork and woodwork were best done after normal school hours.

- Grants be introduced so that schools could acquire technical and scientific collections for their own museums.

- In rural communities agricultural studies should feature in the curriculum.

- The Scottish practice of making it illegal for children under the age of 14 to work full time in factories and workshops should be introduced into England and Wales.

- With regard to the classes of the Science and Art Department, School Boards (or their equivalent) should be allowed to establish, conduct and maintain classes following the strictures of the Department. They also suggested that instruction in science classes should be more practical, payment on results should be increased for the advanced stages of all subjects, examinations in agricultural subjects should be more practical and adjustments in the teaching of metallurgy and mining needed to be made. They called for efficiency of instruction to become a key feature of inspection, the existing limit of £500 for building grants from the Science and Art Department to be abolished and the conditions attached to these grants revised. Ancient endowments should be quickly applied to technical and secondary education and more significantly natural science, drawing, mathematics and modern languages should replace Latin and Greek.

- Local authorities be allowed to establish and maintain secondary and technical schools.

- Museums should be encouraged to open on Sundays.

- In Ireland a range of measures similar to those recommend for England and Wales should be introduced.

Samuelson and his colleagues also made a further six recommendations that they suggested did not require the support of the legislature. They felt that:

- Schools maintained by employers and trade organizations should be attached to factories in which a knowledge of science was desirable amongst the workforce. The young people employed in these concerns should be allowed to attend these schools.

- Teachers pay should be adjusted according to the academic level of the students they were teaching, thus encouraging them to retain those studying advanced science and technical subjects.

- Scholarships should be more accessible particularly for pupils in higher elementary schools.

- The establishment of secondary schools and classes in which agriculture is taught should be aided by those involved farming related activities.

- In Ireland good farming should be promoted through farm schools.

- Adequate funding for the City and Guilds initiative to establish a central institution should be made available. [179]

In keeping with the political climate of the day they were in favour of voluntary action rather than coercion. However, they warned that if voluntary effort could not guarantee technical schools suitable for the greatest industrial society in Europe sooner or later the Government would be forced to intervene. [180]

Volume Two of the Second Report was subdivided into three parts. Part one was compiled by H. M. Jenkins, the head of the Royal College of Agriculture in

Cirencester which was the only farm college in England at the time. It contained information on agricultural education in Northern Germany, Denmark, Belgium, Holland and the United Kingdom. It was a substantial document that encompassed over 400 pages excluding appendices. Jenkin was co-opted as a Commissioner on March 31 st 1882. His brief was to inquire into the agricultural education and instruction of farmers, farm stewards, tenants, bailiffs, estate agents, labourers and peasant proprietors. He was also directed to identify the extent to which agricultural education featured in rural elementary schools and through the work of the Science and Art Department; to seek to establish the link between State and private funding for general and agricultural education and finally to explore the organisation of schools such as those related to the dairy industry. Jenkin produced much of the evidence for part one whilst acting as an Assistant Commissioner to the Royal Commission on the Depression of Agriculture in 1879. [181] It was a conservative document which contained few surprises. Jenkin concluded that consensus about the basic principles on which agricultural education should be founded was difficult to achieve. However, he believed that the technical education of the farmer had to extend over a longer period than it did currently. [182] He also argued that agricultural education required teachers with specialist training, the creation of scholarships and exhibitions, apprenticeships with large landowners for farm labourers and peasant proprietors, national endowments for agricultural colleges and the introduction of evening classes in agricultural education in village schools. He proposed that elementary education should reflect the agricultural heritage of the United Kingdom. He recommended that the government should place agriculture on at least an equal footing with science and art. [183]

Part two consisted of a report on technical education in the United States and Canada and was compiled by William Mather. Mather (1838-1920) born in

Salford and educated in a private school and Germany became chairman of Mather and Platt, the Salford Iron Works, a member of the Institute of civil Engineers and a governor of Owens College, made a knight of the Francis Joseph Order of Austria in 1873 and knighted in Britain in the same year, appointed the chairman of the Froebal Institute, a member of the committee on reorganising the War office in 1902 and a privy councilor in 1910. His politics were Liberal and he sat variously for Salford (1885-86), the Gorton division of Lancashire (1889-95) and the Rossendale division of Lancashire (1900-04). He was in America and Canada for six months, travelling over 10,000 miles making visits to 22 cities and inspecting nearly 100 institutions and manufacturing establishments. Mather provided a general description of public schools and details of the scientific training in colleges and universities. He subdivided his report into four sections. Section one gave a general view of the public schools in cities and counties, and a description of the scientific training in universities and colleges in various states. Section two encompassed the technical, industrial and manual training found in schools of all types. Section three explored the effects of these institutions on the working population including proprietors, foremen and manual workers. It also sought to establish the consequences of this education for American industry. Section four identified additional institutions and traced their influence the working population. In America, where all institutions were founded by the people for the people Mather stated that

> ...there is not a school or college in which may not be found the sons and daughters of the working classes. Not unfrequently have I found young working men spending a year at college in scientific studies who intended to resume their manual employment after leaving it...[184]

He found that they were pre-eminent in many branches of mechanical industry. Reflecting on the enterprise, assiduousness, intelligence, and quality of work displayed by Americans he believed that

> ...it is evident that our own race-one may say, even our own relatives-live under conditions more favourable to progress than we do at home. There are qualities, however, in our workpeople in some respects superior to those of our own kin across the Atlantic which, under equal educational and political conditions, might produce even better results. Our want of education in the past is undoubtedly the chief course of the contrast which are most favourable to us. The main cause of the inventiveness and skill has been necessity, and the general aptitude to acquire knowledge by virtue of the start given to every boy and girl in the public school. [185]

Part three contained further notes on technical education in the United States provided by Professor Ordway, chairman of the committee of management to the school of mechanical art at the Massachusetts Institute of Technology and Professor Fuller who was the principal and professor of chemistry at Worcester Free Institute. It was a short report, only 8 pages long and contained information on nine schools and colleges. It was factual and without conclusions.

Volume Three was subdivided into four parts. Part one, again compiled by William Mather, contained a short report of only 25 pages on the technical education in Russia where he was a regular visitor. He used his considerable experience (gained over a 20 year period) and a concentrated stay of three months in 1884 to gather evidence for his report. It was completed on 28 th August of the same year and focussed on technical education in Moscow and St Petersburg. Mather judged that the majority of Russians showed the aptitude to learn quickly and noted that when well directed possessed '...some excellent natural qualities, docility, endurance, obedience, veneration and the faculty of imitation...' [186] He also believed that these qualities '...only require quickening by systematic elementary instruction to create a new life in the people leading to greater prosperity and morality...' .[187]. He was also concerned to point out that despite the absence of a national system of education Russia produced its fair share of distinguished men but significantly large presence of foreigners in the country (predominantly German, French and English) promoted the rapid growth of

manufacturing industry. Part two contained 70 pages of a report on the English silk industry by Thomas Wardle in which the evidence, rather unusually, was presented in a written form rather than delivered orally to the compiler. The prominence given to the silk industry through its separate report was indicative of the importance of the textile industry in the English. It was also easy to investigate because of the '...frequent opportunities of witnessing the steady growth of the silk industry abroad, and its unhappy decadence in England...' [188] The report concluded that England could not afford to lose any of its artistic industries but strikes amongst the workforce allowed for the encroachment of foreign merchandise. [189] Industrial unrest was an undercurrent theme that was referred to in a number of the documents provided by the Commission. However Wardle believed that the most effective '...means of checking the large silk imports into this country, and of restoring our silk industry, would be for manufacturers to see to the more skilful, dyeing and finishing of goods. [190] Part three outlined a potential scheme for technical education in Ireland and was only 13 pages long. It focussed on art and agricultural education and the teaching of trades in workshops. Ireland was '...specially visited and, owing to its peculiar economical conditions, is the subject of separate treatment in the various sections of the report. [191] The final and most substantial part of Volume Three contained six hundred pages of evidence relating to technical education compiled from the opinions of an assorted group of witnesses.

Volume Four contained further evidence relating to Ireland. It was composed of 300 pages of testimony with an additional 150 pages devoted to appendices. Volume Five contained 52 reports that were notionally described as foreign. However, by far the greatest number (17) originated in the UK followed by France (9) and then Germany (7).

Reaction to the Samuelson Commission

The Times was satisfied that the Commissioners were able

> ...to terminate the labours in which they have been engaged for nearly three years at home and abroad with the conviction that whatever may be the progress of other nations in technical education and in manufactures, our own industries also are also full of vigour; that we already possess considerable opportunities for theoretical instruction in the technical sciences and in art as applied to industry; that these opportunities are capable of increase on their present lines...[192]

It believed that this was an encouraging position to be in because Samuelson had indicated that '...as a whole, our people still maintain their position at the head of the industrial world...' [193] However, the newspaper was keen to avoid complacency and pointed out that, despite a favourable report, it must not be supposed that '...the means for technical instruction to be adequate as to either completeness or diffusion...' [194] Magnus stated that the material produced by Samuelson was

> ...widely circulated at home. It was reprinted and still more widely circulated in America, and was for many years the recognised work of reference on all questions connected with technical education. [195]

He also stated that its '...suggestiveness and the moderation of its proposals commended it to the consideration of Government departments, of manufacturers and of professionals and trade societies.' [196] Keighly Snowden went further and claimed it was '...a sensation.' [197] Roscoe judged that the information created '...more general interest than usually falls to the lot of such documents...' [198] However, the changes that could be expected as a result of this work were not as forthcoming as these comments suggest. Samuelson was concerned about the lack of immediate progress made by the Government on the recommendations of the Royal Commission and asked for an explanation in Parliament. Mundella indicated that primary education was being dealt with first in order that

> ...the scholars may be able, when they leave school, to avail themselves of the facilities for technical instruction offered by the Science and Art Department, the city and Guilds and other public Bodies. [199]

The political crisis that was beginning to engulf the Government when the Commission reported to parliament was probably an equally important factor. Ensor has stated that the second ministry of Gladstone, which stretched between 1880 and 1885, was notable because '...never in the modern era has a triumphant House of Commons majority achieved so little...' [200] This is a harsh judgment because there was some notable activity. [201] However, the Irish question '...so constantly blocked the way, that in the first three sessions no large controversial government measure affecting England was attempted...' [202] The most significant piece of legislation during Gladstone's second ministry was the Third Reform Act which coincided with the publication of the findings of the Commission. It helped to establish ' the principle of one man, one vote and thus inaugurate the era of democratic politics...' [203] The Franchise Bill (1884) included a scheme to redistribute the vote, raising the electorate from 3 to 5 million. The unresolved tensions that this legislation generated inside the government eventually led to election defeat (mid 1885) for Gladstone and left Parnell holding the balance of power. Thus began the most dramatic 13 months in modern English political history. The consequences

> ...went farther than appeared. The Liberals, hitherto normally the dominant party and expecting to be still more so on the widening franchise, were for the moment disrupted and defeated. No one foresaw that, excepting one brief triennium, their defeat would last nineteen years. [204]

The immediate effect of the publication of Samuelson's findings was once again to stimulate public interest in the question of technical education and how it affected the progress of British industries. [205] The Commission made the study of applied sciences at universities respectable by including it in the Report, helped

to change public attitudes towards education in general [206] and provide official recognition that technical education was not solely the preserve of the artisan and working classes. [207] However, the potential to expand the franchise of technical education was hindered by deeply entrenched attitudes at both employer and employee level. [208] One indirect but very real consequence of the work of the Commissioners was that four out of six of them were rewarded with knighthoods. [209] Thus respectability had been given to the champions of the cause of technical education if not to the cause itself.

CONCLUSIONS

The Centennial and Paris exhibition were the very successful mid point in a series of ten international exhibitions held between 1851 and 1900. [210] The proximity of the American and French events to each other and the conditions under which they originated and were developed (post war for both nations) is a demonstration of the value they were perceived to have.

The United States emerged from the Philadelphia exhibition with a vastly improved reputation which left the British in no doubt about the status of this one time colony and about its recovery from civil war. The great potential of American industry was acknowledged and the improvements it had made were attributed in part to education. In a sober evaluation of the relative state of affairs between Britain and America The Times stated the competition in Philadelphia

> ...was not altogether satisfactory to us. It is true that every nation has an advantage in exhibitions held within its own area; but the products of the industry of the United States surpassed our own oftener than can be explained by this circumstance. It appeared as if there was a greater economy of labour habitually practiced in the United States and in conjunction with this there was evidence of the more constant presence of a presiding mind superintending every process of industry. [211]

A unique and portentous signal from the new world to the old, highlighted by the Centennial exhibition, was the American government's determination to protect its new industries. The Paris exhibition was a testament to French self belief, coming so soon after the conflagration and the disastrous period of the Commune. One of the objectives of the organisers was the restoration of France to its former position of power. This was an unrealistic aim in the wake of the Franco-Prussian war and the consequent internal political strife it generated. The balance of power in the region had been fundamentally altered and the French found this difficult to accept. The event simply highlighted the tensions in relationships between nations that existed at the time. Nevertheless the French approach to the exhibition was spirited and they emerged with some credit from the international community.

The British felt that it was important to participate in America and France where, with the exception of the hosts, they had the largest contingent of exhibitors. However, the quality of what they presented did not match the scale of their participation. Lack of governmental support may account for this discrepancy. At both exhibitions many advances in products and processes were apparent, notably in new industries on the continent, but the English confined themselves to exhibiting only what they were good at producing. It was noted that they prudently selected

> ...for effort and display the points in which England excels or holds her own, retiring from the rivalry where her genius or her opportunities are plainly wanting. In whatever is useful for the prosecution of industry or for the comfort and the enjoyment of life, for the works of peace or of war, for agriculture, and for commerce, England enters into competition; otherwise there appear to be gaps in our part of the show. [212]

The scale of foreign industrial advance was apparent from both exhibitions. The connection between the progress observed and technical education was less clear, although the evidence suggests that it helped to facilitate this advance.

It was up to Samuelson and his colleagues to prove the link and to make the case for the implementation of technical education in England, but their investigation was flawed. The scale of the resources available to them were so limited that their work could only be impressionistic, rather than scientific. Neither could they agree amongst themselves about the nature of technical education. Despite an official seal of approval the Commission could only be viewed as '...a freelance inquiry by a small pressure group, all its members were already converts to the idea of technical, education...' [213] Without an unequivocal statement of cause and effect the best it could suggest was a modification of the existing education system rather than more radical action. Samuelson's lack of ambition was also partly based on a fear of the effect of ill conceived plans. The Commissioners were worried that third rate technical schools would mean that

> ...we have spent our money and our pains merely in strengthening that distrust of theory which is already too strong in the half educated Englishman. We shall have wasted the season of enthusiasm and destroyed the hopes of technical education. [214]

Their caution led to the production of reports that contained little that was new. This was remarkable given the strength of some of the individual Commissioners belief in technical education. Swire Smith continually warned that there was an invasion going on in England, even more serious than that of an conquering army. His evidence for this rested on a simple walk to the local shops where he could observe

> ...electrical appliances, dye-wares and piles of articles 'made in Germany'; silks, cashmeres, gloves, works of art from France, butter and cheese from Denmark...it has been in consequence of the greater scientific and artistic knowledge and more systematic technical training of your industrial rivals. [215]

He predicated that as a result of ignorance, idleness and lack of scientific training the British would fall behind their '...foreign competitors in the arts of peace...' unless attitudes changed. [216] Roscoe added even more urgency to the warning when he pointed out that '...the success of German arms in the Franco-German war depended upon the German schoolmaster...' [217] Perhaps moderation prevailed because collectively the Commissioners were aware of what would be politically acceptable when they formulated their conclusions. They were also mindful of complexity of the issue they had investigated and were not persuaded by rhetoric alone.

Did the Philadelphia and Paris exhibitions events have a critical impact on the development of British policy on trade or technical education? They did pose questions about the nature of British trading relationships, offered evidence of foreign commercial advance, provided an indication of the value of new technologies and illustrated the connection between education and industry. However, it cannot be justifiably claimed that they directly led to the Samuelson Commission or substantially influenced the conclusions it came to. Neither succeeded in disturbing the status quo in the same way as the 1867 exhibition had temporarily done.

The most positive outcome for the proponents of technical education that resulted from Philadelphia, Paris and the Royal Commission was that they kept the issue of technical education alive. It was still being debated in parliament and in public. Indeed The Times went so far as to suggest that everyone was ' ...so absolutely convinced now of the obligation of technical training that it is astonishing the discovery should have been reserved for the present period. ' [218] It suggested that it was an indispensable '...means of victory in the race and battle of life against commercial and manufacturing rivals on both sides of the Atlantic. '

[219] But where was the evidence that a lack of it would precipitate an imminent economic collapse? Despite three decades of the apparent neglect of technical education the British still maintained their prominent world position.

FOOTNOTES : 2

1) R. C. Post , A Centennial Exhibition 1876, Smithsonian Institution, Washington, 1976, p. 23

2) J. Allwood, Great Exhibitions, Studio Vista, London, 1977, p. 180

3) Ibid.

4) The Times , Jan 27 th ,1876

5) R. C. Post, op.cit., p. 11

6) Ibid.

7) P. Greenhalgh, Ephemeral Vistas: The Exposition Universelles, Great Exhibitions and World Fairs 1851-1939, Manchester University Press, Manchester, 1988, p. 38

8) The model of fund-raising used in Philadelphia was so successful it was adopted by all the organisers of subsequent American exhibitions. It was a very simple formula that involved money being raised by share subscription, contributions from individual states, foreign participants and the Federal Government.

9) The Times, Jan 27 th, 1876

10) Ibid.

11) The number of visitors fell to a daily total of 12,750.

12 It was closed to avoid desecration of the Sabbath. This stopped the majority of the population who worked a 6 day week from attending.

13) K. W. Luckhurst, The Story of Exhibitions, The Studio Publications, London, 1951, p. 136

14) The main construction was 1880 x 464 feet in size, located on a 20 acre site and designed to house 13,720 exhibitors. The Agricultural Hall was 540 x 820 feet in size and located on a 9 acre site. See R. C. Post, op.cit., p. 17

15) The Times, May 6 th, 1878

16) George H Corliss, one of the Centennial commissioners, was an engineer and business man who embodied the spirit that Americans cherished. His device remained the subject of much curiosity and pride long after his death. It was so big that no commercial application could be found for it when the exhibition closed. Four years later George Pullman used it to power his new car works.

17) The Times, Jan 12 th, 1877

18) R. C. Post, op.cit., p. 17

19) The Smithsonian Institute was opened in 1881.

20) Bartholdi (1834-1904). constructed and displayed parts of this mammoth work at both this exhibition and in Paris in 1878. It was completed in 1886 and became a symbol of freedom and emancipation for the masses who sought liberation through emigration to America. See W. Plum, World Exhibitions in the Nineteenth Century: Pageants of social and cultural change, Friedrich-Ebert-Stiftun Bonn-Bad, Godesberg, 1977, pp. 32-33

21) P. Greenhalgh, op.cit., p. 123

22) K. W. Luckhurst, op.cit., p. 136

23) Elizabeth Gillespie was the great-granddaughter of Benjamin Franklin

24) P. Greenhalgh, op.cit., p. 175

25) Ibid., pp. 174-78

26) Ibid., p. 42

27) Illustrated London News, May 13 th, 1876, p. 462

28) This applied only when the Irish and colonial segments were combined with the British contribution.

29) The Times, Jan 12 th, 1877

30) R. C. Post, op.cit., p.179

31) Economist, May 6 th, 1876, p.539. The Americans had previously taken all the steps possible to keep such goods out.

32) The Times, April 25 th, 1876

33) The Times, 17th April 1876

34) International Conference on Education, The Empire of Brazil at the Universal Exhibition of 1876 in Philadelphia, Imperial Instituto, Rio de Janero, 1876, p.483

35) The Brazilians had a long history of providing this kind of subsidy .They had done so with the events of 1861, 1866 and 1873

36) R. C. Post, op.cit., p. 177

37) The Times, April 17 th, 1876

38) P. Greenhalgh, op.cit., p. 127

39) R. C. Post, op.cit., p. 22

40) The Times, May 12 th, 1876

41) The Times, March 1 st, 1877

42) R. C. Post, op.cit., p. 22

43) Reuleaux was the President of the German jury. See W. Plum, op.cit., p. 110

44) The Times, March 1 st, 1877

45) Ibid.

46) The Times, May 12 th, 1876. The false but plausible economic theory referred to the doctrine of free trade.

47) R. C. K. Ensor, England 1870-1914, Clarendon Press Oxford, 1936, Introduction

48) J. Allwood, op.cit., p. 58

49) It was rumoured that some broke the embargo by working through American agents. See The Times, 13 th, 1877

50) The Times, May 1 st, 1878

51) The Times, December 24 th, 1877

52) Ibid.

53) The Times, May 6 th, 1878

54) The Times, December 24 th, 1877

55) Eiffel had been involved in previous exhibition in Paris

56) The Times, May 1 st, 1878

57) Illustrated London News, March 2 nd, 1878, p. 201

58) P. Greenhalgh, op.cit., p. 123

59) Ibid. , p. 155

60) The Times, December 24 th, 1877

61) Illustrated London News, May 11 th, 1878, p. 442

62) W. Plum, op.cit., pp. 87-88

63) Economist, July 27 th, 1878, p. 888

64) The Americans had requested that an international congress be held in Paris to investigate the role of classical education upon the development of English language teaching See School Board Chronicle, February 9 th, 1878 p. 141

65) The Times, October 9 th, 1878

66) Ibid.

67) School Board Chronicle, August 24 th , 1878, p. 187

68) The Times, October 9 th, 1878

69) The British display was only the biggest when the exhibits of her dependencies were combined with the those from the Union

70) The British and French vied with each other to present their respective Empires in the better light. See P. Greenhalgh, op.cit., p. 65

71) The Times, March 1 st, 1877

72) 700 from London, 64 from Manchester, 56 from Birmingham, 43 from Glasgow, 40 from Leeds, 38 from Edinburgh, 35 from Sheffield, 28 from Dublin, 24 from Huddersfield, 22 from Liverpool, 18 from Bradford, 17 from Belfast, 16 from Norwich, 15 from Bristol and 13 from Nottingham

73) Illustrated London News, May 11 th, 1878, p. 442

74) Hansard, May 16 th, 1878, cols. 27-28

75) Hansard, May 13 th, 1878, col. 1716

76) P. Greenhalgh, op.cit., p. 36 and J. Allwood, op.cit., p. 180

77) Economist, June 22 nd, 1878, pp. 539-40

78) The Times, October 9 th, 1878

79) The Times, May 6 th, 1878

80) Economist, September 21st, pp. 1111-12, October 19 th, p. 1224, November 2 nd, pp. 1854-6. All 1878

81) Ibid. September 21 st, 1878, p. 1111

82) Ibid., p. 1112

83) Illustrated London News, May 11 th, 1878, p. 442

84) Royal Society of Arts, Artisan Reports on the Paris Universal Exhibition of 1878, Sampson Low, Marston, Searle and Rivington, London, 1879, David Walker, p. 228

85) The Times, May 1 st, 1878

86) Taken from an article by George Augusta Sala that appeared in the Daily Telegraph and quoted by J. Allwood, op.cit., p. 62

87) The Times, May 6 th, 1878

88) Ibid.

89) The Conservative Party, which had boasted 350 Members of Parliament, was heavily defeated following Gladstones Midlothian campaign. The Liberals gained an overall majority in Parliament of 50 seats.

90) The seven referred in the verse included their Secretary Redgrave. See K. Snowden, The Master Spinner: A life of Sir Swire Smith, George Allen and Unwin, London, p. 154

91 F. Foden, Philip Magnus: Victorian Educational Pioneer, Valentine Mitchell, London, 1970, p. 164

92) The Times, March 1 st, 1877

93) Hansard, April 1 st, 1881, col. 529

94) Ibid., col. 526

95) Ibid.

96) Ibid., col. 527

97) Ibid., col. 526

98) Ibid., col. 533

99) Ibid., col. 526

100) Ibid., col. 527

101) Ibid., col. 529

102) Ibid.

103) Ibid., col. 530

104) Ibid., col. 527

105) Ibid., col. 533

106) Ibid. Cochran-Patrick was educated at Edinburgh University and graduated with a BA in 1860. He was a magistrate for Renfrewshire and Aryshire and became Under Secretary of State for Scotland.

107) Ibid.

108) Ibid., col. 534

109) He was able to read in detail about the efforts of the Chemnitz Chamber of Commerce to provide this training for its workforce in a study compiled by a business associate of his, H. M. Felkin. Mundella took the study to Philip Magnus who persuaded the City and Guilds to publish it under the title of Technical Education in Saxon Town in May 1881.

110) Hansard, April 1 st, 1881, col. 535

111) Ibid., col. 536

112) Ibid., col. 537

113) Ibid.

114) Ibid.

115) Ibid., col. 543

116) Ibid.

117) Ibid.

118) Ibid.

119) Ibid., col. 548

120 Lubbock was an active parliamentarian and an educational reformer.

121) Hansard, April 1 st, 1881, col. 547

122) Royal Commission on Technical Instruction, Authorisation from Queen Victoria, August 25 th, 1881

123) W. G. H. Armytage, A. J. Mundella: The Liberal Background to the Labour Movement, Ernest Benn Ltd, London, 1951 , p. 139

124) This decade saw the emergence of political organisation representing the socialist movement. Those with trade union affiliations were linked to the Liberal Party. Henry Broadhurst was the first of this type of individual to be made a minister. He was a stonemason until 1872 and became Secretary of the Trades Union Congress Parliamentary Committee from 1875 to 1890. He was Private Secretary to the Home Office in 1886 and Alderman and Justice of the Peace for Norflok. He was a Liberal who was in favour of land reform and Home Rule. He was a Member of Parliament for Stoke on Trent (1880-1885) Birmingham (1885-86) Nottingham (1886-1892) and Leicester (1894-1906)

125) F. Foden, op.cit., p. 164

126) Matthew Arnold would have been asked to become Secretary if Redgrave was unavailable.

127) F. Foden, op.cit., p. 1

128) Ibid., p. 167

129) J. Slagg, Free Trade and Tariffs, Cassel Petter Galpin, London, 1881, p. 5

130) Ibid., p. 12

131) Michael Argles, South Kensington to Robbins: An account of English Technical and Scientific Education since 1851, Longmans, London, 1964, p. 32

132) F. Foden, op.cit., p. 165

133) The Times, March 13 th , 1884

134) K. Snowden, op.cit., p. 151

135) Ibid., p. 158

136) F. Foden , op.cit., p. 162

137) H. E. Roscoe, The life and experiences of Sir Henry Enfield Roscoe DCL LLD FRS, Macmillan and Co, London, 1906, p. 191

138) F. Foden , op.cit., p. 81

139) Royal Commission on Technical Instruction, 2 nd Report, Vol. 3, Part 4, Minutes of Evidence, para. 7689

140) Ibid.

141) Ibid., para. 2145

142) Ibid., para. 2454

143) Ibid.

144) Ibid., para. 4031-40

145) Ibid., para. 4215-19

146) Ibid., para. 4253

147) Ibid.

148) Ibid., para. 4258

149) Ibid., para. 4293-96

150) Ibid., para. 2568

151) He was secretary to the International Jury in London in 1862 and Dublin in 1865, vice president and reporter of the International Jury Paris in 1867, writer of reports for the Society of Arts at the Paris exhibition in 1855, London in 1873 and Paris in 1878

152) Royal Commission on Technical Instruction, 2 nd Report, Vol. 3, Part 4, Minutes of Evidence, para. 2187

153) Ibid., para. 2912-15

154) It focussed on the technical education of proprietors and senior mangers, foremen and workmen and considered them as separate entities.

155) It included a substantial number of appendices.

156) Royal Commission on Technical Instruction, 1 st Report, p. 30

157) Ibid., 2 nd Report, Vol. 1 , p. 505

158) F. Foden , op.cit., p. 161

159) Royal Commission on Technical Instruction, 2 nd Report, Vol. 1, p. 509

160) H. E. Roscoe, op.cit., p. 191

161) Royal Commission on Technical Instruction, 2 nd Report, Vol. 1, p. 511

162) H. E. Roscoe, op.cit., p. 193

163) Royal Commission on Technical Instruction , 2 nd Report, Vol. 1, p. 505

164) Ibid., p. 514

165) G. Roderick and M. Stephens, Where did we go wrong? Industrial performance, Education and the Economy in Victorian Britain, The Falmer Press, Lewes, 1981, p. 156. Segment by Stanley D Chapman

166) Ibid. Segment by Keith Trace.

167) Royal Commission on Technical Instruction, 2 nd Report, Vol. 1, p. 505

168) H. E. Roscoe, op.cit., p. 196

169) F. C. Montague, Technical Education: A summary of the Royal Commission on Technical Instruction, Vol. 1, Cassell and Co, London, 1887, p. iv. Samuelson writing the introduction to the publication

170) H. E. Roscoe, op.cit., pp. 203-204

171) Royal Commission on Technical Instruction, 2 nd Report, Vol. 1, p. 512

172) M. Argles, op.cit., p. 138

173) F. C. Montague, op.cit., p. 66

174) Royal Commission on Technical Instruction, 2 nd Report, Vol. 1, p. 513

175 Ibid.

176 Ibid., p. 517

177) The Times, March 13 th, 1884

178) Ibid.

179 Royal Commission on Technical Instruction, 2 nd Report Vol. , pp. 536-4

180) F. C. Montague, op.cit., p. 68

181) The Royal Commission on the Depression in Agriculture was presided over by the Duke of Richmond

182) Royal Commission on Technical Instruction, 2 nd Report, Vol. 2, Part 1, p. 303

183) Ibid. , 317

184) Ibid. , Part 2, p. 12

185) Ibid. , 64

186) Ibid. , Vol. 3, Part 1. p. XXVII

187) Ibid. , p. XXVII

188) Ibid. , p. XXX

189) Ibid. , p. LXXXIV

190) Ibid. , p. LXXXV

191) The Times, March 13 th, 1884

192) Ibid.

193) Ibid.

194) Ibid.

195) F. Foden , op.cit., p. 168

196) Ibid.

197) K. Snowden, op.cit., p. 158

198) H. E. Roscoe, op.cit., p. 201

199) Hansard, March 16 th, 1885, col. 1237

200) R. C. K. Ensor, op.cit., pp. 66-67

201) In 1880 parliament passed the Burials Act to placate nonconformists, the Ground Game Act to remedy a long held complaint of tenant farmers, the Seaman's Wages Act and the Grain Cargoes Act. In 1881 it outlawed flogging in the army and navy. In 1882 women were given the right to separate ownership through the Married Women's Property Act and the Settled Land Act broke down barriers in the transfer of land. In 1883 the Bankruptcy Act, the Patents Act and the Corrupt Practices Act were passed. The passing of the Corrupt Practices Act in 1883 did much to destroy the evils of the old order by effectively limiting election expenses. It helped to produce an electoral system, that within a generation was reasonably fair and honest. See P. Aldeman , Gladstone, Disraeli and Later Victorian Politics, Longmans, London, 1970, p. XI

202) R. C. K. Ensor, op.cit., p. 86

203) The Second Reform Act was implemented in 1867 which, ironically, coincided with the other great inquiry into technical education. See P. Aldeman, op.cit., p. XI

204) R. C. K. Ensor, op.cit., p. 99

205) H. E. Roscoe, op.cit., p. 214

206) F. Foden , op.cit., p. 168

207) W. G. H. Armytage, op.cit., p. 224

208) G. Roderick and M. Stephens, Where did we go wrong? Industrial performance, Education and the Economy in Victorian Britain, The Falmer Press, Lewes, 1981, p.10

209) Roscoe and Samuelson were knighted in 1885, Magnus in 1886 and Swire Smith in 1896. It is not clear whether these rewards were expected as a result their unpaid roles on the Commission

210) Exhibitions were held in London in 1851, Paris in 1855, London in 1862, Paris in 1867, Vienna in 1873, Paris in 1889, Chicago in 1893 and Paris in 1900

211) The Times, March 1st, 1877

212) The Times, May 1st, 1878

213) W. G. H. Armytage, op.cit., p. 32 and M. Argles, op.cit., pp. 31-32

214) F. C. Montague, op.cit., p. 66

215) H. E. Roscoe, op.cit., p. 199

216) Ibid.

217) Ibid.

218) The Times, December 14 th, 1883

219) Ibid.

Section 3 : From Small Beginnings And By Very Slow Degrees

The Times August 11 th 1884

The Marquis of Hartington believed that the

> ...subject of technical education has now been so long before the country that it would be very little short of a scandal if we failed to give some expression to what is the almost universally-acknowledged desire, that additional facilities for the promotion of technical education should be given. [1]

INTRODUCTION

Even before Samuelson and his colleagues had gone through the final stages of their work as Commissioners, plans were being formulated to hold a series of exhibitions and conferences in London which reflected the British fear and fascination with science and technology. They were the International Health Exhibition (and the conference on education associated with it) and the International Inventions Exhibition. Both denote a renewed interest in exhibitions in England. They were serious in intent but could not escape the need to attract paying customers. The International Inventions Exhibition in particular offered a unique opportunity to test one of the fundamental tenets of the technical educationists, that innovation and by association industry would suffer because of the lack of investment in technical education. These exhibitions were followed by the Royal Commission on the Depression of Trade, which originated in part as a result of a growing realisation in Britain of the power of competition from abroad. This was important because the extent of the relationship between technical education and the supposed industrial decline was bound to be revealed by the work of the Commission. The cycle of activity was completed by the Technical Instruction Act and the introduction of Whisky money at the end of the decade. They represent the first significant response by Parliament to the issue of technical education which had been raised over twenty years earlier by the Select Committee.

THE INTERNATIONAL HEALTH EXHIBITION I.H.E. (1884)

The event

The International Health Exhibition (I.H.E.) was designed to facilitate an understanding of the links between everyday items and actions '...and their bearing on health.' [4] It was housed in a number of different locations in South Kensington and was sponsored by the City and Guilds and Livery Companies. [2] The event opened on May 9 th 1884. The exhibits were provided by two thousand businesses, organizations and individuals. Visitors were able to see a diverse selection of exhibits ranging from dairies with real cows to economical workmen's kitchens in which bread was made and cookery demonstrated. There were also opportunities to collect information on the study of waterproof clothing and other materials, view the machinery and appliances for manufacturing clothes and learn about sanitary engineering all under the same roof. [3] Indeed it was claimed that the great charm and usefulness of the exhibition was '...its catholicity. ' [5] However, a new component in exhibition planning was apparent, the efforts of the executive council to educate and elevate had to be tempered by the need to entertain. They recognised that the majority would visit for '...the simple and very meritorious purpose of amusing and enjoying themselves...' [6] Accordingly they provided a number of facilities and attractions to encourage paying customers. Food was plentiful. The exhibition was described as a Liberty Hall in which, for a little money the public could eat and drink what they liked. [7] This was in direct contrast to the restrictions which had prevailed at other English events. [8] An additional attraction was a large garden

> ...beautiful enough by day ; and magnificent by night with the glow of thousands of variously coloured lanterns; crowned by the cluster of electric lamps that suspended high above the buildings may be seen for miles around. [9]

The Albert Hall, which was one of the principal venues for the event and the promenade concerts it hosted, were unashamedly promoted by the organisers as key amenities. One commentator, alarmed by the dedication shown by the executive council to pleasing visitors was prompted to ask

> ...what have all these brass bands; the nocturnal fetes; these flower shows and flower sales; these Chinese Courts; palanquins; lanterns and chow-chow; these twenty thousand additional lamps; these American juleps; ice creams; and sherry cobblers that I hear about got to do with Heath and an Exhibition in connexion therewith? [10]

The answer was clear to one witness who suggested that if the event been organised by sanitary engineers, medical men and professors of social science, it would have been useful and instructive to the professional classes but to the majority an intolerably dull and dismal spectacle. He believed that an exhibition '...which kept inflexible strictness within the terms of its title would have been to the mass of the community nothing more or less than a gigantic Bore...' [11] The consequence of this dedication to entertainment was that I.H.E. was very popular and '...thronged with the daily increasing crowds of the votaries both of business and of pleasure...' [12] By the time it closed at the end of October, it had been visited by over four million people.

The exhibits were divided two divisions. Division One focused on public health and included sections on ambulances, dress, food, housing, schools and workshops. Division Two was devoted to educational matters including school design, apparatus, fittings and fixings, school meals, preventing contagion in schools, physical education equipment, domestic economy, handicraft teaching for boys , schools for the blind and deaf. [13] The organisers of the exhibition justified

the link that they had forged between education and health by recognising that it was more than just a superficial association. [14] They believed that

> ...health is dependent on education; that the appliances; conditions; ideas; and principles of health and of sanitation can be propagated and made universal; and can produce their ultimate benefits only when education takes them in hand and teaches them to every child. [15]

Division Two was not as popular as Division One partly because the Albert Hall and the Central Institution at Finsbury Park were used to house the exhibits. In the Albert Hall displays were banished to the circular gallery at the top of the building, which had limited space and was difficult to get to. The items housed in the Central Institution were equally isolated but at least they had the advantage of '...not being situated midway betwixt heaven and earth.' [16] The School Board Chronicle complained that it could ' ...scarcely help thinking that education has been somewhat slighted in the disposition of space..' [17] However, the critics did recognise the difficulties of finding suitable locations and generally praised the efforts of the organisers. [18] Indeed, some believed that '...no such educational collection; so varied; so scientifically arranged or so valuable has ever been brought together. ' [19] However, others complained that public elementary education in Britain was poorly represented. They believed that all

> ...the money spent since 1870; all the energy expended by the Education Department, the School Boards and the voluntary associations and the results achieved are left to be assumed from the isolated exhibits of a few English and Scotch School Boards, which however excellent in themselves are not a sufficient national representation. [20]

The best the London School Board could do was to arranged twice weekly demonstrations of gymnastics whilst other School Boards provided samples of work. [21] In contrast the French exhibition, organised by the Ministry of Public Instruction and Fine Arts, represented a complete survey of primary education in

France. The School Board Chronicle suggested that they had paid Britain a very high compliment '...in setting before it with perfect frankness this complete and beautiful collection...' [22] The importance the French attached to an educated workforce was apparent from this display.

A number of the fourteen different conferences held in conjunction with the exhibition had educational themes which included topics such as school hygiene and overpressure on pupils. [23] The Times announced that the promoters of the International Health Exhibition had also arranged to hold

> ...the first international conference on education; and not withstanding the objection that the connexion between health and education is not obvious we are altogether too well satisfied with the prospect of so popular theme being thoroughly well thrashed out to be hypercritical as to the precise organization which had been instrumental in inaugurating the discussion. [24]

The template for the London event, the Brussels International Congress on Education, was held in 1880 as part of the celebrations to mark the 50 th anniversary of the Belgian state. Amongst the participants was Philip Magnus. [25]

The International Conference on Education (I.C.E.) was organised by the Foreign Office and the Department of Education, represented by Lord Carlingford, Lord President of the Privy Council, in the Upper Chamber and A. J. Mundella in the Commons. [26] Queen Victoria and the Prince of Wales were both patrons of the conference. It was held in the City and Guilds Institute, which was located conveniently close to the site of education section of the I.H.E. . [27]

The executive committee was chaired by Donald James MacKay Eleventh Baron Reay (1839-1921). Reay, was a statesman and diplomat who was interested in international politics and law. He was born in the Hague, educated at Leiden, entered the Dutch Foreign Office in 1877 and later became a naturalized Englishman. He was made a baron in 1881 and was appointed Governor of

Bombay (1885-90), Vice Secretary of State for India (1894-95), the last Chairman of the London School Board (1895-1904) and the first President of the British Academy (1902-07). The Vice Chairman was Rev. Thomas Graham DD . Other members included the Ven. Archdeacon William Emery (1825-1910), a Fellow of Corpus Christi College Cambridge (1847-65) who was a keen advocate of the volunteer movement and became Archdeacon of Ely between 1864 and 1907; Philip Magnus; Rev. James Harrison Rigg (1821-1909), a Wesleyan divine ordained in 1849 who was appointed as principal of the Westminster Training School (1868-1903); Francis Storr, a dedicated administrator and educational pioneer who took an active part in resolving the controversies associated with the organisation and conduct of public education and the Hon. Edward Lyulph Stanley (1839-1925) 4 th Baron Sheffield of Roscommon in Ireland and 4 th Baron Stanley of Alderley. Stanley was a member of the London School Board from 1876 to 1885 and Vice Chairman between 1891 and 1904. In addition, over 400 other individuals helped to organise the conference. The size of this group was indicative of the seriousness with which it was regarded.

The opening meeting took place on August 4 th 1884 and the proceedings closed five days later. August was not a suitable month to hold the conference because it was regarded as the '...the season of the holidaymaker. ' [28] The event also coincided with a conference for heads of public schools held in Switzerland which helps to explain the absence a large number of prominent educators. [29]

Most European countries were keen to participate in the I.C.E. Delegates included official representatives from Belgium (11) [30] France (16) [31] Japan (3) , the USA (3) and unofficial representatives from Austria (2) , Brazil (2) , Denmark (1) , Germany (2) , Italy (1) , Netherlands (1) , Norway (1) , Russia (1) , Spain (3) and Switzerland (1). It is noteworthy that Germany had no official representation.

Unusually, a small but significant number of women contributed to the conference and also participated in the debates on technical education.

The aim of the conference, identified by M. Buisson (Inspector General and Director of Primary Education in France) was to seek answers to the question of what

> ...must we do to give every man a complete education, an education that will make of him not an artisan or an artist, a merchant, a scientist or a literary man, but something more-a man...[32]

An additional underlying theme was articulated by a foreign delegate from Belgium, who observed that poor countries '...could only become wealthy by education and wealthy countries could only keep their wealth by giving education to the masses.' [33]

Lord Carlingford, a noted Free Trader provided the official welcome. He remarked that this was the first education conference to take place in Britain and that it was the result of private enterprise and energy. [34] The opening address was provide by Lord Reay. He took the opportunity to comment on a number of topics including the Royal Commission on Technical Instruction, which he described as very important. [35] He noted that there was a lack of popular support for the wide dissemination of education and was in no doubt that the existing system was in need of reform. [36] Lord Reay also stated that at the elementary level the monopoly of the three R's was doomed and '...the enthronement beside them of the three D's-drawing, drill and adroitness-approaches. ' [37] He strongly advocated that a modern curriculum should be introduced into secondary education and delivered through a variety of institutions. His reasons for adopting this viewpoint were straight forward. He argued that a

> ...lawyer ignorant of Roman law, a theologian ignorant of the Greek Testament, an artist without classical training, seem to me imperfectly educated, but then an architect, an engineer, a doctor, not trained in science are equally unsound. [38]

He also suggested that schools which embraced this new thinking were ' ...more likely to benefit the greater number of those who frequent them than classical schools which only really benefit a select few. ' [39] He believed it was possible to centralize education but realised the difficulties were significant because a '...free country like England will not tolerate State unity in education, any more than it has tolerated it in any region of her politics...' [40] At the same time he was also certain that the Empire could only be maintained if the greatest variety of methods of education were employed. Lord Reay was particularly concerned about agricultural education:

> Gold is a rare commodity, therefore you can only give it to a skilled artisan, on the other hand, the management of the soil, which raises a host of scientific and economic considerations of the utmost delicacy, is left in most cases to those who have not had any training in science or in the technicalities of agriculture. [41]

He believed that not to offer technical education to all those involved in agriculture was as absurd as '...entrusting HM's ironclad Inflexible , with its complex machinery, a floating laboratory, not to a scientific officer like Captain Fisher but to the skipper of a Yarmouth fishing smack...' [42]

The majority of foreign delegates including James Russell Lowell (the American Minister) attended the inaugural address. Lord Kimberley (1826-1902), the Lord Advocate and many highly placed individuals from education and training in Britain were also present, indicating the importance of the event. [43] Attendances were good and the discussions lively. A number of contemporary issues ran through all the debates such as the New Code , free education and the paucity of secondary schooling.

The I.C.E. was divided into four sections. Section (a) was dedicated to exploring health education, infant training and teaching, the organisation of elementary education, the inspection and examination of schools, gymnastics and physical exercise and the teaching of music. [44] A majority of women attended this section. The Rev T. Graham and Dr. Joshua Girling Fitch (1824-1903) who was a teacher, a writer on education and an inspector of schools and of elementary training colleges for women in England and Wales from 1885 to 94 were appointed as Vice Chairmen. W Severn, (1830-1904) a water colour artist and employee of the Education Department from 1852 to 1885 who was accredited by some with the revival of art needlework and embroidery was made the Honorary Secretary.

Section (c) explored the organisation of university education. [45] It was held in one of the smaller rooms and attracted a limited audience composed of mainly British academics. [46] Sir George Young (1837-1930) an administrator and author who showed a keen interest in education, was secretary to various commissions between 1870 and 80 and became chief charity commissioner for England and Wales (1903-06) and Francis Storr were appointed as Vice Chairmen of this section. W. R. Bourke was made the Honorary Secretary.

Section (d) explored teacher training, and the organisation of intermediate and higher education. [47] The Hon. E. Lyulph Stanley, M.P. and the Rev. James H. Rigg were appointed as Vice Chairmen of this section and C. R. Hodgson as the Honorary Secretary. The four sections operated simultaneously giving little opportunity to examine the interconnection between the themes. Four volumes, which recorded the proceedings of the conference, were published after the event. Volume 2 contained material on issues relating to technical education condensed into twenty topics.

Section (b) explored technical teaching, science, art , handicrafts, agriculture, domestic economy, subsidiary aids to instruction and thrift in schools. [48] The organising committee of technical education section of the conference included all the member of the Royal Commission on Technical Instruction. [49] However, The Times stated that in

> ...view of the vast importance of this branch of the education question it is somewhat to be regretted that no direct discussion is invited upon the Commissioner's recently issued Report. Happily, however much of the ground will be covered by the papers to be read on science teaching in elementary schools, and in training colleges, on workshop instruction and manual training schools, on technical teaching, cookery, drawing and colouring and more particularly on agricultural science. There is little doubt, therefore, that this section will be well attended on each of the four days its attention is directed to the consideration of technical teaching. [50]

In practice the Commission was alluded to but not discussed in any depth. However, the British proponents of technical education were given an opportunity to speak to an audience from abroad and foreign delegates (from Belgium, Spain and the USA) were able to share their experiences directly with their counterparts in England. Philip Magnus and B. St. John Ackers were appointed as Vice Chairmen of this section and E. M. Dixon as the Honorary Secretary. [51]

It was opened by A. J. Mundella on August 4 th. The inaugural address was provided by Philip Magnus who spoke on The problems in technical education. He believed that technical education was a subject that was poorly understood. He complained that despite great publicity about the issue, there was still a lack of consensus across Europe about what form it should take. [52] He maintained that failure to solve this problem would result in a loss of effectiveness of technical education. [53] Magnus suggested that the extent to which the practical should be combined with the theoretical in the education of entrepreneurs, managers and technologists also needed to be addressed. He chose this event to express his views about a number of other related issues. He felt that for artisans '...technical

education must rest on a basis of sound primary instruction, and that technical teaching can avail little where primary instruction has been neglected...' [54] At the same time he insisted that the core curriculum should be complimented by the teaching of drawing. [55] Magnus believed literary education still prevailed. [56] He was adamant that it was ill-suited to the needs of a large proportion of the population including all the labouring classes. He claimed that it represented

> ...the survival of a method well enough adapted at one time to those who alone received education, but unintentionally extended to other classes who, on account of the differences of their pursuits, require a totally different system of education. [57]

Magnus took this opportunity to comments on a subject that had already been widely debated in England, the value of manual instruction in the elementary school. This was a subject which was more universally appreciated than technical education. Using examples from his knowledge of foreign systems, he illustrated the good and bad points of schools such as the Ecole des Apprentis in Paris and Le Havre and the Ecoles des Arts et Metiers in Chalons, Aix and Angers. He felt that they embodied an old fashioned idea of training and were only valuable when they provided instruction which included the use of modern machinery. [58] He noted that similar examples of these institutions did not exist in England. His believed that

> ...where workshops are introduced into elementary schools the instruction should be rather disciplinary than professional, and should have for its object not the teaching of a trade , but the imparting to the pupil a general knowledge of, and familiarity with the use of such tools as are required in almost every kind of work in which the pupil may afterwards be engaged. [59]

He suggested that this form of training should not begin until the end of elementary education. Magnus tried to address the issue of how best to provide evening classes for artizans. He was aware of the problems generated by the conflict between his organisation, the City and Guilds Institute, and the

Department of Science and Art, particularly in provision of examinations. He could not offer a solution to the vexed problem of satisfying the demands for training from such diverse industries as printing and watchmaking. He did suggested that the study of foreign languages, particularly French and German, should form an important part of technical education. [60]

This was a moderate speech that raised some contentious issues but ignored many others. He could have used his experiences as a member of the Royal Commission on Technical Instruction to summarise the key questions associated with the expansion of technical education but did not do so. The nature of the audience he was speaking to may have influenced what he had to say. It was composed of a few uncritical foreigners who were eager to hear his opinions and less sympathetic colleagues from home who would scrutinise his word closely.

Other speakers with the same perspective as the technical educationists added to the debate started by Magnus. John F. Moss a teacher at the Allen Glen School in Glasgow, believed that every

> ...large public elementary school would be all the better for having a room fitted with benches and supplied with a few tools, so that elder scholars might be taught in their leisure hours how to use the saw and he plane and thus become more helpful and handy. But it would be hazardous to attempt any interference with the ordinary work of the school. [61]

He also maintained that the teaching of a trade should be done systematically and expressed the hope that '...the day is not far distant when England will outshine every other country in the thoroughness of its system of practical education for people of every condition in life...' [62] R. Clough, a teacher of practical subjects stated that the '...the question was not so much how to give technical education to students, as how to interest the employers, who would be directly benefited by such education [63] William Garnett, Professor of Engineering, University College Nottingham and later Secretary of the London Technical Education Board,

suggested that the nature of technical education in England was to teach a student to understand what he saw rather than follow the practice of some Continental schools of teaching him to produce what he has not seen. [64] He strongly believed that the continental approach was the best one and he developed radical ideas to support his thesis. He suggested that children in nursery schools should to be encouraged to reason and to seek understanding about the world around them by letting there be '...more toys and fewer books in our elementary schools, and by making a right use of them, our children will become mechanical engineers without knowing it...' [65] He also felt that the first two or three years after a child left school was a time of special need, when the nature of the opportunities provided for the continuation of their education were critical. He also suggested that evening classes were pivotally important and should be made available either by direct provision or through the use of higher technical schools. He maintained that apprenticeships should not be dominated by practical experience in the workshop but be combined with at least two years in the classroom. Garnett believed that the Mechanical Technical School in Nottingham, which catered for the educational needs of those who had left school, was an ideal role model. The school offered day and evening classes for those with a fairly good general education, evening classes for trade apprentices and a range of opportunities for those workmen who wished to further their education.

A different perspective on technical education, one which illustrated how its development was closely linked with cultural and social mores, was provided by several contributors from abroad. C. M. Woodward, speaking about manual training schools, observed that it

> ...would be unpopular in America, where all men are born equal, for any school to set out to train children to occupy positions in life which are held to be low in the social scale. If we aim directly at any, we must aim at the highest...[66]

This was a statement of aspiration rather than fact but contrasted sharply with the English notion linking the provision of technical education to the existing social hierarchy. Woodward expanded his premise further by stating that Americans had for too long tolerated a one sided system in which

> ...books and literary culture monopolizes the machinery of the schools and shut out other kinds of culture as useful, as noble, as intellectual, as humane as that of letters. We are learning that one must be useful before he can be ornamental, that the mechanical arts must precede the fine arts, that in this age, which I ventured to call the DYNAMIC AGE, there are other forces to be studied and utilized beside those of authority and tradition...[67]

He suggested that this viewpoint had become so universally accepted in the United States that technical education was now considered to be a right without social stigma attached to it and that the '...only aristocracy is that of intelligence.' [68] Professor Giner de Los Rios (Madrid University), in his account of what was offered at the Institucion Libre De Ensenanza, said that Spanish technical education was founded on a consistent and systematic whole, governed by one spirit and scheme. He explained that

> ...the chasm which at present separates the different grades of (a) workmen , (b) foremen , (c), master engineers and (d) architects ought to be absolutely bridged over for it is perfectly false to maintain that the one class should be formed in the workshop solely by empirical and manual practice, and the other in the theoretical school without any practical study whatever. [69]

However, he noted that the workman, like the engineer, had to start with a general education '...fuller and more fully subdivided in each grade as you go higher up, but in all solid and integral...' [70] Giner de Los Rios also believed that the transition from general to special (technical) education must be slow and gradual and that they should not be mutually exclusive because '...a man does not cease to be a man on becoming an engineer...' [71]

The dangers of uncritical acceptance of ideas from abroad had already been raised but the extent of how much governments should intervene in all forms of education was a central theme of the conference. [72] The notion that education should be overseen by a centralised and all powerful ministry pervaded the work of the first three sections and the necessity for a Minister of Education was dealt with during the concluding meeting. The creation of a Ministry of Education had been resisted in England for over fifty years on the grounds that it would be too intrusive. The debate had been at its most acute in Parliament in 1874 when Lyon Playfair raised the issue of dissatisfaction with the Committee of Council. [73] At the I.C.E. Viscount Lymington had commented upon the need for a Minister of Education, observing that since the state sanctioned interference with parental responsibility and claimed the right to treat education as a national necessity,

> ...the principle of laissez-faire is already abandoned , leaving behind it only the question of degree to which voluntary effort and the personal responsibility should remain free from centralising influences. [74]

He argued that the current situation was unacceptable because the Minister '...who is responsible for the general policy of education has not the necessary control and selection of those who are instrumental in its efficient and harmonious administration...' [75] To compound matters the Education Department (set up as an off-shoot of the Privy Council in 1839) did not have Ministry status and retained '...the functions of an accountant, not a policy maker. ' [76]

T. E. Heller, member of the London School Board from 1873 to 1885 and also secretary of the National Union of Elementary Teachers, made reference to crisis in English education that would not be resolved by centralisation. He stated that about only half of those who should be in school on a daily basis were present. He believed that this situation was exacerbated because in

> ...many districts the members of the School Boards and attendance committees refused to apply the law, and in other places the magistrates distinctly avowed their intention not to convict offenders or did it with so much reluctance as to destroy the exemplary effection of convictions. In some rural and urban districts the very persons elected to carry out the law of compulsory attendance were those who infringed its provision by the illegal employment of children. [77]

He also noted that '...prison had no terrors for the bad parents, and it affected only the respectable parents.' [78]

Lord Reay commented that events of the week signified that there was '...a great deal in our education system that requires reform.' [79] Francis Storr believed that although the conference

> ...had shown us our defects, and though perhaps nothing very distinctive had been struck out as to the way in which existing gaps were to be filled up, still this Socratic process of showing us our ignorance was itself a gain. [80]

The Times was more pragmatic stating that John Bull will now be asking

> ...what is to be the outcome of it all. He cannot be expected to study in detail the mass of the matter which, if produced in one continuous section instead of simultaneously in four separate sections, would have occupied 100 hours in delivery. But he does not want to know whether or not the leading subjects of educational debate are ripening for practical solutions, and if so for what, and his curiosity rises to anxiety when he inquires as to the possibility of England departing from her old policy of letting the tree grow pretty much as it will, and adopting in its place the continental method of pruning it into rigid conformity to three pattern devised and set fourth by central authority. [81]

Dr. J. H. Gladstone F.R.S., member (1873-94) and Vice Chairman (1888-91) of the London School Board placed emphasis on technical education outcome. He believed that the Conference had enabled those who attended to learn how to appreciate

> ...something of this great movement which had been initiated by the Guilds of London, in carrying out their ancient trusts, and in organising this great movement for technical education of the country. They had learned at the same time how they were behind in all matters connected with technical education, whilst at the same time they had visibly before them very definite grounds of hope for the future education of English artizans in all those matters which they required to know. [82]

Despite this positive note the event did not provide any guidance to the ordinary delegates on how to fund technical education. The Times noted that this question must '...remain over for consideration as well as for answer. [83] The conference ended with a banquet hosted by the Lord Mayor and this in itself drew attention to the progress that the issue of education

> '...as a state enterprise had made since 1870. Then legislation had been considered necessary for the provision only of supplementary elementary schools for the poorest sections of the community. Now fifty years behind the French, the British were apparently awakening to the importance of education at all levels as a national issue. [84]

However, a warning was issued to the reformers not to ignore the consensus amongst the delegates who believed that

> ...it lies with those who agitate for a radical change to show either from the proved failure of the existing system or from the better results produced by more uniform systems in other lands that the improvement desired by all is unattainable by any natural growth or expansion of that which, from small beginnings and oftentimes by very slow degrees, has developed into the Elementary Education system, such as it is, with which most Englishmen are more or less familiar. [85]

Reaction to the I.H.E. and the I.C.E.

The interest amongst the general public for news of both events was significant. This was reflected by the efforts made to record what had gone on. The International Health Exhibition was widely reported in The Times and the Illustrated London News. Detailed coverage of the International Conference on Education was provide by the School Board Chronicle and the Schoolmaster. The

official papers and debates were printed in four large volumes. They did not form the basis for legislative action. A hundred years later they were considered to be a useful archive which were '...less well known than the celebrated Government Reports but similarly valuable both for comparativists and historians.' [86]

The School Board Chronicle asserted that when hundreds of the most intelligent and active of the thinkers and workers in one field are brought together for a week '...to compare their ideas and interchange their opinions, a tidal wave is set moving which finds its way to all the parts of the world...' [87] This was a bold claim that belied a more prosaic reality. Although the event had an international dimension it can only truthfully be described as an internal debate governed by English politics and cultural mores, with foreign guests invited to add their opinions. It generated many new questions but offered few answers. Globally it caused hardly a ripple, whilst in England some innovation in elementary, technical and secondary education may be said to have been encouraged by it, a coordinated and coherent scheme to promote its growth was unforthcoming. Neither enthusiasm nor expertise were lacking, but

> ...failing a Ministry (which was finally established through the Board of Education Act of 1889) to consolidate its conclusions the national education system England so urgently needed could not come into existence. [88]

Plans were being made for another major exhibition almost as soon the doors of the I.H.E. were closed.

THE INTERNATIONAL INVENTIONS EXHIBITION (I.I.E.) 1885

The event

At the Fisheries Exhibition in 1883 the Prince of Wales suggested that much good might result from organising an event which illustrated a range of new devices and processes invented since the last major English exhibition in 1862. [89] This was not a new idea. The Society of Arts had been involved in organising such events for a number of years. The first was held in 1849 and displayed inventions taken from the Society's own collection. [90] It proved to be a success and became an annual occurrence that continued until 1861. [91] The Times accurately reflected popular feeling when it stated that it was a basic and pleasurable human instinct to witness a triumph of ingenuity, when '...a piece of mechanism which with apparent simplicity of action, performs some intricate and successful operation...' [92] The Times also reminded its readers that although entertainment was important, developing industry without endangering it was another reason for organising an exhibition that celebrated invention. [93] Some doubt was expressed about the wisdom of holding an event so soon after the International Health Exhibition. However, the appetite for such fairs had developed considerably. There were now members of the public '...whose support may be depended upon if only , in addition to the instruction which will be appreciated by a few, liberal provision be made for the many. ' [94] The popularity of the concept was indicated by the swift response to the call for funding. Almost half of the necessary £50000 required as a guaranteed fund had been promised even before the issue was made public. The Goldsmith's Company alone donated £5000. An additional £87000 was secured from private subscription to meet expenses.

The resulting International Inventions Exhibition (I.I.E.) was jointly hosted by the City and Guilds and the Society of Arts. Queen Victoria was patron and the Prince of Wales acted as president, as he done at both the Fisheries and Health Exhibitions. It was separated into two divisions. Divisions one concentrated on inventions and division two featured music. This followed the precedent established by the previous exhibition when heath and education were combined. [95] Sir Frederick Joseph Bramwell (1818-1903) was appointed the chairman of the executive committee which was charged with overseeing the event. He started his working life as an apprentice to the locomotive company John Hague Ltd. and became a recognised authority on municipal and water works engineering. He was a member and then appointed President of the Institute of Mechanical Engineers in 1874, chairman of the City and Guilds Institute between 1878 and 1903, president of the British Association in 1888, president of the Society of Arts and honorary secretary of the Royal Institute between 1878 and 1903. The vice-chairman was the Marquis of Hamilton. Other members of the committee included Sir Frederick Augustus Abel, Sir Isac Lowthian Bell, Colonel Sir Francis John Bolton, Sir Philip Cunliffe-Owen, Sir William Henry Preece, Professor James Dewar, Dr. Sir John Stainer and Warrington Wilkinson Smyth.

Sir Frederick Augustus Abel, C.B. (1827-1902) was a chemist and accomplished musician who was educated at the Royal College of Chemistry and joint inventor of cordite. He became Demonstrator of Chemistry at St. Bartholomew's Hospital 1851, lecturer at the Royal Military Academy Woolwich and Chemist at the War Department in 1852, President of the British Association Leeds in 1890 and Organising Secretary and Director of the Imperial Institute in 1893.

Sir Isac Lowthian Bell F. R .S. (1816-1904) was a metallurgical chemist and pioneer in industrial enterprise. He trained in physics and chemistry in Germany , Denmark , Edinburgh and Paris and started his industrial career by joining his

fathers ironworks in 1836. He was involved in the railways industry , iron and steel production and chemical works with various other members of his family including his brothers and father in law. He became a director for life of Bell Brothers in 1865 and was president of the Iron and Steel Institute 1873-75, the Institute of Mechanical Engineers 1884 and the Society of the Chemical Industry. He published widely on the principles and techniques associated with the production of iron and steel. He was M. P. for Hartlepool (1875-80) and mayor of Newcastle upon Tyne (1854-85) and (1862-63).

Colonel Sir Francis John Bolton, (1831-1887) was a soldier and electrician who with Philip Colomb developed a system for visual signalling and invented ox-calcium light for night signalling. He became Captain in the 12 th Foot in 1860, brevet major in 1868 and lieutenant colonel in 1877. He jointly founded the Society of Telegraph Engineers and Electricians in 1871 and designed and controlled the fountains and lights for exhibitions at South Kensington between 1883 and 1886. He was knighted in 1884.

Sir Philip Cunliffe-Owen (1828-1894) originally joined the navy at the age of twelve intending to devote his life to the sea. He had to abandon this notion after five years because of ill health and obtained a post at the Science and Art Department in 1854. He was appointed deputy general superintendent of the South Kensington Museum in 1857, assistant director in 1860 and director from 1873 until his retirement in 1893. Throughout his working life he was associated with a number exhibitions including Paris in 1855 and 1867, London in 1862, Vienna in 1873, Philadelphia in 1876, the Fisheries Exhibition in 1883 and the Health Exhibition in 1884.

Professor James Dewar F. R. S. (1842-1923) was professor of natural and experimental philosophy at Cambridge University from 1875 to 1923 and joint inventor of cordite.

Sir Edward Walter Hamilton (1847-1908) was educated at Eton and Christ Church Oxford Treasury Official. He became Private Secretary to Robert Lowe and Gladstone (1872-85), Permanent Secretary to the Treasury (1902-07). He was an associate of Goschen and became a K.B.C. in 1894, G.B.C. in 1906 and a Privy Councillor in 1908.

Sir William Henry Preece (1834-1913) F.R.S. studied telegraphy and telephony, was an early pioneer of wireless telegraphy and developed systems to improve railway signalling. He was also an electric engineer in the service of the Post Office (1870 -1904) and its engineer in chief from 1892-99. He was also president of the Institute of Civil Engineers and the Institution of Electrical Engineers.

Dr. Sir John Stainer, (1840-1901) organist and composer who was Professor of Music at Oxford (1889-99) and was knighted in 1888.

Warrington Wilkinson Smyth F.R.S. (1817-1890) was a mineralogist who published on topics such as mining and travel. He was born in Naples. and studied geology in Germany on Worts foundation. He was appointed mining geologist to the Geological Survey in 1844, lectured on mining to the School of Mines and was inspector of Crown Minerals in 1857. He was knighted in 1887.

Henry Truman Wood (1845-1929) was the secretary to the Jury Commission. Wood was educated at Harrow and Clare College, Cambridge, twice winning the Le Bas Prize. On leaving University he worked at the Patent Office where he developed a significant knowledge of new inventions. Wood subsequently joined the Society of Arts in 1872 and held the post of Secretary from 1879 to 1917 and Chairman from 1919 to 1920. He was knighted in 1890.

J. R. Somers Vine was the City and official agent. [96] H. Edward Cunliffe-Owen was the secretary.

The Executive Committee responsible for Music included Sir Philip Cunliffe Owen and Sir George Grove (1820-1900) the musicologist who started his career as an engineer superintending the erection of lighthouses and became the first director of the Royal College of Music (1883-94). Juries were appointed to assess the exhibits and award diplomas of honour and bronze silver and gold medals.

Although many manufacturers from Britain were keen to exhibit their wares others were reluctant to participate. Trade issues were becoming pressing. They believed that producers from England were

> ...struggling against formidable competition, in which they cannot afford to lose any one of the advantages which they posses. These advantages depend partly upon inventions which can be, and are, the subjects of patents , and which are thus protected in England as well as in other countries in which patents for them have been ordained. [97]

Caution was recommended when determining what went on display because the protection afforded by patents was not very reliable. It was pointed out that whilst in many foreign countries, especially Germany, patents were difficult to obtain

> ...it is freely said that German manufacturers have been permitted to inspect English and other foreign applications for patents which have been lodged with the officials, and that the processes referred in them have been in full swing in German workshops by the time the application has been refused. [98]

Even Bessemer suffered from this duplicity. It was suggested that some businesses should boycott the event or limit what they showed. There is no indication of the number who heeded this call.

Only a few foreign manufactures provided material for display. [99] Their numbers were limited partly because the letter sent by the Foreign Office inviting them to participate was dispatched at the last possible moment, leaving little time to prepare. [100] Nevertheless, Austria-Hungary, France, China, Greece, Italy, Japan, Russia, Siam and Switzerland all established official Commissions. The American

government did not become involved but wide publicity in United States resulted in many exhibitors participating independently. The lack of a German Commission was notable omission.

The same location as the International Health Exhibition was used to house this event but despite significant alterations the space available was still restricted. [101] Consequently, Sir Frederick Bramwell stated that he and his colleagues found it necessary '...to lay down rules by which prominence should be more especially afforded to those inventions which the public had not had the opportunity of inspecting at recent exhibitions.' [102] They also intended to confine the displays to those that illustrated processes and appliances and exhibit products only when they made a procedure more understandable or had a novelty value. Bramwell was keen to make sure that the exhibition did not become a trade fair at which manufacturers could simply display their wares, as they had done before. It was strictly against the rules '...to allot space for manufactured goods unaccompanied by the illustration of the process of manufacture.' [103] There was a suggestion that space be offered to the thousands of inventors '...with clever and striking machines, and articles of general usefulness, who are unable to exploit their inventions for the want of capital or for the want of publicity.' [104] It was not taken up. A Committee of Advice was formed to cope with vast number of applications and '...eventually only those inventions which appeared to be of sufficient public interest or importance were admitted.' [105] Other restrictions were imposed on those who got through the first stage of the selection process. Some exhibitors were required

> ...to pay for any gas or water they may require. No charge will be made for space ; but exhibitors will have to pay every expense of conveying, delivering, fixing and removing their exhibits and also the cost of erecting counters to display them on. [106]

Division one was subdivided into 31 groups. These categories reflected the preferences of the organisers and help to determine impact of the exhibition. It appeared that those responsible for making the choice had taken a balanced view of what to include. Group I was devoted to Agriculture and Horticulture and was separated into seven classes. Products from 99 British firms were displayed including portable steam engines and ploughs, mowing reaping and hay making machinery, seed drills, dairy and horticultural appliances and a variety of labour saving devices. A company owned by Bernhard Samuelson exhibited a sheaf binding harvester. Group II was devoted to Mining and Metallurgy and was separated into four classes. Products from 110 firms were displayed including deep boring, rock drilling, hauling and lifting machinery, coal breaking and cutting appliances, explosives, pulverising and sorting equipment for ores and minerals and various safety lamps. The Bessemer and Siemens processes and the Gilchrist Thomas system along with other features of the metal industry were also on display. Group III contained Engineering Construction and Architecture and was separated into thirteen classes. Products from 190 firms were displayed including exhibits relating to the design, construction of houses, factories, public buildings and harbours, bridges, docks, breakwaters, tunnels, roads and railways, mechanical methods of excavation, digging foundations and the manufacture of lifts and accumulators. Group IV was dedicated to Prime Mover and was separated into four classes. Products from 195 firms were displayed including engines driven by steam, gas, hot air and water pressure, water wheels, turbines, steam generators, shafts, transmission systems and hydraulics. Group V contained Railway Plant and was separated into five classes. Products from 66 firms were displayed including commercial plant and safety systems. Group VI was separated into four classes which were devoted to Road Carriages and included carriages, cabs and carts and a vast array of bicycles, tricycles and accessories. The bicycle had become so entrenched in popular culture that it was predicted that on

> ...the well paved streets of towns, and on the better class of country roads, there is apparently no reason why they should not to a great extent supersede (sic) the use of the horse and cart for the purpose of retail tradesmen. [107]

Group VII was devoted to Naval Architecture and was separated into two classes. Products from 120 firms were displayed. A common feature of all the exhibits in this category was the universal adoption of steam as a means of propulsion and a change from wood to iron , and then iron to steel as the principle construction material. An improved understanding of the laws of motion and floating bodies, the role of watertight transverse bulkheads in promoting safety and improved steering, stowage and discharge of cargo was evident. It was just half a century

> ...since Scott Russell commenced to raise ship building from the position of merely empirical practice to that of scientific art, but the last half of that period has witnessed a wonderful development of our theoretical knowledge of the laws of resistance to the motion of floating bodies, and other problems involved in propulsion. [108]

According to Sir E. J. Reed, M. P. the progress made in naval architecture during the 25 years which were covered by the inventions displayed in the exhibition was '...greater and more remarkable than the aggregate progress made in all the preceding ages of the world.' [109] However, the navy only provided models of ships designed at least ten years earlier for display. There was similar reluctance in the commercial marine sector. [110] Group VIII was devoted to Aeronautics, separated into two classes and included models of proposed flying machines and improvements in balloons. Group IX was committed to Textiles and Fabrics and was separated into twelve classes. Products from 60 firms were on display including machinery involved in the manufacture of cotton, linen, woollens and worsted, hosiery, carpets and a continuous bleaching machine from Mather and Platt. Most of the improvements in these devices related to their accuracy and efficiency. Group X was devoted to Machine Tools, which were separated into three classes and included items for working in metals, wood, stone and other

resistant materials. Most were similar to those seen in 1862 and only manifested improvements in detail. Group XI was dedicated to Hydraulic Machinery and was separated into four classes. This had become a popular alternative to steam as a means of transmitting power and was found in equipment for forging, riveting and raising and lowering cargo. It was also used by the armaments industry for the working of heavy guns. Group XII was devoted to Elements of Machinery and was separated into two classes. There were very few contributors to this section. Group XIII concentrated on products associated with electricity and was separated into twelve classes. Products from 110 firms were displayed. There were very few demonstrations of the practical applications of electricity in the 1862 exhibition, apart from telegraphy and metallic platting. However, it was evident that 1885 it has penetrated '...into nearly every branch of practical engineering.' [111] The items exhibited, most of which had been developed in the previous ten years, included dynamos and motors (enabling the transmission of electricity over great distances) generators, batteries, lighting and electro-metallurgy for the production of metals such as cooper. A sexduplex telegraphing system based on one that connected Providence, Rhode Island to Boston was also on display. [112] Two additional inventions celebrated in this group were the electric light and the telephone and it was confidently predicted that both would have a significant impact on society. [113] The employment of electricity for the purpose of lighting was

> ...undoubtedly one of the most striking instances of the application of science to the purposes of daily life...the method we have adopted will, it is believed, render any sudden failure of the lights impossible, and will favourably display the most recent and improved apparatus and advances that up to this date have been made in electrical lighting. [114]

The rate of change was marked. Only a year earlier the International Health Exhibition had been lit mainly by oil lamps. [115] Group XIV was devoted to Applied

Chemistry and was separated into three classes. Products from 50 British firms were displayed including examples of the ammonia soda process and the improved utilisation of the bye products from gas works. Chemistry had become increasingly important to industry and there were '...few branches of applied science from metallurgy to calico-printing in which a knowledge of chemistry is not more or less useful.' [116] Group XV was dedicated to Gas and other Illuminants and was separated into six classes. Examples of apparatus for the manufacture of coal gas, gasoline and other gas making machinery and equipment were on display. The petrochemical industry, which had only been developed since 1862 , was well represented. [117] Group XVI, Fuels and Furnaces, Group XVII, Food, Cookery and Stimulants and Group XVIII, Clothing were explored fully in the Health Exhibition and received little space. Group XIX contained jewellery products. Group XX was devoted to Leather and was separated into three classes. Little of note, except the invention of a method for speeding up the tanning process was on display. Group XXI was assigned to inventions from the India Rubber and Gutta Purcha industries and Group XXII was devoted to Furniture. Group XXIII contained Glass and Pottery and was separated into four classes. Products from 25 firms were displayed including a process of toughening glass through the application of oil. This group had, like many others, been fully covered in the previous year. Group XXIV was dedicated to Cutlery and Ironmongery. Group XXV was devoted to Fire Arms, Military Weapons and Equipment and was separated into seven classes. Products from 70 firms were displayed. The Official Catalogue stated that if the improvements in technology for peaceful purposes could be described as truly remarkable then '...the progress attained in the destructive arts of warfare are not less impressive...' [118] Bigger, stronger and more accurate and powerful weapons were being developed, largely as a result of the introduction of new metals such as steel and the improved quality of gunpowder. Group XXVI was assigned to Paper and Printing products and separated into seven classes. Two key

facets of this industry were reflected in the exhibits. The consumption of paper in Britain was enormous and if a method (1862) to produce it from ground wood rather than rags not been developed, a severe shortage would have ensued. The introduction of the photographic plate also had a significant impact on the printing process. Group XXVII devoted to Clocks and Watches. The Waltham Watch Company exhibit was one of the chief attractions from the USA. [119] Group XXVIII contained Philosophical Instruments that were separated into four classes including the mercurial air pump for producing a vacuum and the spectroscope for chemical analysis. Group XIX was dedicated to Photography and was separated into three classes. Products from 50 firms were displayed including examples of the new negative plates and the use of bichromated gelatine for print production. These developments, combined with new equipment, put photography within the reach of the amateurs Group XXX was devoted to Educational Apparatus. This group had been fully represented in the Health Exhibition. Group XXXI contained *Toys and Games.* [120] The range of categories serve to illustrate how pervasive technology was becoming. Division two was split into 3 groups covering musical instruments and appliances, music engraving and printing and a loan collection of antique instruments.

The exhibition was located in the buildings erected in the gardens of the Royal Horticultural Society at South Kensington. [121] Machinery was exhibited in the West Gallery. The South Central Gallery housed the furniture exhibition. The Eastern Annex housed the education, aeronautics, paper and printing exhibitions. Clothing and leather exhibitions were located in the East Quadrant. The West Quadrant housed the rubber, pottery and glass exhibitions. The carriage building and naval architecture exhibitions, which included Lord Wolseley's Nile boats and a steam launch were in the Queens Gate Annex. [122] Agricultural equipment and the music exhibition were located In the Central Gallery. The armaments

exhibition was housed in the prominent South Gallery. Nearby were the articles related to the railway industry. [123]

The exhibition was opened by the Prince of Wales at noon on May 4 th. He was accompanied by his wife and the Duke of Cambridge, the Duke and Duchess of Edinburgh, and the Prince and Princess of Schleswig-Holstein. The ceremony was held in the conservatory of the Albert Hall. [124] Amongst those in attendance were the old enthusiasts Sir Lyon Playfair, Professor Huxley (now President of the Royal Society), A. J. Mundella, Captain Douglas Galton and Owen Roberts of the City and Guilds Institute. A light show designed by Sir Francis Bolton accompanied the event. Some argued that the show trivialised exhibition but it also added to its popularity. [125] Indeed, The Times suggest that if there were no inventions to be examined and no music to listen to '...save that which is eloquently discoursed by the military bands, the scene of beauty presented by the gardens at night would alone suffice to attract the crowds...' [126]

Nearly four million people visited the exhibition during the six months it was open. The average daily total was 23,071. [127] Attendance was encouraged because of the ease of transportation to the site. The railway companies published an International Inventions Exhibition Time and Guide Book which contained a small outline map of the railways and stations around London and a list of all the trains that ran towards the exhibition, indicating their frequency. [128] The first edition was issued free, through the postal system, to all households within a 20 mile radius of the exhibition site. [129] There was also a covered walkway from the underground railway station at South Kensington to the exhibition which facilitated easy access.

Reaction to the I.I.E.

The reaction to the event in the popular press was mixed. [130] Aspects of both divisions were reported by The Times but music received extensive coverage. No reference was made to it in the School Board Chronicle. Short descriptive catalogues, written by scientists and men of eminence, were printed but they were not widely circulated. [131] The impact of the exhibition was also limited because unlike earlier events, it was only accompanied by two conferences, one on the patent laws and the other on musical pitch. It also could not claim to have had a significant influence on international affairs because of poor foreign participation. It was however, popular on a local level. According to the Illustrated London News the Inventories, as it became known, was the favourite recreation ground of Londoners. [132] The strategy of using entertainment to attract visitors was clearly successful. At the same time the organising committee hoped that as

> ...the vulgar proverb warns life is not all beer and skittles it may occur to a serious minority that an Inventions Exhibition does not consist entirely of pleasure gardens, fountains, illuminations and bands of music...[133]

The extent to which this objective was achieved is questionable. The remarkable emergence at the exhibition of a number of new British high technology industries *passed with little comment. In addition at the I.I.E.* , which had a unique potential to highlight the weaknesses in manufacturing that the technical educationists had continually warned of, no sense of failure emerged. It seems that the entertainment element overshadowed the significant advances British industry had made in new fields without the technical education reforms that had been advocated for more than twenty years. This is particularly significant because the claim that trade was under threat led to a royal commission sitting at the same time as the I.I.E. .

The Royal Commission on the Depression of Trade R.C.D.T. (1885)

Origin

The Royal Commission on the Depression of Trade (R.C.D.T.) was the official response to a general sense of malaise that pervade some segments of the industrial community. It provided an opportunity to compare the progress of Britain with that of other countries. and would inevitably address the issue of technical education. It was convened on the August 29 th 1885 to inquire '...into the extent, nature and probable causes of the depression now recently existing in various branches of trade and industry' [134] The idea to hold such an investigation was not new. It had been suggested on a number of occasions by politicians including Lord Beaconsfield, the Earl of Dunraven and by E. Goschen. [135] The eventual chairman of the R.C.D.T. , Stafford Henry, Lord Iddesleigh, the First Lord of the Treasury, explained to parliament the rationale for turning the idea into a reality. He suggested that the economic condition of the country over the previous twelve years and in particular the last two, had led to many cries for help. It therefore seemed to the Government to be a

> ...right and proper and desirable thing that an inquiry take place to get as far as possible at the real facts of the case and to ascertain what this depression is, and how it is working, and what is the *probable outcome of the present state of things if nothing is done.* [136]

In a country which had regarded the terms of trade as fixed once and for all in 1846 the appointment of the Commission was not welcomed. Arthur Arnold M.P. for Salford (1880-1885) suggested that it was a '...quack remedy ' for the economic ills that beset the country. [137] Others claimed that it was an electioneering ploy which would enable the Conservatives '...to pose as the friends of the working man, who were going to inquire into the causes of his troubles and

discover some brand new way of alleviating them.' [138] Iddesleigh was adamant that the Commission would not be charged with establishing policy but ascertaining the facts. This had particular importance for the technical educationist. The Economist claimed that it was doomed to failure because the facts were already in the public domain and it would not be able to elicit from the witnesses '...anything which is not notorious to all men of business, and which economists and practical men alike have been writing and talking about for years past.' [139] The Economist also prophesied that Lord Iddesleigh and his colleagues would combine this old information with the odd pertinent comment and embody it in a big Blue Book '...which will be published at some expense to the country, and forgotten almost as soon as it is issued; and the matter will end. ' [140]

Personnel

Lord Iddesleigh made great efforts to convince a number of prominent politicians who were noted for their interests in education, including John Slagg, E. Goschen and W. E. Forster, to join him. They declined, citing a variety of reason for their non participation. The potential conflict between the Fair and Free traders probably had some bearing on this decision. [141] The Commission eventually included commentators on economics Robert Harry Inglis Palgrave, formerly editor of the Economist; George Auldjo Jamieson, President of the Scottish Society of Accountants, and Bonamy Price, Professor of Political Economy at Oxford; politicians William Farrer Ecroyd, M.P. for Preston; Charles Mark Palmer, M.P. for North Durham; William Henry Holdsworth, M.P. for Manchester; William Lawies Jackson, M.P. for Leeds; Philip Albert Muntz, M.P. for North Warwickshire; Samuel Storey, M.P. for Sunderland and James Porter Corry, an M.P. and a shipowner from Belfast; industrialists Sir James Joseph Allport, formerly the general manager of the Midland Railway; John Aird, a partner in the firm of Lucas and Aird, a major

employer; David Dale, an iron manufacturer from Darlington and William Pearce, a shipbuilder who worked for the Glasgow company of Elder and Company; merchants Neville Lubbock (brother of Sir John), a sugar trader and Lionel Loius Cohen, a financier and others such as Thomas Wyndham, Earl of Dunraven and Mount-Earl , cousin to the Queen and Under Secretary of State for the Colonies and Thomas Birtwistle, Secretary to the Weavers Association. The single representative of the working class was symptomatic of how little political attitudes had changed, despite two recent Parliamentary Reform Acts.

Witnesses

A variety of means were used to answers to the central question posed by the Commission including seeking the direct testimony of a range of witnesses drawn from government agencies, the working class, various Chambers of Commerce and other trade associations. Over 90 were called to testify. [142] Nine official witnesses were also requested to provide evidence. A questionnaire asking for information was issued to Diplomatic and Consular offices abroad and to various organisations representing the working classes.

The witnesses drawn from industry had many theories to explain the poor state of trade over the previous decade. William Coare Brocklehurst an M.P. and a silk manufacturer from Macclesfield was in little doubt why the Britain was experiencing difficulties. He believed that it had suffered

> ...for want of what our people require, namely technical education. We feel it very much when we go to France, where we find that the Government of the country has paid considerable attention to the teaching of their workpeople; whereas in England the teaching has been very much neglected indeed, and we feel the want of technical schools and technical education more now than ever...I think from my own practical knowledge, that we are very far behind in information and education as compared with those who have been taught in the technical schools of France and Germany. [143]

His views coincide with those of the technical educationists. Some believed that the situation was compounded further because the reputation of the British workmanship had languished as consequence of the overall lack of technical training. [144] They suggested that communities abroad were therefore increasingly meeting their own commercial needs rather than buy from Britain. However others blamed the apparent difficulties on '...fluctuations in the price of cotton, bad harvests at home and in India and China, the decline in the silver exchange, strikes and lockouts, excessive production and overtrading.' [145] An alternative theme that ran through the evidence of some, but by no means all of the remaining witnesses was the increasing severity of industrial competition, both at home and in neutral markets. They contented that others countries were now openly competing with Britain in markets where a monopoly had formerly existed. [146] Reports from abroad also showed that in every quarter of the world the Germans in particular appeared to be winning new customers because they had a knowledge of the markets of the world and

> ...a desire to accommodate themselves to local tastes or idiosyncrasies, a determination to obtain a footing wherever they can and a tenacity in maintaining it, they appear to gaining ground...[147]

The British, in contrast, were more reluctant to embrace other cultures in search of new markets. The Times, reporting on the work of the Commission, acknowledged that

> ...we seem to be particularly deficient as compared with some of our foreign competitors; and this remark applies...to the ordinary commercial education which is required in mercantile houses, and especially the knowledge of foreign languages. [148]

Reports

The first report of 229 pages was issued on November 7 th 1885. The second report was issued on March 31 st 1886 and consisted of nearly nine hundred pages. [149] The third report of 496 pages was issued on June 18 th 1886 and the final report of 139 pages was issued on December 21 st 1886. In the final report the Commission stated unequivocally that '...the trade and industry of the country are in a condition that may be fairly be described as depressed...' [150] It argued that the trend had started in 1875 and continued unabated except for the period from 1880 to 1883. In practical terms the depression meant a decline in, or a complete absence of trade, and a corresponding reduction of employment opportunities for the working classes. The most acute problems were felt in the agricultural communities.

The Commission identified a number of factors which contributed to the depression recognising in particular that in trading matters tariffs were now the major issue. They also indicated that a general fall in prices, foreign competition in neutral markets, an increase in local taxation, cheaper transportation costs abroad, legislation relating to employment had an impact. Lord Iddesleigh and his colleagues made reference to the superior technical education of the workmen in foreign countries as the last of these causal factors. They did not attach any importance to the growth of new and more technically biased industries .

Conclusions of the R.C.D.T.

Iddesleigh and his colleagues declared that it that was no longer possible '...to maintain to the same extent as before the lead which we formerly held amongst manufacturing nations of the world...' [151] The Commissioners also

judged that even if the natural advantage was no longer enough to maintain the status of their countrymen they still possessed

> ...the same physical and intellectual qualities which gave us so commanding a lead: and we see no reason why, with care , intelligence , enterprise and thoroughness we should not be able to advance. [152]

Indeed, they felt that the general condition of the country '...affords encouragement for the future.' [153] To address the difficulties referred to by the witnesses Lord Iddesleigh and his colleagues recommended that the cost production should be reduced , new markets identified and explored, the offices of Diplomatic and Consular offices should be used to support commercial activity abroad, fuller statistical data on home trade produced, transportation should be improved, legislation created to avoid counterfeiting and technical and commercial education should be enhanced. [154] They suggested that the information which they had collected would dispel '...much of the misapprehension which appears to prevail on the subject of our commercial position, and...encourage a more hopeful view of the situation...' [155] The Commissioners believed that

> ...a large part of the prevailing complaints and the general sense of *depression may be accounted for by the* changes which taken place in recent years in the appointment and distribution of profit. [156]

They also concluded that on

> ...taking the industries of the country as a whole, and having regard to the figures of a series of years, there is not any diminution in the aggregate of commodities produced by British capital and British labour. [157]

Finally Lord Iddesleigh and his colleagues recognised that the increasing severity of the competition from foreign countries was '...a matter deserving more serious attention than it has received at the hands of our commercial and industrial classes. ' [158]

George Booth, Lionel Cohen, Henry Gibbs, George Jamieson and Robert Palgrave signed the final report of the Commission but they deemed it too optimistic and though that '...it minimises the depression proved by the evidence submitted to exists.' [159] Their objection was acknowledged separately. Thomas Wyndham, William Ecroyd, Philip Muntz and Neville Lubbock (who were branded a group of Fair Traders by the Economist) refused to sign the main report because they, like Booth and his colleagues, believed that depression was much more severe than described. They produced a separate 13 page report which was dated December 20 th 1886. In it they concluded that it would be difficult to estimate the extent

> ...to which our industries have been aided in different ways by the advance of elementary, scientific, artistic and technical education during the past twenty years. But we must not rest upon our oars; for in certain respects some of our foreign competitors appear to be in advance of us, and it is evident that in neutral markets we shall only be able to hold our ground by a continual advance in intellectual training, scientific knowledge and true artistic taste on the part of both employers and workmen. In view of these facts, attention has of late been wisely directed to the importance of technical education, for though in some of our great industries the best of all technical schools must always be the well ordered factory or workshop, there are other important manufacturers in which the technical instruction imparted in schools specially organised for that purpose will be indispensable. [160]

Reaction to the R.C.D.T.

The fact that the Commission could not unanimously agree about the extent of the depression and what caused it meant that, at its best, it could only have a limited impact. The Economist unkindly suggested that the R.C.D.T. contained '...nothing which was not previously patent to all and beyond a modification of the old exhortation to 'Trust in God and keep your powder dry', it has practically nothing to recommend.' [161] This was unfair because Iddesleigh and his colleagues gave prominence to the tariff issue which was a new development. However, the Economist was correct when it stated that their work did not have '...any better a

chance of being followed now that it has been enshrined in a Government paper.' [162] The Commission failed to convince the politicians of the importance of the terms of trade. The Times provided a limited report on the R.C.D.T. which gave prominence to the views of those members who disagreed with the sentiments expressed in the final document. In the meantime the cause of technical education had not been abandoned.

THE TECHNICAL INSTRUCTION ACT (1889)

Origin

The cycle of exhibition and investigation repeated itself with since 1867, but very little real change had resulted from them. However, between 1887 and 1889 periodic efforts were made in parliament by individual members to create legislation that would enable direct support for technical education. [163] What these attempts reveal is less the degree of indifference in the government to this issue, but more the determination of the enthusiasts not give it up despite the emergence of other factors contributing to Great Britain's trading performance. Sir Henry Roscoe, George Dixon, Sir Lyon Playfair and Sir John Lubbock introduced the first abortive Bill to promote technical education in January 1887 but it was not officially supported. [164] The failure of the Roscoe Bill directly led to the formation of the National Association for the Promotion of Technical Education (N.A.P.T.E.) in June 1887. The Association was particularly concerned with developing '...the intelligence of those of all classes upon whom our industries depend.' [165] and mounted a vigorous campaign to promote the cause of technical education. In some senses this represents the transformation of the technical educationists into a formal organisation. It was chaired by Lord Hartington and had twenty vice presidents including Henry Broadhurst, Sir John Lubbock, A. J.

Mundella, Sir Lyon Playfair and Sir Bernhard Samuelson. The Executive Committee was composed of Sir William Kay-Shuttleworth, Philip Magnus and Swire Smith. Members were drawn from School Boards, trade unions, Chambers of Commerce and Parliament. [166] There were many specialists in education but they generally lacked industrial expertise. Local branches were founded in areas such as Birmingham, Bradford, Leeds, Liverpool, Newcastle and Oldham. Hartington explained that the Association had developed a common notion of the meaning of technical education. [167] The Association had been encouraged by the passage of the Scotch Technical Schools Act 1887. Hartington regarded it as particularly significant because for the first time parliament recognised that technical education was '...a fitting subject for direct local as well as indirect public support.' [168]

The Association was fortunate in gaining the support of Sir William Hart Dyke , Vice President of the Committee of Council for Education who introduced the first Technical Instruction Bill sponsored by the government at a late sitting on July 19 th 1887. He apologized to his colleagues for bringing it to their attention because of the size of legislative programme they already had to deal with, but he suggested their time '.. may not be wasted in discussing such a proposal.' [169] Hart Dyke pleaded that there were extenuating circumstances for introducing this topic. He suggested that it had generated a considerable amount of strong feeling amongst the working and artizan classes for many years and warranted further attention. [170] He also believed that industrialists had begun to recognise that

> ...although all the commercial depression we are suffering from may not arise from the lack of technical and commercial education in this country, yet some part of it is due to the fact the foreign and Continental nations have had great advantages over us in regard to the technical training and special industrial training they have had in their youths. They have for years past outstripped us in this race , and have gained very material advantage thereby. [171]

Hart Dyke used the findings of the Royal Commission on Technical Instruction to forward his argument. He asserted that the Commissioners had shown that

> ...there was a considerable difference between the English treatment of the educational question and its treatment in other countries. They also pointed out that, with the exception of France, there was no European country of the first rank that has an Imperial Budget for educational purposes comparable to our own; and they further pointed out that with reference to existing educational institutions in this country-alluding to the Science and Art Department at South Kensington-they will not alone accomplish the object aimed at, and localities must depend more than they have done hitherto on their own special exertions. [172]

This was the basis on which he formulated his legislation. He proposed that Local Authorities, either School Boards where they existed and Town Councils where they did not, be given the power to levy a rate for the establishment of new technical schools or in support of existing institutions. Neighbouring Local Authorities would be allowed to combine their effort, thus saving expense to the taxpayer. They would also be authorised to supplement existing teaching in public elementary schools with technical instruction during the day or evening. Hart Dyke considered this to be one of the most valuable provisions of the Bill. [173] The directorate of the Science and Art Department would control the scheme despite the feeling amongst some Members that this South Kensington agency was '...a rather expensive toy.' [174] The measure would only apply to the education of those scholars who had had reached the Sixth Standard. [175] Local ratepayers would be allowed to veto any proposal made by under the Bill (providing at least fifty or a third of the total number objected) except in London. This feature was included to placate those who were bound to object to additional taxation. Hart Dyke stated that everybody disliked the rates

> ...and I think therefore in a measure of this kind , if you are to get a fair chance of success you must be careful to show not only that the ratepayer has some adequate protection, but also that it would be valuable if we could show that the Bill is essentially a cheap Bill so far as its working is concerned and that great consideration in some respects is shown to the ratepayers in regard to the actual expenses which the Bill may inflict. [176]

He believed that the statute would be popular and would not stifle voluntary effort as some had implied. [177] He was also confident that it would enable both pupils and the industrial localities in which they lived to benefit from the continuation of their education. [178] Despite the fact that it did not address every question associated with technical training he urged his fellow parliamentarians to support the measure. He felt it was in the interest of all to do so, particularly because it was a neutral measure without the encumbrance of party politics. [179] Mundella responded by stating that '...there were one or two points raised in the speech of the right hon. Gentleman that I am bound to say fell on my ears with something of surprise and disappointment.' [180] He was concerned about raising money through the rates and the power of veto of local ratepayers. He stated that you could always find '...50 cantankerous ratepayers who are opposed to everything in this world, and who would oppose this Bill.' [181] Others suggested that past experience of giving localities the power to collect revenue in support of educational initiatives had proved ineffective. The 1885 Libraries Act enabled districts with a population of 5000 or more to raise a penny rate which could be spent, amongst other things, on science and art in schools. Few localities implemented the Act and of those that did most funding was used to support libraries with little left for science. [182] Mundella agreed with Hart Dyke that technical education should be given to children who were well prepared but he also wanted '...continuation schools for the tens of thousands of children who are turned out of school at and below the Fourth Standard.' [183] He was astounded that after all the evidence acquired from the reports of the Samuelson Commission and the R.C.D.T. stating that British

industry was suffering because of the neglect of technical training, the Government had not

> ...shown that they care enough for technical education to give something out of national funds to stimulate and develop local efforts. It is not fair that they do not do so. [184]

He had been an advocate the cause of technical education for over 30 years and had seen how the Germans, more than any other nation, had made advances solely through the superior technical education. [185] He stated that he had seen for himself how

> ...as a consequence of the adopting of technical education, not only the increased facility of German workmen, but their increased adaptability in the development of new trades and diversities of industry-a matter of still greater importance to this country than to any other country in Europe. [186]

Stanley Leighton, M.P. for Shropshire, called it a very indigestible measure that was only half cooked. [187]

The Bill underwent a second reading on August 9 th but was withdrawn at the Committee stage because '...it aroused too much controversy over the rights of voluntary schools and the religious problem. ' [188] Some argued that it was aimed at the destruction of School Boards and that the partnership envisaged between them and voluntary aided schools was untenable. It was also opposed because Members regarded it as a means of providing free education. The component that dealt with that local taxation was viewed as an unfair burden that would grow inexorably.

Even before the fate of the legislation was known Hart Dyke stated that he was certain that the issue of support for technical education could not be avoided by Parliament. [189] He was correct. On February 2 nd 1988 Roscoe introduced another Bill, sponsored by N.A.P.T.E. that received a second reading and went to Committee stage. It was abandoned by the Government on July 2 nd 1888 due to

opposition from voluntary school managers who, under the terms of the legislation, could not receive support from the rates. The government introduced a Bill of its own on May 17 th 1888 which also failed to become law. There were a additional number of Bills related to technical education which were considered by Parliament in 1889 including the Technical Schools (Local Authorities) Bill which was withdrawn July 25 th, the Technical Education (England and Wales) Bill which was with drawn August 6 th and the Technical Education (No 2) Bill which was withdrawn August 27 th. The Marquis of Hartington, commenting on their failure, stated that the

> ...subject of technical education has now been so long before the country that it would be very little short of a scandal if we failed to give some expression to what is the almost universally-acknowledged desire, that additional facilities for the promotion of technical education should be given. [190]

Details of the Legislation

The government introduced another Bill on July 24 th 1889 which contained elements of the language and conditions enshrined in the previous Bills. The 1889 Technical Instruction Act gave newly created Local Authorities the ability to levy a penny rate in order to '...supply or aid the supply of technical or manual instruction to such an extent and on such terms as the authority thinks expedient. ' [191] The term Local Authority meant a county council, county borough or any urban sanitary authority defined by the terms of the Public Health Acts. The precedent for using regional agencies as a means of supplying technical education came from the Samuelson Commission, which believed that it was important to give local bodies a significant role. [192] In the context of the Bill the expression technical instruction was defined as the teaching of the principles of science and art pertinent to both general and specific industries. This did not include teaching the practice of any trade or industry or employment except instruction in the

> ...branches of science and art with respect to which grants are for the time being made by the Department of Science and Art, and any other form of instruction, including modern languages and commercial and agricultural subjects, which may for the time being be sanctioned by the Department by a minute laid before Parliament and made on the representation of a local authority that such a form of instruction is required by the circumstances of its district. [193]

The provision was subject to a number of conditions. Technical education, as defined by the terms of the Act, could not be taught in elementary schools or to elementary pupils and should not compromise any existing provision. Attendance at a Sunday school or a place of worship could not be made either a condition of entry or exclusion from a programme associated with the legislation. The teaching could not contain religious education drawn from a specific denomination or formulary. By including the clauses on worship those who drafted this legislation had tried to deal with the vexed religious question, responsible for the failure of many earlier Bills. [194] The amount of rates collected could not exceed one penny in the pound. Local Authorities could delegate all their powers except that of

> ...levying a rate or borrowing money to a committee of their own appointment-a provision which will sanction, for instance , the nomination by a county council of a Technical Instruction Committee, supplemented by one or more persons from outside the council. [195]

They were also entitled to be represented on the governing body of institutions in receipt of support from money generated by the legislation. The Science and Art Department was designated as the final arbitrator if the sufficiency of provision in these institutions was brought into question. [196] The Times suggested that the new Act could be regarded '...as a legislative extension of the work of the Science and Art Department.' [197]

Francis Sharp Powell (1827-1911) who sat for Wigan (1857-1859) and (1885-1910) expressed the feelings of many when he stated that this Act would prove to be of great value to technical education and that the Government should

be congratulated for bringing it to parliament. He was certain that the time had come

> ...after the reports of the Commissions , discussions innumerable, and Bills succeeding Bills , when some effective action should be taken and a measure passed into law. Even in 1889 we had two Bills , one introduced by Sir H Roscoe and another by Mr. A. H. D. Acland , with the support of other members, including myself. Little discussion arose in the House, but the subject was continually mentioned in conversation among members fully alive to the necessity of progress, and there was just impatience and further delay. [198]

There was, he argued, the highest external authority for the leading principles of the Bill and the political consensus in support of it was wide. [199] William Hart Dyke believed that the legislation would help to reconcile past opponents of technical education and that an enormous amount of good would result from it. [200] He acknowledged that there had been a difficulty in finding a common definition of technical education, but suggested the architects of the Bill had avoided this pitfall by aligning the new provision to the work of the Science and Art Department. [201] In his opinion Clause 31, which enabled Local Authorities to form a Technical Committee in support of their activities, was particularly important. These Committees would help to adequately reflect the educational needs of the locality. [202]

Lord Hartington and his colleagues in N.A.P.T.E. were initially unhappy with the Bill because they feared it contained obscure clauses that provided obstacles to its implementation. Despite this criticism Hartington still claimed credit for the legislation on behalf of N.A.P.T.E. . [203] After some clarification the Association agreed that '...the Act if used wisely , could be beneficial to the cause of technical education. ' [204]

Regardless of the general acclaim that was bestowed on the Technical Instruction Act in parliament it was '...accompanied by a sharp passage of arms...'

[205] Mundella, a principal opponent, viewed it as a miserable compromise and '...one of the greatest shams ever perpetrated in the House...' [206] His main criticism was that the architects of the Bill were building

> ...a castle in the air and providing secondary technical instruction because there is some idea that the voluntary schools stand in the way of introducing this technical instruction in elementary schools. [207]

He wanted to know what the Bill would do for technical education in the capital city. He noted that for two years

> ...the London School Board has had before it a scheme of technical instruction which everybody wishes to see enforced, but this Bill will not allow a single boy in the London Board Schools to obtain this kind of instruction. [208]

Henry Broadhurst complained that the Bill should have been introduced at the beginning of the Session so more debate about its contents could be undertaken. He felt that Members had to accept the measure without modification or lose the opportunity to address this important issue. [209] He was particularly concerned that, as a result of the Act, technical instruction would be overseen by local agencies such as the Rural Sanitary Authorities who would have to divide their attention between water quality and education. [210] He believed that what was required was '...a good, thorough, honest and comprehensive measure to be placed in the hands of educational, and not drainage authorities.' [211] Handel Cossam (1824-1890) Liberal M.P. for Bristol from 1885 to 1890 was more outspoken, considering it '...a most extraordinary idea to give the Boards of Guardians the charge of Technical Education.' [212] Halley Stewart (1838-1937) Liberal M.P. for the Spadling Division of Lincolnshire (1887-1895) considered that by their actions they were re-opening questions settled by the Education Act of 1870 which would disturb the status quo. [213] The Times complained that the county councils

were barely a year old '...and yet the Legislature has already begun to devolve additional tasks upon them...' [214]

Unlike its predecessors the Bill was passed by Parliament on August 29 th and was given Royal Assent the following day. The Times , commenting on what the resulting funding arrangements were, could now offer a definitive guide to its readers on how '...the sinews of war are to be divided.' [215] It stated that a number of different source were available including Parliamentary grants awarded through the work of the Science and Art Department, the fees of the scholars, voluntary contributions and local grants from the Technical Instruction Act.

Reaction to the Technical Instruction Act

Almost a year after it had been passed evidence of the Act was at work was seen in most of the large industrial centres including Bingley, Blackburn, Bolton, Burnley, Leeds, Maidstone, Manchester, Macclesfield, Newcastle, Notingham, Reading, Rochdale, Rotherham, Sheffield, Stockport and Wakefield but there was a difficulty in getting money for building purposes. However, Sir William Hart Dyke noted that most localities faced '...the rate necessary for the maintenance of an institution , but they will not undertake the initial expenditure which is required to obtain a building.' [216] Action was needed to provide additional forms of support. A. H. D. Acland complained that unless more was done the '...Technical Instruction Act of last Session will remain, what unfortunately it is at the present moment, a dead letter.' [217]

WHISKY MONEY

Acland wanted the Government to raise more capital from local contributions and was confident that if they did they would soon find '...a network of technical and secondary schools rising throughout the country that would do credit to

England and soon put us on a level with other countries.' [218] He suggested (on behalf of the now renamed National Association for the Promotion of Technical and Secondary Education) that certain sums of money from customs and excise duties should be allocated to local authorities either to relieve the rates or to subsidise technical education. [219] The history of what later became known as whisky money was convoluted. The Local Government Act 1888 incorporated a number of clauses which allowed liquor licensing to be transferred from justices of the peace to county councils, who were also given the power to close redundant public houses. A special fund was to be created to compensate affected licence holders. The liquor trade and the temperance party denounced the clauses for different reasons and they were dropped. Goschen, who was alarmed at the growth of drunkenness, tried to reinstate the initiative through the Budget of 1890. He put an extra 6d a gallon on spirits to help to form a new fund to compensate license holders. The indemnity plan was again defeated but the Local Taxation (Customs and Excise) Duties Act 1890 relating to licensing was in place , leaving a sum of money unused. This was the money that Acland had referred to although Ensor credits Goschen with some responsibility for suggesting it could be used for the support of technical education. [220] The idea appealed to the Government because it was not controversial and did not require new funds. Acland was confident that the money raised would be a great asset in making the Technical Instruction Act work more effectively. [221] Hart Dyke agreed, stating that that it would

> ...fit precisely into the groove , precisely fill up the gap, and furnish to these localities the amount of the initial expenditure which I think can be usefully and beneficially applied. [222]

The tax was raised almost entirely from the working classes whose children benefited less than those with parents who could afford to support their offspring through intermediate education. Elliott Lees, M. P. for Oldham observed that '...the

father of a large family who wishes to give his children a good education has only to consume as much drink as possible. ' [223] The Local Government Act 1888 was used to regulate how the duty was dispersed. In some cases this linked the degree of support provided to the total allocated to the poor and mentally insane, which was described by some as a '...singularly irrelevant basis for distributing assistance to Technical Education.' [224] The formula used did not take into account population size or the varying educational needs of different localities, leading to many inequalities. Those boroughs which received the least were mainly in the north and midlands and '...there can be little doubt that many of England's industrial centers faired badly in the distribution of grants and lagged behind some more fortunate rural areas.' [225] The situation was exacerbated because county councils, which already had better endowments than county boroughs, were more favourably treated. When disputes arose about the distribution of the money they were settled by Local Government Commissioners, who declined to make public the basis on which they made their adjudication. Some argued that a more inappropriate way of dividing whisky money '...could hardly have been found.' [226]

At the beginning of December 1890 N.A.P.T.S.E. (the word Secondary had been added to the title) organised a conference to discus the implications of the (Customs and Excise) Duties Act and to dispel some of the confusion that surrounded it. At the conference Hartington asked his colleagues to remember that the new funding was from an additional tax placed on alcoholic drinks and it was possible that

> ...a state of things might arise under which these articles would not bear the additional duty, and it would become a question of whether the grant should be made up from some other source arising from the general taxation of the country. [227]

His position, given the precarious nature of the funding was that it should be applied to

> ...the establishment of important educational work which would be beneficial to the whole community, it becomes almost morally certain that it would be incumbent upon any Government that might be in power at the time not to deprive the local authorities of the grant. [228]

He was worried that if the money was not promptly used for education it might revert to the treasury. He was right to agonise over this issue because the loss of this funding would have significantly affected the development of technical education. Whisky money grants were to become even more important for the public support of technical education than the aid available '...through the Science and Art Department.' [229] The grants allowed for the expansion of provision and without them most of the work of Technical Instruction Committees would have been impossible.' [230] Ensor could therefor justifiably claim that whisky money promoted significant change. [231] The Local Taxation (Customs and Excise) Act 1890 was amended in 1892. The alteration made it explicit that the sums raised from the 1890 Act (which made no direct reference to education) could be used in support of technical training. [232]

The Technical Instruction Act and more importantly, the windfall provided by Whisky Money helped to fund an expansion of technical education during the last decade of the century. Initially most authorities chose to relieve the rates. In 1895-96 the total spent on technical education from the income generated by whisky money was £666,607. The remaining £159,336 was spent on relieving the rates, of which London alone accounted for £121,558. However, under pressure from critics the amount of whisky money used for technical instruction increased. [233] By 1900 the total had reached £867,000 out of £804,000. In same year 39 County Councils were giving all, and 10 part, of this money to education and

similarly 61 County Boroughs were giving all, and 4 part of this money to education. A sum amounting to £82,000 was raised by 284 English local authorities levying a rate under the Technical Instruction Act. The Science and Art Department, Technical Instruction Committees and School Boards controlled the distribution of some these funds, thus playing a key part in the growth of provision. The Act had enlarged the purview of the Department and enabled it to more actively support technical education. Hitherto it had only given grants for examinations passed by members of the industrial classes which excluded any one who paid, or whose parents paid income tax. This restriction applied to most of the future '...masters and managers...' [234] Technical Instruction Committees, established as a result of the Act to promote technical education, were controlled by County and County Borough Councils. The role they played varied according to region. Some based their work entirely on local needs whilst others such as the London Technical Education Board took a much broader view of their remit by granting aid to secondary and endowed grammar schools. [235]

CONCLUSIONS

Globally there was a strong belief that exhibitions and conference could provide a suitable catalyst for change. Major General Eaton , an American Commissioner of Education at the I.C.E. stated that the original international exhibitions were almost exclusively designed for commercial purposes but the Great Exhibition introduced new and more profound features. He recalled that under influence of the Prince Consort the 1851 event

> ...enlarged all of those endeavors beyond merely commercial character and gave them an educating character. All their commercial benefits were retained, but at the same time they caught the attention of the world, and carried it into fields of improvement and fields of instruction, and that spirit and that method have remained to this day...[236]

If this spirit was embodied in the contemporary events then the International Health Exhibition through the International Conference on Education and the International Inventions Exhibition were in a position to make significant contribution to the debate about technical education. [237] There were a number of important features common to both that increased their potential to inform and influence a British audience. They were held in England, thus making them readily accessible . The size of visitor numbers and their place in mass culture was also germane . However, each also had their own inimitable features. The International Conference on Education was a new and popular phenomenon. [238] Issues debated at the I.C.E. were therefore more likely to capture the attention of the public because of the place of the conference in late Victorian culture. A commentator, remarking that there was a contemporary tendency to seek the opinions of the many rather than of the few, suggested that

> ...if there is one description which more emphatically than any other characterizes the age in which we live it is it is that which dubs it the age of conference. [239]

The International Inventions Exhibition provided a significant opportunity to test the relative scientific and technological progress of Britain. It was therefore a unique chance for those who prophesied that British industry would collapse to use the event to add legitimacy to their claim. If they were right the evidence would be before them.

As a political force the technical educationists were not strong enough on their own to effect the changes in educational policy that they desired. It was important that they presented clear and unambiguous proof that technical education had

advanced foreign competitiveness and a lack of it hastened English decline. The Times did not make things easy for them. It stated unequivocally that

> ...the closeness, if not the extent, of foreign competition with English manufacturers has been much exaggerated by trade fears and by popular report. Taking the two points of price and quality, there is no important department in which England does not hold the first place, not barely or doubtfully , but in a manner which admits of neither question nor denial. [240]

It was also up to them to show from the proven failure of the existing system or from

> ...the better results produced by more uniform systems in other lands that the improvement desired by all is unattainable by any natural growth or expansion of that which, from small beginnings and oftentimes by very slow degrees, has developed into the... system, such as it is, with which most Englishmen are more or less familiar. [241]

This would mean that the investment in education could not be deferred. In retrospect, what both exhibitions did was to emphasise the limited perspective of the technical educationists. The I.C.E. in particular could have profitably employed the abundance of information generated by the activities of the Samuelson and his colleagues, but it did not. With the exception of Magnus they contributed little to and made no comment about the I.C.E. Perhaps they felt that the stage had been passed when a discussion about the advantages of technical education was needed. They appeared to be intent on debating more complex issues such as who to give it to and how they should receive it. Through their actions the technical educationists lost an opportunity to advance the cause. Perhaps more fundamentally education was still held in low esteem and all evidence, no matter how powerful, would fail to influence the policy makers. Heller offered an example of this to his fellow delegates at the I.C.E. He observed that the higher one went in the social scale

> ...the lower was the idea as to what children should be taught. The House of Lords itself had perhaps the lowest idea-it was an idea that all education was a 'bore'-that children should be taught only to read their Bible and have sufficient knowledge to make them servile. The House of Commons had little higher idea. But the lower down the social scale they went the higher was the appreciation of education. [242]

A. J. Mundella was in no doubt about the importance of this issue. He concluded, in terms he had deployed fifteen years before, that progress could only be made if the English were to develop

> ...a higher idea of education. We want more redlines to make sacrifices on the part of parents, and of all concerned. We want more of the Scotch spirit amongst us, where the shepherd and the hind will work hard to keep his boy at school until he is 14 or 15, and then very often send him on to the University. [243]

The I.I.E. failed as a legitimate source of comparison because only a limited number of foreigners participated.

The final and possibly most significant factor that limited the impact of the I.H.E. and the I.I.E. was their trivialisation. [244] In order to attract visitors show and spectacle had become important. The scientists and distinguished men who organised these events recognised that '...if the people are to be made happy they must be amused.' [245] In embodying this principle in their planning they tried to be true to the high ideals described by Eaton through linking entertainment and education together. However, Robin Betts has suggested that the entertainment factor was so overpowering that the more serious objectives were lost. [246] It appears that the public were more readily seduced by sights and sounds instead of matters of gravitas.

The Royal Commission on the Depression of Trade, in common with the I.I.E., had an effect on the debate about technical education because the question of the relative performance of British industry was central to it. The fact that the Commission existed at all was significant. It represented an admission that there

were economic difficulties in certain parts of the country. This had been long predicted by the technical educationalists, but if they believed the R.C.D.T. would add strength to their cause they were mistaken. It assigned only limited importance to technical education and cited many other factors as significant, particularly the terms of trade. The Commission also had a basic flaw which was widely recognised at the time. Thomas and the other dissenters considered that the investigation was unbalanced because it '...frequently experienced the want of accurate statistics with regard to the details of our home trade. ' [247] They recommended that steps should be taken '...to procure fuller information both as to the production of the leading industries of the country and as to the distribution of our industrial population.' [248] This should have been a fundamental step for any enquiry which relied on a comparison of economic performance to formulate judgments. The best Iddesleigh and his colleagues could do was to give an impression of what they thought was happening.

The I.H.E. , the I.I.E. and R.C.D.T. failed to add to the debate as the technical educationist might have wished. Hence the legislation that they had so long strived for came later rather than sooner. When it did arrive the Technical Instruction Act represented the least that could be done without appearing to ignore the issue. Religion and money were two of the constraining factors. The question of religion was dealt with by the clauses on worship and the subsidy issue was cleverly devolved to the regions. However, Colonel Eyre, M.P. for Gainsborough, arguing that parliament should face up to its responsibilities , suggested that if

> ...the nation has to benefit, as I believe it will do, by technical education, the nation ought to pay the whole of the expense. It seems to me that it is unjust that in the case of a national question, and one of great interest like this , local interest should pay more than its share towards what the wholes nation benefit by. [249]

It also lacked the radical components necessary for sweeping change, partly because those that had championed the cause did not consult widely. They formulated their plans for technical education from within a relatively small group. This had been their modus operandi since Playfair had first voiced his concerns in 1867. Some in parliament, including James Rowlands, Liberal M.P. for East Finsbury from 1886 to 1895, were unhappy about this exclusivity. He stated that although he was not a member of the Royal Commission on Technical Education he had made the effort to become conversant with the needs of the working classes. [250] He had also taken an active part in the work of the Technical Institute and regarded himself as uniquely qualified to offer advice on technical education. His help had not been sought at all and he complained that

> ...the mistake which has been made is that a certain number of the Gentlemen constitute themselves the guardians of technical instruction, and act by themselves, whereas they might have taken into their confidence and allowed us something to say on the subject. [251]

Nevertheless, the Act was on the statute books and in theory represented a major step forward. However, it did not truly start to have an effect until the Whiskey Money was introduced. It is ironic but fitting that, given the amount of time and effort that had been devoted to the subject of technical education, meaningful action was only possible through incidental legislation that related to the consumption of alcohol.

FOOTNOTES : 3

1) Hansard, July 25 th, 1889, col. 483

2) The City and Guilds also sponsored the production of twenty-eight handbooks on a range of subjects related to the central theme of health. The topics included Healthy Nurseries and Bedrooms, Health in the Village, Water and Water Supplies, Principles of Cooking, Healthy Schools, Dress and its Relationship to Health and Climate, Athletics, Physical Exercise and Recreation, Healthy and Unhealthy Houses in Town and Country, Infectious Diseases and its Prevention and Alcoholic Drinks

3) Illustrated London News, August 2 nd, 1884, p. 90

4) Ibid.

5) Ibid., p. 91

6) Ibid.

7) Ibid. Times had changed. At the 1851 event there was no similar freedom to drink and eat what you liked. Alcohol was banned.

8) Ibid., p. 94

9) The School Board Chronicle, May 31 st, 1884, p. 545

10) Illustrated London News, August 2 nd, 1884, p. 90

11) Ibid., p. 91

12) School Board Chronicle, May 31 st, 1884, p. 545

13) Ibid.

14) Their motto was mens sana in corpore sano

15) International Conference on Education, Vol. 4, p. 440

16) The School Board Chronicle, May 31 st , 1884, p. 54

17) Ibid., p. 545

18) Ibid.

19) Ibid., p. 39

20) Ibid.

21) P. Gordon, 'The First International Conference on Education', History of Education Society Bulletin, N° 28, 1981, p. 38

22) School Board Chronicle, July 12 th, 1884, p. 39

23) P. Gordon, op.cit., p. 38

24) The Times, August 4 th, 1884

25) P. Gibson, 'Dr. A. J. Mundella and foreign Education systems 1867-1897', (Ph.D)University of Liverpool, 1988p. 43

26) Chichester Samuel Parkinson-Fortesque (1823-98) was influential in framing legislation on Ireland. He was president of the Board of Trade from 1871 to 1874

27) The City and Guilds Institute had been funded by private subscription from the Guilds and it was claimed with some justification, that central government should have provided the revenue that made it possible.

28) Schoolmaster, August 16 th, 1884, p. 205

29) It also coincided with the publication of the main report of the Samuelson Commission

30) R. Betts (D), "The International Conference on Education' , History of Education Society Bulletin, Vol. 38, p. 19. The Belgians also set up a substantive display of their own in the Queens Gate Annex. Papers were received from an additional five individuals.

31) School Board Chronicle, August 9 th, 1884, p. 141. The French Minister of Public Instruction was represented by individuals from the all the key segments of education

32) International Conference on Education, Vol. 1, p. 21

33) School Board Chronicle, August 9 th, 1884, p. 142

34) International Conference on Education, Vol. 1, p. 23

35) Ibid., p. 3. Reay erroneously gave the Royal Commission on Technical Instruction the credit for raising the alarm about this issue.

36) Ibid., p. 18

37) Ibid., p. 3

38) Ibid., p. 7

39) Ibid., p. 9

40) Ibid., p. 10 . Lord Reay using a quote by Lyon Playfair

41) Ibid., p. 4

42) Ibid.

43) Those attending the event included London School Board luminaries E. N. Buxton (Chairman), Professor John Gladstone(1827-1902) a chemist, author, and advocate of technical education, president of the Physical and Chemical societies

who undertook pioneering research into optics , Rev. H. D. Pearson, and Mrs. Westlake.

44) International Conference on Education, Vol. 1, p. 41

45) Ibid., Vol. 3, p. 424

46) R. Betts (D), op.cit., p. 20

47) International Conference on Education, Vol. 3, p. 424

48) Ibid., Vol. 1, p. 648

49) School Board Chronicle, February 9 th, 1884, p. 149

50) The Times, August 4 th, 1884

51) The platform from where the speakers delivered their lectures was equipped like a laboratory to help to illustrate the science papers.

52) International Conference on Education, Vol. 2, pp. 2-3

53) Ibid., p. 14

54) Ibid., p. 3

55) Ibid., p. 3-4. Only a quarter of 7-13 year olds in England at that time received any instruction in drawing

56) Ibid., p. 4

57) Ibid., p. 5

58) Ibid., p. 9

59) Ibid., p. 7

60) Ibid., p. 5

61) Ibid., p. 25. Allen Glen School was regarded as a centre of good practice.

62) Ibid., p. 31

63) Ibid., p. 33

64) Ibid., p. 106. In making his speech Garnett used a direct quotation from Professor Osborne Reynolds (1842-1912) physicist and professor of engineering at Owens College from 1868 to 1905.

65) Ibid., p. 107

66) Ibid., p. 56

67) Ibid., p. 68

68) Ibid., p. 59

69) Ibid., p. 282

70) Ibid., p. 283

71) Ibid., p. 285

72) R. Betts (D), op.cit., p. 24

73) The Committee of Council was vigorously opposed by the Church when it started in the 1840s. The president usually came from the Lords, because of the influence such an individual would bring. The vice president, first appointed in 1856, implemented policy and came from the Commons

74) International Conference on Education, Vol. 2, p. 285

75) Ibid.

76) R. Betts (D), op.cit., p. 24

77) The Times, August 7 th, 1884

78) Ibid.

79) International Conference on Education, Vol. 4, p. 458

80) Ibid., p. 454

81) The Times, August 11 th, 1884

82) International Conference on Education, Vol. 4, p. 451

83) The Times, August 11 th, 1884

84) R. Betts (D), op.cit., p. 20

85) The Times, August 11 th, 1884

86) R. Betts (D), op.cit., p. 24

87) P. Gordon, op.cit., p. 41

88) R. Betts (D), op.cit., p. 24

89) Official Guide to the International Inventions Exhibition, William Clowes and sons, London, 1884, p. 5

90) The exhibition was open between December 26 th and January 30 th and had 446 recently patented devices on display

91) H. Trueman Wood (A), A History of the Royal Society of Arts, John Murray, London, 1913, p. 379

92) The Times, October 8 th, 1884

93) The Times, October 15 th, 1884

94) The Times, August 13 th, 1885

95) The choice of music as a companion division was odd. It was probably included because of the patronage of the Royal family and the potential entertainment value.

96) The Times, May 5 th, 1885 and August 13 th, 1884

97) The Times, October 8 th, 1884

98) Ibid.

99) R. Betts(C), 'Persistent but misguided?: the technical educationists 1867-89, History of Education, Volume 27, N° 3, 1998, p. 268

100) The Times, May 5 th, 1885

101) In order to facilitate the exhibition walls were removed, space was added between annexes and galleries and several courts were widened and enlarged.

102) The Times, May 5 th, 1885. This prohibition included the Fisheries and Health exhibitions and extended as far back as the Smoke Abatement Exhibition.

103) The Times August 13 th 1885

104) The Times, October 8 th, 1884

105) Official Guide to the International Inventions Exhibition, p. 5

106) The Times, August 13 th, 1884

107) Official Guide to the International Inventions Exhibition, p. 7

108) Ibid., p. 8

109) The Times, May 25 th, 1885

110)

111) Official Guide to the International Inventions Exhibition, p. 10

112) The Times, May 4 th, 1885

113) Official Guide to the International Inventions Exhibition, pp. 10- 11

114) The Times, May 5 th, 1885

115) The Times, May 26 th, 1885. Electrical engineers contemptuously referred to them as grease spots.

116) Official Guide to the International Inventions Exhibition, p. 11

117) Ibid.

118) Ibid., p. 12

119) The Times, May 4 th, 1885

120) Each one of the classes is described in full in The Times, August 13 th

121) The Times, August 13 th, 1885

122) Ibid., May 25 th, 1885

123) Ibid., May 4 th, 1885, p. 7

124) Ibid., May 5 th, 1885, p. 11

125) Ibid., October 5 th, 1851, p. 2

126) Ibid., May 26 th, 1885, p. 3

127) R. Betts (C), op.cit., p. 268

128) The booklet was compiled by J. R. Somers Vine

129) The Times, March 6 th, 1885

130) R. Betts (C), op.cit., p. 274

131) This followed on from the successful practise established at the two previous events

132) Illustrated London News, August 8 th, 1885, p. 139

133) Ibid.

134) Royal Commission on the Depression of Trade

135) Hansard, August 10 th, 1885, col. 1537

136) Ibid.

137) Hansard, August 5 th, 1885, col. 1237

138) The Economist Jan 22 nd 1887 101

139) Ibid.

140) Ibid.

141), Hansard, August 10 th, 1885, col. 1543

142) They were drawn from agriculture , the chemical trade, coal and mining, cotton, iron and steel, jute, lace and hosiery, linen, paper, the railways and canals, shipbuilding, shipping, silk, textiles, sugar, and woollens.

143) Royal Commission on the Depression of Trade, Minutes of Evidence, para. 7213

144) The Times, Jan 7 th, 1887

145) D. H. Aldcroft, The Development of British Industry and Foreign Competition 1875-1914, George Allen and Unwin, London, 1968, p. 116

146) The Times, Jan 7 th, 1887

147) Ibid.

148) The Times, Jan 7 th, 1887

149) It was split into two parts of 430 and 428 pages

150) The Times, Jan 7 th, 1887

151) Ibid.

152) Ibid.

153) Ibid.

154) Royal Commission on the Depression of Trade, Final Report, Section IV, para xxiv

155) Ibid. , p. 106, para. xxv

156) The Times, Jan 7 th, 1887

157) Ibid.

158) Ibid.

159) Ibid.

160) Royal Commission on the Depression of Trade, Final Report, p. 112, para. lxiii

161) The Economist Jan 22 nd 1887

162) Ibid.

163) P. Owens, The National Association for the Promotion of Technical Education and the Technical Instruction Act of 1889, (M.Ed) University of Liverpool, 1987 , p. 48

164) Ibid.

165) National Association for the Promotion of Technical Education, First Annual Report, Co-operative Printing Society, London, July 1888, p. 1

166) There were over 40 Members of Parliament

167) The Times , December 6 th, 1890. Lord Hartington and his colleagues regarded it as the practical instruction given in both elementary and secondary schools which had a direct bearing upon the industrial pursuits of the community and which helped to increase the efficiency of labour in every branch of industry and commerce.

168) Ibid.

169) Hansard, July 19 th, 1887, col. 1466

170) Ibid., col. 1465

171) Ibid., col. 1465

172) Ibid., col. 1466

173) Ibid., col. 1467

174) Hansard, July 19 th, 1887, col. 1473. Hart Dyke attempted to stifle this criticism by indicating that the Department should administer the scheme within the strictest economy.

175) Hansard, July 19 th, 1887, col. 1467

176) Ibid., col. 1468

177) He suggested that those such as the City and Guilds who contributed voluntarily already knew the value of this form of education and would not withdraw their support

178) Hansard, July 19 th, 1887, cols. 1465-66

179) Ibid., col. 1473

180) Ibid., col. 1474

181) Ibid.,

182) P. R. Sharp, 'Whiskey Money and the development of technical and secondary education in the 1890s' Journal of Educational Administration and History, Vol. IV, 1, University of Leeds, 1971, p. 31

183) Hansard, July 19 th, 1887, col. 1474

184) Hansard, August 9 th, 1887, cols. 1848-1850

185) Ibid., col. 1849

186) Ibid., col. 1850

187) Ibid., col. 1830

188) P. Owens, op.cit., p. 54

189) Hansard, August 9 th, 1887, col. 1828

190) Hansard, July 25 th, 1889, col. 483

191) British Parliamentary Papers, Technical Instruction Act, Clause 1, p. 214

192) The Times September 11 th 1889

193) British Parliamentary Papers, Technical Instruction Act, Clause 7, p. 220

194) The Times, September 27 th, 1889

195) Ibid.

196) Technical Instruction Act, Clause 4, p. 219

197) The Times, September 27 th, 1889

198) The Times, September 11 th, 1889

199) Ibid.

200) Hansard, August 1 st, 1889, col. 158

201) Hansard, August 14 th, 1889, col. 1250

202) Hansard, August 1 st, 1889, col. 158

203) The Times, September 11 th, 1889

204) P. Owens, op.cit., p. 60

205) The Times, September 27 th, 1889

206) Hansard, August 9 th, 1889, col. 992

207) Ibid.

208) Ibid.

209) Hansard, August 14 th, 1889, col. 1254

210) Ibid., col. 1256

211) Ibid.

212) Ibid., col. 1258

213) Ibid., col. 1254

214) The Times, September 27 th, 1889

215) Ibid.

216) Hansard, August 1 st, 1890, col. 1571

217) Hansard, June 10 th, 1890, col. 568

218) Ibid.

219) P. R. Sharp, op.cit., p. 31 and M. Argles, South Kensington to Robbins, p. 35

220) R. C. K. Ensor, England 1870-1914, Clarendon PressOxford, 1936, p. 204

221) Hansard, August 1 st, 1890, col. 1577

222) Ibid., col. 1571

223) Hansard, June 10 th, 1890, col. 574

224) P. R. Sharp, op.cit., p. 32

225) Ibid.

226) Ibid.

227) The Times, December 6 th

228) Ibid.

229) P. R. Sharp, op.cit., p. 31

230) Ibid.

231) R. C. K. Ensor, op.cit., p. 320

232) Local Taxation (Custom and Excise) Act (1890) Amendment, 1892, p. 457, Clause 2

233) M. Argles, op.cit., p. 35

234) R. C. K. Ensor, op.cit., p. 319

235) By 1900 the London Technical Education Board oversaw the distribution of nearly £1000000 on technical education

236) International Conference on Education, Vol. 4, p. 440

237) The International Health Exhibition had less impact on the debate surrounding technical education.

238) The International Conference on Education was the first of its kind in Britain at least

239) The Times, August 4 th, 1884

240) The Times, October 8 th, 1884

241) The Times, August 11 th, 1884

242) The Times, August 7 th, 1884

243) International Conference on Education, Vol. 2, p. 47

244) The International Conference on Education was possibly tainted with spectre of trivialisation because of its association with the I.H.E. and I.I.E.

245) Illustrated London News, August 2 nd, 1884, p. 91

246) R. Betts (C), op.cit., p. 268

247) The Times, Jan 7 th, 1887 and Royal Commission on the Depression of Trade, Final Report, p. 117, para. lxiv

248) Ibid.

249) Hansard, August 9 th, 1887, col. 1835

250) Rowland's investigation into the needs of the working classes were made easier because he had experience of the workshop himself. He was educated at the Working Men's College, Great Ormond Street, London and attended lectures at the School of Mines. He started his working life as an apprentice to a watch case maker.

251) Hansard, August 14 th, 1889, col. 1253

Section 4 : 'Washing bottles in the public house'

(Dr. Macnamara)

Michael Sadler believed that every nation

> may be said to have the system of education which it deserves. That is to say a national system of education is the outcome of national history and a sure index of national character [1]

INTRODUCTION

During the last years of the century international exhibitions were held in Australia, Jamaica, South Africa and South America. [2] They each attracted between 200,000 and 300, 000 visitors. European cities including Antwerp in 1894 and Brussels in 1897 held larger and more spectacular events, attracting over 9,000,000 visitors between them. By far the biggest and most significant events were held in Chicago in 1893 and Paris in 1900. The American exhibition, which attracted 27, 529, 400 visitors provided an opportunity for the old and new world to compare their relative progress since the Philadelphia event. The French exhibition, which attracted a staggering 48, 130, 300 visitors, was held to mark the end of a century in which profound social and industrial change had taken place. It therefore had symbolic importance and at the same time provided a final opportunity for the competing nations in Europe to test themselves against each other before the new century dawned. Chicago and Paris were additionally linked because of the prominence they gave to education. The British were active in both of them although participating in the American event was more difficult because of the distances involved and the costs. At home technical education, which had been a beneficiary of the Technical Instruction Act in the previous decade, had become more widespread. However this expansion was halted as the century closed by the Cockerton Judgment and the 1902 Education Act.

THE CHICAGO EXHIBITION (1893)

The event

A group of Americans, who had been to Paris in 1889 and were impressed by the French claim that theirs was the biggest and best exhibition ever held, reasoned that they must have a better '...and above all a bigger one.' [3] Congress duly nominated a National Commission to undertake the organisation of an exhibition which would celebrate the 400 th anniversary of the discovery of America by Columbus. [4] There was some debate about the appropriate year in which it should take place but it was agreed that the exhibitions buildings would be dedicated in 1892 and the event itself would open in 1893. [5] It became known as the Columbian Exhibition. The Americans were urged to use the opportunity presented by the exhibition to illustrate '...how a young country has applied technology to exploit the resources of nature with greater productivity and efficiency than any other people.' [6]

Chicago was officially designated as the host city for the exhibition by Congress on February 24 th 1890. A Bill was passed enshrining this notion on March 26 th 1890. Americans in the east regarded Chicago as provincial and were concerned that the event would fail if it was held there. To add to the concerns of those from more cosmopolitan regions the city had an unenviable reputation. It was notorious for a grimy smoke produced by the coal burnt in homes and factories that could rival the worst found in Manchester or Leeds. [7] However, the Chicago team, who were very quickly able to prove that they could raise the necessary $10 million required to underwrite the project, were awarded the right to hold the event. The State of Illinois established a corporation of 45 members who were asked to select a site for the project, oversee the production of drawings

for the buildings and manage the funds. The plans in particular were subject to the approval of the National Commission. [8]

The location chosen for the event was a 586 acres site known as Jackson Park which was composed of long strips of swampy sand ridges populated by clumps of scrub. [9] An additional 80 acres of land on the Midway Plaisance close to Lake Michigan, were also made available. A number of prominent landscape architects including Frederick Law Olmsted, Harry. S. Codman, J. W. Root, Frank Millet and Daniel H. Burnham were invited to create an overall plan for the site. Burnham was appointed as the chief of works and Millet was responsible for colour and decoration. Olmsted and Codman devised a grandiose scheme for the layout of the grounds in which water played a prominent part. They envisaged a network of interconnecting canals which would connect each of the principal buildings of the exhibition site. In the middle of these waterways a 15 acres island planted with trees and foliage was to be created. The absence of buildings on this island was designed to offset the complexity of the main site. This proposal contrasted sharply with some of the more extraordinary ideas suggested by others and it was eventually adopted. [10]

The first ground at the site was broken on Jan 27 th 1891. The work was immediately interrupted by an industrial dispute between the tradesmen workers and their employers. However, by October 21 st 1892 (dedication day) all the external parts of the 400 separate buildings that made up the main complex were largely completed. The most prominent were the Machinery Hall, the Agricultural Building the Forestry Building, the Electricity Building, the Mines and Mining Building, the Horticulture Building, the Women's Building the Fisheries Building and the Palace of Fine Arts. The building in which the Manufacturing and Liberal Arts exhibits were housed was the largest structure and in commercial terms was described as '...the ground on which, perhaps the most important battle will be

fought...' [11] The goods on display inside it ranged from pins to sewing machines, watches to a giant alabaster clock that was considered to be a central attraction. The Transportation Building contained railway exhibits from a number of countries, the latest cars and a full sized cross section of a modern transatlantic ocean liner over four stories high. [12] The Administration Building, regarded by many as the architectural masterpiece of the exhibition, contained offices decorated with a few pictures and statues. Each of the 38 States that made up the Union had their own building. National pavilions, mostly grouped together in the north west segment of the park were erected by Great Britain, Canada, Ceylon, Germany, Japan, Argentina, Austria, Brazil, Costa Rica, Colombia, Chile, Equador, France, Guatemala, Haiti, Mexico, Nicaragua, Norway, Sweden and the Hawaiian Islands. The largest was constructed by the Germans and it cost £30,000. This was fifteen times more than the Americans had spent. [13]

The majority of the buildings were fashioned in a Neo Classical Florentine style of Romanesque and Renaissance origin. The sense of the ancient was heightened because most were finished in staff, a blend of plaster of Paris and water reinforced by jute, which was painted white to simulate marble. [14] The exhibition site became known as the White City because of the effect created by this technique. Although this style influenced the design of American civic buildings for many years to come it did not meet with universal acclaim. Lewis describes it as being unsuitable for displaying the material progress of the contemporary world. [15] He believed that Americans were capable of greater originality. Despite this concern, which was also voiced by other architectural authorities, the Grand Basin and surrounding buildings stunned those who came to see it. [16] The Times applauded the Chicago organisers, commenting that never before had anybody

> ...even conceived the idea of erecting for a mere six months use such ranges of gorgeous palaces, unsuited, indeed, for their ostensible purposes, but admirably capable of fulfilling their real object-that of demonstrating the wealth and energy of the great western city. [17]

The buildings were impressive but they had '...leaking roofs, poor ventilation and darkened exhibition spaces. [18]

The principal means of transportation at the exhibition was an overhead electric railway which was mounted on a gantry and encircled the site. A train ran from Congress Street in the heart of Chicago to Jackson Park every 3 minutes and the system accommodated 40,000 people per hour. Visitors were also conveyed by Otis lifts, electric boats, steam launches and gondolas imported from Venice complete with their own gondoliers. More novel forms transportation included a sliding railway running on a water lubricated central support and an ice railway which travelled on an 875 foot refrigerated ice base '...like a giant toboggan.' [19] The exhibition was also famous for a moving walkway that consisted of a series of benches mounted on railway tracks. An ingenious two speed platform allowed for safe entry and exit from the system. It was powered by electricity and ran at approximately 6 mph. It moved passengers around a one mile covered track along the Casino Pier.

From a commercial perspective Chicago was unique because all the major trading and manufacturing nations including England, France and Germany were present at an exhibition at the same time. However, the Europeans were initially reluctant to take up the invitation to attend the event issued by President Benjamin Harrison. Some were deterred from taking part by the protectionist McKinley Tariff, which the Americans had introduced 1890. It was condemned throughout Europe and inspired an angry response from manufacturers who '...announced they would not participate in the exposition...' [20] To some it seemed hardly reasonable that

> ...a country should one day establish a tariff intended to keep out foreign trade, and the next organise an exhibition of which one main purpose would be to encourage foreign traders. [21]

In order placate those affected by the tax goods for display at the exhibition were allowed into America temporarily duty free until they were sold, when the tariff would be reapplied. This was also the most expensive international event in which to participate of any ever held. The cost of setting up displays was prohibitive. In order to encourage involvement from abroad the National Commission appointed a committee to visit Europe. It was composed of Benjamin Butterworth, Major Mosses P. Handy, T. W. Peek, A. G. Bullock and Secretary Benjamin Davies who travelled to London, Copenhagen, Paris, Berlin, St Petersburg and Vienna. They also went to the Scandinavian countries. The practical outcome of their trip was an increase in foreign participation, thus making certain that the exhibition had '...a genuinely international character...' [22] Despite these obstacles demand for exhibition space was five times greater than that available. [23] Henry Trueman Wood predicted that the resulting competition from such a gathering would be fierce. [24] The rivalry was accentuated because the industrial exhibits from the major manufacturing countries were grouped in the most prominent position around

> ...the Clock Tower in the centre of the Manufactures and Liberal Arts Building, the United States being to the north east, France to the south east, Great Britain to the south west and Germany to the north west...[25]

The French spent more than any other Government on the World's Fair and created a much admired display with exhibits from all over the Empire. [26] They also provided a grant of £120,000 for those exhibitors who needed support and sent 60 sailors and a naval officer to help out. The Russians and Italians dispatched similar numbers. The Germans were very keen to develop trade with South America and regarded Chicago as an ideal opportunity to do so. They were

also intent on making amends '...for the cheap and meagre display...at the Paris and Philadelphia exhibitions...' [27] Germany took the lead '...in the magnitude and completeness of its representation...' [28] It provided 6,000 exhibits which required quarter of a million square feet of display space. The products and ideas from over 2,500 companies and organisations including the textile, chemical and iron and steel industries were represented. Krupps had a pavilion large enough to display a 127 ton gun. In the electrical section at least thirty German companies vied with each other for business. Some had received substantial assistance from the German government (at least twice the amount of subsidy given by the British to equivalent companies) and were able to spend lavishly [29] '...on the display of the exhibits sums which must have approached the intrinsic value of the exhibits themselves...' [30] This was confirmation of a trend referred to in the pages of The Times. It noted that there had been a significant change in the attitude of foreigners towards participating in international exhibitions. The history of Germans involvement provided a good example of this phenomenon. In 1873 at the Vienna exhibition Germany was not

> ...seeking so earnestly for foreign markets for productions. Nor in 1876 was she so inclined to send samples of her wares as far abroad as Philadelphia. In 1878 and in 1889 she abstained entirely, for in those years the shows were held in Paris. France, again, never in the old days much inclined to seek external markets, cared little for the exhibitions of Philadelphia and Vienna; and as her own capital she was in them superior to any possible competition from foreigners. [31]

What the Germans and the French hoped was that this investment would be repaid by increased trade. Henry Trueman Wood perceived this shift in the purpose of international exhibitions. He commented that they were spending more lavishly on exhibitions '...for the purpose...of taking our trade away from us...' [32]

In keeping with previous exhibitions whole sections of the White City were devoted to entertainment. There were Hindu jugglers, Turkish contortionists, Fijian

dancers, camels, elephants and palanquin bearers. [33] Replicas of the Santa Maria (the flag ship of Columbus) and its sister ships, the Nina and the Pinta, were moored on shores of Lake Michigan. The illuminations of the Court of Honour added to the spectacle. Indeed, electricity was everywhere '...lighting, pumping and driving.' [34] The additional lighting of the grounds and the buildings together with the display in the Electricity Building added greatly to the attractions on view. Music also pervaded all corners of the site. Plentiful refreshments proved to be a great factor in the success of the exhibition. Over 150 restaurants were located in the principal buildings. The Manufacturers and Liberal Arts complex contained 16 cafes and 72 private dining rooms. A strip of land 1 mile long and 300 yards wide on the Midway Plaisance housed a range of unofficial attractions. These included animal side shows, belly dancers, a captive balloon that rose to over 1500 feet and the most popular attraction of the White City, the first Ferris Wheel. [35]

The British section was directed by the Council of the Society of Arts. It was given the status of a Royal Commission, was empowered to raise money from the charges made to exhibitors and had a grant of £25,000 to distribute for expenses. This was still considerably less than had been provided for earlier events but improved on the situation in Paris in 1889 when no money at all was made available. [36] Henry Trueman Wood was appointed Secretary to the Commission. The offices for the British section were located in Victoria House, a copy of an English half timber 16 th century building that was designed by Colonel Edis. [37] The lower storey was finished in yellow terra-cotta with red brick facing and mullion windows. It overlooked the lake and was also used to entertain distinguished British visitors to the exhibition. [38]

Apathy, however, restricted the level of British involvement. The Times noted that manufacturers who had taken '...a larger part in exhibitions than those of other countries are sick and tired of them...' [39] The cost of exhibiting, the distance and the McKinley Tariff also deterred British companies from participating. [40] Nevertheless, Sir Richard Webster pointed out that Chicago was of great importance commercially and should be attended at all costs. America represented one of Britain's largest markets and the exhibition was an ideal opportunity for existing relationship to be maintained and new ones created. [41] He urged industrialists to become involved because he felt that the quality of the goods they produced would prevail. He also felt that they had a public duty to do so. [42] Henry Trueman Wood believed that it would be disastrous not to take part and argued that to blame the Americans for non participation was '...mere foolishness' [43] He stated that whilst the imposition of the McKinley Tariff might protect certain industries, it would also force prices to rise. [44] He also reminded manufacturers that the British had always filled the biggest space

> ...taken the largest proportion of jury awards, and generally proved the most important. Even in 1889, without a Government grant or the hardly less important aids of Government influence ,we held our own. If it were found that England was ready to take the a lower place at a 'World's Fair' our enemies would have some reason to say that our old spirit of commercial enterprise was less vigorous than of yore. [45]

The international rivalry had become so acute that British manufacturers had never experienced '...competition so powerful and well organized...' [46] Henry Trueman Wood therefore concluded that it was '...worth our while to bestir ourselves...' [47]

Britain was given a number of small but attractive pavilions in the south west corner of the Manufacturing and Liberal Arts Building in which to exhibit its products. [48] On display were Belfast linens, bread and biscuit making apparatus,

ginger ales, lace, looms, mineral water, needlework, petrol engines, printing equipment, spinning frames, steam hammers and textile machinery. The chemical industry was represented by United Alkali, Brunner Mond, and Lewis Berger. From the pottery industry companies such as Brown Westhead, Copland, Coalport, Doulton, Minton, Wedgewood and Worcester were in attendance. [49] Some of the most important contributions from the British were located in the Transportation building. These included two old engines called the Sampson and the Albion that had been built in England but spent their working lives in Nova Scotia. Also in the same building were models of a Red Cross ambulance, the Cunard ships Umbria and Eturi and the Forth Bridge as well as exhibits from the White Star Line, Lairds and the Navy. The London and North Western railway sent an engine and two carriages. The Great Western Railway provided an old broad gauge train called the Lord of the Isles which was also displayed in 1851. Plenty of British bicycles (but no cars) were in evidence. [50] A large number of furniture and textile manufacturers were present. There were also 34 British exhibits in the Mines and Mining building and 75 in the Agricultural Hall. The Fisheries and Horticultural buildings only contained a few exhibits from Britain. But English manufacturers, unlike their German counterparts seemed to be '..tired of exhibitions.' [51] This was most apparent in the electrical section where there were few private exhibitors of importance. It resulted in England making '...but a feeble appearance...' [52] This was surprising considering the prominence given to electricity at the Inventions event in the previous decade.

In general the extent of the British exhibits

> ...did not come up to the expectations entertained of the recognised power and capabilities of the country. The indifference apparently shown in so many departments was not shared by other countries...[53]

There was a marked contrast between some British displays and those from other countries. The Times observed that in the Machinery Building it was apparent that

> ...our makers feel the pinch of American competition. The cost of labour in the States has for many years past directed American ingenuity to the invention of labour machines, and the result has been that in many classes of machine tool they are admittedly ahead of us. [54]

Over 13,000 men were employed day and night in order to get the event ready in time. [55] Despite this concentrated effort some exhibits still remained in their packing cases as the guest of honour, the Duke of Veragua(a distant relative of Columbus) took his place for the opening ceremony. [56] Other guests included President Cleveland, Vice President Stevenson, members of the National Commission, the directors of the Exhibition Company and, from the British Royal Commission, Sir Edward Birkbeck, James Dredge and Walter Harris. [57] A third of a million people gathered to witness the inauguration and 300 journalists to record it. In his address President Cleveland linked American Industrial advance to education

> We, who believe that popular education and the stimulation of the best impulses to our citizens lead the way to the realization of the proud national destiny which our faith promises, gladly welcome this opportunity of seeing the results, accomplished by efforts which have been exerted longer than ours, in the field of man's improvement, while in appreciative return, we exhibit the unparalleled advancement and the wonderful accomplishments of a young nation-the present triumphs of a vigorous, self reliant, and independent people. [58]

Although the overall attendance was below that anticipated by the organisers, approximately twenty seven million visitors were drawn to the exhibition during the 179 days it was officially open. Those who passed through the portals of the Columbian Arch had access to free hospitals, telephone and telegraphic services and post offices, as well as the exhibits and the entertainment. The total expenditure exceeded $100 million. [59] The Americans had been unaware that the

final cost would be so great but '...as money was wanted, money was provide without stint and hesitation...' [60] Despite this generosity the exhibition still made a small profit. [61]

An auxiliary conference took place at the same time as the main exhibition and covered every branch of science, art, philosophy and social economy. It was divided into 16 sections, encompassed 210 separate meetings and cost £40000. The Art Gallery in the centre of Chicago was used as the principal venue. To the Americans this conference appeared to be of much greater interest than

> ...the Exposition itself, however proud they were of the latter. They threw themselves with astonishing vigour and independence into the discussion; yet even the most callous European could hardly fail to become interested in the variety of types and conceptions which he met here. [62]

The education section was organised by the National Educational Association and the topics for debate were grouped into two categories, those focusing on what was already in place and those which explored the education of the future. [63]

Technical instruction was adopted as one of the main themes for discussion. The ensuing debate, which was guided by Professor R. H. Thurston and Professor J. M. Ordway, considered the suitability of technical schools for training men for scientific professions. [64] Manual instruction was also investigated. Delegates were asked to focus on a number of questions including what new demands were being made on elementary education by global industry. A significant amount of time was also devoted to a discussion of business education. It was beginning to emerge as a key area of interest and the parallels with the origin of the debate on technical education are striking.

Education was also given considerable profile in the main exhibition. Twenty six nations in total including Australia (through the province of New South Wales), Brazil, Canada, Ceylon, Egypt, France, Germany, Japan, Mexico, Russia,

Great Britain and the host country took this opportunity to mount displays which celebrated their school systems. The Americans were ' proud of their public school system, and resolved not to spare any pains to represent it at the exhibition in the most complete manner...' [65] Their display was composed of exhibits from 44 States, although only 32 were represented directly. Elementary education was given prominence. It contained nearly 30,000 items, occupied 175,000 sq. feet and reflected the work of 1,150 cities and towns, 271 counties, 756 academies and private schools, 51 normal schools, 53 special school and 46 universities and colleges. The older and more established States such as Illinois, Indiana, Massachusetts, Minnesota and New York had exhibits of the highest quality. Some such as New Jersey were quick to embrace new technologies to enhance their displays by using photographs, an early form of the projectors and recordings of children reading. However, Selim H. Peabody, Chief of the Liberal Arts in Chicago, believed that the overall exhibit failed to indicate the existence of '...well organised and active systems which provide for the wants of the State as a whole.' [66]

The Americans had strict guidelines for what each country should include in the educational section of their exhibit. They stated that it was necessary to show

> ...the sites and different types of school building on as large a chart as possible, explain the administration and organisation of its school system by inscriptions, tables and graphic representations, and also show the means of instruction peculiar to it. From the very beginning particular stress was laid upon exhibiting the work of pupils. [67]

Few countries, with the exception of the Germany, Russia and France, were able to meet these standards, mounting displays which the Americans regarded as '...modest and incomplete...' [68] The German exhibition, prepared under the guidance of the Minister of Education was described as excellent. [69] Dr. Stephen Waetzoldt, Principal of Elizabeth School, Professor of Romanic languages and literature at the University of Berlin was appointed chief commissioner. Waetzoldt

set the tone for the German effort when he stated that '..he who fails to exhibit either has nothing to exhibit or shuns competition, his achievements being inferior...' [70] The displays were housed in the western gallery of the Manufactures and Liberal Arts complex, alongside those from England, France and the United States. They represented a complete overview of the entire German system and included apparatus, books and educational material related to public instruction museums, religion and the work of the Empress. [71]

The French exhibit, overseen by Jules Steeg, Director of the Paris Musée Pedagogique, occupied three rooms and consisted of educational material related to the Ecole des Arts et Métiers and public instruction. It contained an elaborate display of an advanced engineering workshop, examples of elementary art, literature from the Ministry of Education and an exhibit of work from a Parisian school. [72] The Russian display, which was highly commended, featured girls handiwork and art instruction. Most other foreigners appeared to be less concerned with their own display and more interested in observing the work of others.

The English display was not comprehensive. Sir Joshua Fitch, H. M. Chief Inspector of Schools, offered a partial explanation for this deficiency when he stated that England differs

> ...from most European countries and from America in having been very late to accept on the part the State any responsibility for providing the means of public education. [73]

It consisted of education material from the City of London, the Science and Art Department and the University of Oxford. The London School Board (L.S.B.) provided specimens of work produced by children between the ages of four to fifteen. These included written exercises, map and design drawings, models in clay and card, woodwork, metalwork, kindergarten handicraft and laundry work.

School materials and appliances such as books, pictures and apparatus were also on display. In addition models and plans of school classrooms, buildings and regulations and reports were presented by the L.S.B. It was described by The Times as a good display which demonstrated that the Board was making education '...more practical in cultivating taste and design, and in training to the habits of exact observation, accuracy and neatness...' [74] The Science and Art Department provided examples of drawing, painting and modeling by students at the National School of Art in South Kensington. Books, papers, drawings and photographs illustrating the history and methods of the extension system were contributed by Oxford University. Medical models were displayed by D. J. Cunningham from Trinity College, Dublin. The work from Eight women's colleges including those in Oxford, Cambridge and North London were exhibited in the Women's Building. Mrs. D. Hart supervised an exhibit of industrial teaching in Donegal. There was perhaps just enough in the totality of these exhibits

> ...to turn the thoughtful visitor to the examination of the results already attained by public education in England, and interest him in the history of the heroic struggle by which these results have been secured [75]

The education exhibits were housed in a number of different locations and the organisers were criticised when the difficulty that this caused became apparent. The Anthropological Building contained an exhibition on reformatory education. In the Agricultural Building there were exhibits from Uruguay, Liberia and England. The Bureau of Education display was located in the United States Government Building. Some exhibits relating to female education were housed in the Women's Building. A number of States had their own buildings (California, Illinois, Kansas, Washington) in which all or part of their education exhibit was mounted. The Japanese display was spread across three different venues. The Argentine Republic was given an alcove. The Egyptians displayed children's manual work in wood and iron. Japan exhibited material from state universities

and the school of technology. The offerings from Austria, Denmark, Italy, Norway and Sweden were described as meagre and it was suggested that the Spanish display could have been accommodated on a desk.

Technical education did not receive great prominence in Chicago. [76] It would have been reasonable to expect that the phenomenal growth in American schools and colleges of technology that had taken place between 1876 and 1893, would be acclaimed. [77] The fact that it was not celebrated was an unexpected omission. Perhaps the lack of universal provision made the Americans, who placed great faith in technical knowledge, unwilling to expose their system to international scrutiny. [78] The German exhibit was similarly limited but it was more ruthlessly criticised. Stephen Waetzolt considered that '...the missing exhibit of technical and industrial schools was an unacceptable deficiency...' [79] He was forced to ask why this situation had arisen and concluded that fear of competition had restricted the display. He believed that America, which he characterised as the land of technology and technical progress, could easily surpass any Germany effort. [80] It is significant that the perception of the relative educational strengths of the participating nations had on bearing on their exhibits. This demonstrates the propaganda value of exhibitions. Although technical education was poorly represented examples of manual training were given considerable space and prominence. [81] Perhaps it was an easier alternative to exhibit. It was long established, easy to define and universally recognised as important. All of these features combined are indicative of an overall loss of interest in the technical education debate in an exhibition context.

Eaton believed that when comparing the educational exhibits with the rest of the displays in Chicago one could not fail to be impressed with their capacity to

save nations from what he referred to as disorder. He used an example from English history to illustrate his assertion. He stated that

> ...we catch hints of the evidence that England avoided a foreshadowed revolution by aiding industrial and technical education and establishing a system of elementary schools...[82]

He concluded that the quality of the experiences of those who visited the educational component of the exhibition would determine its potential to influence educational practice and the extent to which new ideas were disseminated. [83] Selim H. Peabody was in no doubt about the excellence of what was on offer. He believed that nothing short of a complete catalogue '...will enable one to understand the fullness, the richness and the dignity of this wonderful exhibit...' [84] It also provide a useful reference point by which the progress of the whole of American education could be judged. [85] The exhibition closed on October 30 th.

Reaction to the Chicago Exhibition (1893)

From an American perspective the Columbian Exhibition was very successful. The impact it had on the whole country was as great as that on the shoreline of Lake Michigan. The event was widely celebrated in the American press and provided opportunities for growth in commercial and other spheres that were readily seized upon. Some Europeans believed that Chicago fairly reflected the mature status America had achieved, noting that only an independent, wealthy and educated people would '...create such an Exposition, and only an educated and thinking population could appreciate it...' [86] An eight member commission was formed to write a report for Congress and a sister exhibition, containing many of the Columbian exhibits, was opened in San Francisco in 1894 so that the people of the South West could share in the Chicago spectacle. [87]

The Columbian Exposition was regarded by some as most important exhibition ever held. [88] However, although it was well managed, there were clear failings in Chicago. The exhibition organisers did not appreciate that the lack of space and their hesitancy in allocating it had a universally discouraging effect. [89] Some foreigners were also dismayed by the plan to use single jurors to oversee the award system. [90] This led to claims of bias and devalued the honours bestowed on participants.

Chicago was widely reported in sections of the English press which concentrated on the superficial aspects of the event such as its architecture and entertainment, rather than comment on more serious issues. The public were wholly dependent on information and opinions from newspapers to help them form judgments about what was happening because of the inevitable remoteness of an event taking place three thousand miles away. [91] The limited number of British participants made the reliance on the views of few journalists and commentators even more necessary. This concentration of opinion had an adverse effect on how well the exhibition was perceived by casting doubt on its potential as a commercial marketplace. Henry Trueman Wood was typical of this small group. He believed that exhibitions had '..beyond question developed in a wrong and unfortunate direction...' [92] The Times therefore concluded that the exhibition was poorly appreciated. [93]

Three Foreign Office reports (Miscellaneous Series) compiled by J. Hayes Sadler, the Consul in Chicago examined tariffs, the key issue emerging from the exhibition. They were presented to Parliament in October 1892 (N° 256), in June 1893 (N° 292) and in January 1895 (N° 314). Collectively they warned that Chicago, far from being another opportunity to celebrate triumph, posed a threat because only British manufacturers who were keen to maintain existing markets

or wishing to develop new business on the American Continent were prepared to take part. Official indifference towards others who wanted to have a presence in Chicago but were deterred by the cost of transporting personnel and displays over such a great distance did not help. There was also little attempt to combat the bad publicity surrounding the McKinley Tariff. Of those who did become involved a significant number of complained that they did not get enough support from their accredited representatives, who seemed more prepared to spend the budget on decorating offices rather than enhancing the displays. [94] The penalties for this lack of ambition and disorganisation were highlighted in the last report. It suggested that the impression created at an exhibition was important. It believed that although

> ...the world may recognise in a country the highest standard of manufacturing power, visitors at an Exposition such as the World's Fair at Chicago are liable unconsciously to ascribe superiority to the larger and more effective displays [95]

THE PARIS EXHIBITION (1900)

The event

When the Germans announced that they intended to hold a universal exhibition in 1900 to celebrate the close of the century, the French regarded the move as unfair. They argued that as the holders of events in 1867, 1878 and 1889 the privilege of hosting an exhibition in 1900 was theirs by right. Even The Times agreed, noting that an eleven year cycle ' ...for these monster variety entertainments is claimed by France as her special prerogative...' [96] The President of the Republic, M. Carnot acted quickly to prevent the Germans realizing their ambition. He signed a decree announcing that an exhibition would be held in

Paris which would open in April 1900 and close in November of the same year. [97] It has been suggested that the Germans had no intention of holding the event. Cynics believed that the rumour was started with the Machiavellian purpose of '...drawing France into an enterprise which would absorb all her attention and divert her from any warlike idea' thus helping to keep the peace in Europe. [98] If this was an authentic motive it was very ambitious. More objective commentators realised that war, '...when it comes is the unexpected outbreak of forces which makes short work of exhibitions and their promoters...' [99] It was likely that the fear of failing to meet the standards set at other events was a powerful deterrent, and when Berlin was mentioned as a possible venue, '...it was a mere game of bluff and that talk was not serious.' [100] Nevertheless the German reaction to the announcement of the Paris event was muted. Despite the fact that trade between the two countries had once again become significant German producers still feared another conflict and the heavy social and commercial losses that it would entail. However, it was hoped that they would fully take part. [101] The French were determined that the event should be a success and the notion, once established was received with great enthusiasm.

It was destined to become a celebration that provided a '...summary at the end of the nineteenth century of the world's experience.' [102]

The exhibition was held on the Paris site traditionally used for earlier events. The Palais du Trocadéro (1878) and the Galerie de Machines (1889) were retained but the old Palais de l'Industrie (1895) was demolished. Midway between the Champs Elyees and the Pont Alexander III two new palaces were erected, the Petit Palace and a vast and rambling structure, the Grand Palace. The Eiffel Tower(1889) was given a new coat of yellow paint. The main entrance to the exhibition, the Pont Monumentale, was located on the Palace de la Concorde. It

was designed by Rene Binet in an Art Nouveau style. The entrance on the Champs Elysees was situated at the end of a broad statue lined avenue leading to the Pont de Invalides. A Palace of Fine Arts, which replaced the Palace de Industrie was situated on the right of the avenue and a museum containing arts of the past on the left. On both banks of the Seine, between the Pont de Invalides and the Pont de Alms, a series of buildings which housed foreign exhibits, various conferences and flower shows were located. The food, transport mechanical and chemical sections of the exhibition were on one side (Avene de Suffren) of the Champs de Mars and the literary, scientific, artistic, dress, mining and metals sections of the exhibition were on the other (Aveene de la Bourdonnais). They were connected by the electricity building. The colonial exhibition was placed in the Trocadéro Gardens. [103] In the Trocadéro itself

> ...a dazzling electric lamp has been placed between every pillar of the outer gallery, and it has undergone a felicitous transformation. The allegorical figures of the fountain have been renovated. The front of the summit is covered with electric lights. All along the border extending from the grand steps to the river all known varieties of roses have been planted...[104]

Decorative arts were housed in two long symmetrical buildings near to the Pont Alexander III, with foreign exhibits on the right and French on the left. The foreign pavilions, designed, paid for and in some cases constructed by the nation that used them, were allocated a position without consultation. This meant that on both the left and right of the Trocadéro the national buildings of China, India, Japan, Russia, Sahara, Sudan, Tunis and America were '...dotted down wherever there was sufficient space...' [105] It produced a virtually unplanned section of '...national architectural styles, finishes and effects along the right bank of the Seine.' [106] The American pavilion was originally located far from the banks of the Seine where favoured nations were given space. [107] Much diplomatic activity and argument followed before '..each country already in the front line gave up a little

of its space and the American pavilion was squeezed in.' [108] America spent more than any other nation on participating in the exhibition, partly as a result of the extra transportation costs it naturally had to incur, but also because it was aware of a new status it had acquired as one of the worlds leading nations. [109]

Hundreds of thousands of people were transported by the Decauville railway and the Trottoir Roulant, the French version of the Moving Sidewalk first used in Chicago. It had three lanes operating at different speeds and linked all points of the exhibition together. It was developed by Blot, Guyerot and Mocombe and had an excellent safety record. It became a central attraction. An electrically powered overhead railway provided an alternative means of transportation. A new underground metro connected the Western business centre of Paris to the exhibition site. The decorative Art Nouveau gateways to this system were designed by Hector Guimard.

The French were aware from their long experience, that exhibitions were not paid for by the serious visitor. The need to attract the masses meant that entertainment had become very important. Commerce, science and art were subsumed by the need to amuse. It was argued that if Paris was to be a success, it would not be

> ...on account of its reforming influence over the morality of the nations, or the stimulus it will give to social progress. It will be because its artistic attractions will appeal to people who crave for excitement all over the world. [110]

Accordingly they concentrated on spectacle. The French used electric lighting extensively to heighten the sense of theatre. The Palais de'l Electricité was illuminated with a multitude of coloured lights and Hachette claimed that it contained the living active soul of the exhibition. [111] The facade of the Galerie des Machines was illuminated by over 5000 multi coloured lamps of various types. Even the pinnacle of the building was lit up. [112] The Porte Monumental, the Pont

Alexandre III, the Champs Elysées, the Champs de Mars and the Trocadéro were illuminated by a further 16,000 incandescent lamps and 300 arc lamps. The lighting required that miles of wire had to be threaded along the various pathways and under the Seine. Unfortunately technical problems in the first week of the exhibition plunged it into darkness. Other forms of entertainment included a gigantic planetarium called the Dome of Discovery, restaurants and cafes that offered national dishes served by men and women in local costume and a French version of the Ferris Wheel. A panoramic 330° picture show by Raoul Grimoin-Samson, a film that simulated a trip on a steamship called a Mareorama and talking movies were also included. A cluster of native villages featuring the Algerians, Egyptians and Senegalese nestled at the base of the Eiffel Tower. The atmosphere in this area '...could only be described as utterly bizarre, as the noises, sights and smells of dozens of totally different cultures vied for attention...' [113] The 1900 Olympics were held in conjunction with the exhibition to add to the spectacle. They were accommodated in an annex at Vincennes but the investment in the games was insignificant. Competition winners were given tie-pins and pencils and '...100 francs from which they were supposed to buy their own medals.' [114] Few did so. Two hundred conferences were also held at the same time. The Paris International Assembly planned to help to bring the best exhibitors and contributors to these conferences. It also intended to support serious minded foreign visitors to the exhibition by proving expert guidance , information centers, lectures, excursions and private hospitality. The Assembly believed their actions would 'raise to the highest power the educational value of the great exhibition and the very large number of congresses that are to be held in connection with it...' [115]

The British appointed 112 commissioners to oversee their efforts in Paris. Notable amongst them were Sir Frederick Augustus Abel who acted as Chairman, well established activists for the cause of technical education including Sir John

Fletcherville Dykes Donnelly, now secretary of the Science and Art Department, Lord Reay, Sir James Kitson and Sir John Lubbock and educationists comprising the Duke of Devonshire, Lord President of the Council (who was nominally in charge of the education system in England and Wales) and Sir George William Kekewich, Permanent Secretary to the Education Department. The politicians included Sir Courtney Edmund Boyle, Permanent Secretary to the Board of Trade, Kenelm Edward Digby, Permanent Under Secretary of State for the Home Department, Earl of Dudley, Parliamentary Secretary of State for the Board of Trade and Charles Thomson Richie, President of the Board of Trade. Some of the others invited to participate were Sir John Barnston, President of the Royal Institute of British Architects, Major General Sir Owen Tudor Burne, Chairman of the Council of the Society of Arts, Sir George Hayter Chubb, President of the Institution of Civil Engineers, Casper Purdion Clarke, Director of the Art Museum at South Kensington, Lord Lister, President of the Royal Society and Edward Windsor Richards, President of the Institute of Mechanical Engineers. The business community was represented by 18 delegates from various chambers of commerce who were drawn from all parts of the Union. The Secretary of the Commission was Herbert Jekyll. [116] The British Royal Pavilion was created by Sir Edwin Lutyens. It was an exact replica of the Hall at Bradford on Avon. It was not built from traditional materials but out of steel sheet covered in roughened cement designed to imitate stone. [117] The interior panels could be taken apart and reassembled at another location. The irony of creating the old from the new is not lost on Greenhaulgh. He points out that the

> ...creation of an Olde Englande was a relatively easy task for exhibition organisers and government propagandists, as they themselves tend to emerge from the villages and suburbs of England to be educated in the ancient schools and universities. For them the vision felt natural and desirable. [118]

The choice of this style could indicate that at the dawn of a new century, earlier times were more important to the British although it probably signalled no more than they had taken into account the relative cost of construction and the need for entertainment. What was more significant was the lack of British commercial participation in Paris, despite the proximity of the two nations. There were a number of reasons for this reluctance to take part. Lasenby Liberty (chairman of Liberty and Company) suggested that, as in Chicago, there were many manufacturers and distributors

> ...who at one time looked forward to being represented in the exhibition who now find themselves practically excluded. This disillusion is understood to be due to the French exhibition authorities insistence on the most stringent compliance of all would be exhibitors with an excellent broad and general rule-to the effect, namely, that all goods must be classified and exhibited only in conjunction with those of a similar kind...[119]

There was also a great deal of anti British sentiment in Paris because of French sympathy for the Boers as a result of the war that began in October 1899. The British claimed that this led to preferential treatment for exhibitors from other countries. However, the Commercial Attaché to the British Embassy in Berlin, Mr. Gaskell, warned, as Henry Trueman Wood had done in Chicago, that failure to take to part in Paris was a serious omission. [120] He noted that the Germans had taken extraordinary care '...in providing a satisfactory representation of the Empire's industrial activity...' [121] Only approved goods were accepted, and the exhibits represented only the finest that Germany could produce. He strongly recommended that experts on the leading British trades be sent to Paris '...to examine thoroughly the best specimens of German handiwork...' [122] Gaskell believed that the expenses of such technical visitors should be met by manufacturers and trade groups and he pointed out that the German Government defrayed the costs of sending certain groups of workmen to Paris to report on industrial progress. [123] Some companies had already anticipated the

merits of this proposal. Lever Brothers (soap makers from Port Sunlight) sent 2000 employees to Paris on an organised visit that cost the company £7000. The return trip (including overnight travel) took 48 hours, of which only 5 hours were spent in the exhibition. Nevertheless, the men and women from the north west of England were impressed with the artistic skill and inventiveness of the French. [124] Thomas Cook also allowed workmen and others to make weekly payments towards the cost of an organised trip to the event. This included a return journey to Paris, hotel accommodation for 3 days, admission to the exhibition fro 2 days, an excursion to Versailles and the services of an interpreter. [125]

The Paris Exhibition was opened on April 14 th 1900 by the President of the Republic. [126] British representatives who were in attendance included the Attorney General Sir Richard Webster, Sir Cecil Clementi Smith, Sir Edward Buck and the British Ambassador, Sir Edmund Manson. Monsieur Millerand, the Minister of Commerce, continuing on the same theme stated in his address that the

> ...genius of a Pasteur, a pure benefactor of mankind whose glory is saddened by no shadow, increases a hundred fold the power of surgery and medicine. Disease grappled with at its source and isolated gives way, and on the near horizon appears the happy period when epidemics which ravaged cities and decimated peoples will no longer be anything but terrifying recollections and, as it were, the legends of the past. Thus science with admirable prodigality, multiplies the means placed by it at the disposal of man to bend to its laws external forces or guarantee him from their hostility. It renders him a more signal service by furnishing him with the secret of the material and moral greatness of communities which is contained in one word, Solidarity. [127]

To celebrate the opening all punishments in the army, navy and public schools were canceled and ticket prices were reduced from one franc to seventy centimes during the afternoon of the 14 th. Despite all the pomp and ceremony some sections of the exhibition (including that of the British) were not completed in time for the opening. They presented a chaotic scene and some of the French press

were unflinching in their criticism of the delay. [128] Many Parisians also quit the capital that weekend to avoid the masses.

The number of visitors was a third less than had been anticipated despite the fact that weather for the duration of the exhibition was the best it had been for some years. [129] This was blamed on the high cost entry which was necessary to meet the exorbitant running costs. Consequently the event made a loss of over 82,000 francs. Many ordinary investors lost money and the desire to hold similar events in France was seriously affected. [130]

The French authorities still sought to emphasise '...the educational possibilities of a great international display, and the existence of an intimate relations between the growth of educational systems and the increase of commercial and industrial prosperity...' [131] Accordingly it was given a very high profile. They paid a great deal of attention to promoting the education section of the main exhibition which occupied the a substantial part of the gallery of the Palace of Letters, Arts and Science in the Champs de Mars. There was plenty of space for those who applied early and all exhibitors were directed to classify their exhibits into primary, secondary, superior, state assisted, agricultural and commercial and independent educational divisions. The education component of the Paris event represented many diverse systems from around the globe and provided an opportunity for international comparison on a grand scale. The French exhibits were grouped into two distinct parts. Part one consisted of education in State primary, secondary, superior, art, agricultural and industrial schools and part two education in the independent sector by the Christian Brothers, the Sisters of Charity and secular organisations including the Philotechnic Association of Paris and commercial schools. Great attention to detail was paid to every exhibit. Each item was closely vetted the Ministry of Public Instruction.

The United States Congress delayed the appointment of a commission to oversee their education section until 1898. Most other countries had already committed themselves and the best venues were allocated. The American were consequently forced to use a smaller space than they required. Careful thought had to be applied in selecting what should be displayed in order to provide a true representative exhibit. It had to reflect the school and college system of the whole nation, leaving no room for individual States to dominate. An advisory committee appointed by the National Education Association and presided over by Howard J. Rogers (deputy superintendent of education for the State of New York who later became Director of Education for the United States) had the delicate task of making the decisions about what to exclude. Half the space made available to the Americans was devoted to elementary and secondary education, trade schools and education for special interest groups such as the disabled. The other half was given to higher education including colleges, universities and professional schools. The exhibits were drawn principally from eight cities, Albany, Boston, Chicago, Denver, Newark, New York, Omaha and St Louis and included statistical data, photographs and pupils work. This information was enhanced by nineteen booklets, edited by Dr. Nicholas Murray Butler of Columbia University which provide a complete description of education in the United States. The collection was assembled with the profound conviction that the American school system had

> ...most materially assisted in producing a type of citizen self reliant and well equipped, able to aid the nation in every emergency, and to demonstrate that the existence of such is not the fortune of chance conditions, but the inevitable result of free institutions wisely directed. [132]

It combined high ideals with a democratic spirit and was described as 'exceedingly attractive to the eye and admirably organised...' [133]

The jurors in Paris agreed with this conclusion. Many prizes were awarded to the Americans including 43 grand prix, 63 gold medals, 40 silver medals, 18

bronze medals and 9 honourable mentions. [134] Some British commentators, whilst acknowledging the quality American teaching in history, geography and math, believed that their science teaching, particularly in physics and chemistry, was poor in relation to that found in England. [135] The British spent five times less than the Americans on their educational exhibit. It defied systematic arrangement because of

> ...the peculiarly disorganized state of educational agencies...and their high degree of local independence and individuality did not lend itself to the French scheme. The English Director, therefore, wisely gave up the endeavour to force the material within set lines. [136]

However, it was more comprehensive than that found in Chicago, consisting of representations from various school boards, public schools and universities. [137] Birmingham, Bristol, Leeds, London, and Manchester School Boards all had exhibits. They were described as being '...full of suggestion and instruction...' [138] Some fine examples of scientific work (especially in an engineering and food technology) were provided and the display by Oxford and Cambridge received much praise. [139] Howard J. Rogers stated that the impression created by English system was that it was ruggedly and forcefully constructed. He admired the growth of board schools and their rapid absorption of the territory occupied by the denominational schools. He complimented the organisers of the exhibit whom he believed had '...done magnificently with the funds placed at his disposal...' [140] The English placed more emphasis on mounting this display than they had done in Chicago because France was more accessible and their system, even in a short time, had developed. The results of this effort were reflected the extensive list of educational agencies and institutions awarded honours in Paris which was published in The Times Between August 16 th to the 18 th. Those receiving a Grand Prize included the London School Board, the Education Department of

South Kensington, the City and Guilds Institution and the Examination Department of London County Council. Those receiving Gold medals included the School Boards of Aberdeen, Barry, Birmingham, Edinburgh, Glasgow, Liverpool, Brighton, Bristol, Cardiff, Leeds, Leith, Newport, Old Monkland, Preston, Sheffield and Swansea. The Germans did not participate, citing the lack of space and the absence a national educational system as reasons for not attending.

Technical education received more prominence in Paris than it had done in Chicago. The French mounted a large display which was organised by the Ministry of Commerce. Fabian Ware, a representative of the Education Committee of the Royal Commission was impressed with the quality of the exhibit. He believed that it was better than any display of technical education he had seen before and '...probably never will be equalled...' [141] The British gave prominence to the Birmingham Manual Training school, the Manchester Technical and Agricultural Institute, the Coventry Technical School for Art and Welsh technical and trade schools but they failed to make the same impression on visitors as the French had done. Howard J. Rogers believed that it was hardly fair to compare the work of the British '...with the long established technical schools on the continent, as precedents and conditions are so diverse...' [142] Rogers was convinced that most notable features of the education exhibition were the significant advances made during the last decade by Russian and Japan and the advent of the manual training in France and Austria. He also acknowledged that to Americans education had an intrinsic value but to the English it was about cost and conforming to a code. However he was aware of what he referred to as the educational awakening of the English. He stated that for the first time they had '...made an educational exhibit...' [143] Rogers was confident that '...the seed is planted, and by the time the next international exposition is held England will show astonishing results...' [144] A

less charitable view was provide by a French commentator Gustave Lanson in a Paris magazine, who stated that

> ...in the absence-unexplained-of Germany, whose pedagogy was represented by optical and surgical instruments: in view of the obstinate empiricism and traditionalism of England, which for the rest presented a rather confused and, in some instances, puerile exhibit, two countries predominately merited attention-Russia and the United States...[145]

Reaction to the Paris Exhibition (1900)

The desire to overshadow the efforts of previous exhibitions was prominent in the minds of the organisers of the Paris event. [146] In terms of size and spectacle the Art Nouveau Exhibition was very successful. [147] Extensive reports on the nature of the exhibits and the role call of honours appeared in The Times and references to it were also made in the School Board Chronicle. However, the reports in these publications were yet again devalued because in their search to attract visitors the organisers had become intent on elevating the trivial and marginalising the serious. This trend, long in evidence, had forced Kenric B. Murray, Secretary of the London Chamber of Commerce, to complain that exhibitors had come to be regarded as a means of income generation rather than as '...the backbone of any enterprise worthy of the name of international or universal exhibition.' [148] The Times claimed that the bewildering profusion of exhibits at these events should only be assumed to be there, as were the clothes on the back of the king in the Hans Andersen's story. [149] It argued somewhat mischievously that the ultimate extension of this policy would lead to exhibits being abandoned completely. As an antidote it suggested that in order to encourage participation on a large scale at any future exhibition it would be necessary to make

> ...considerable alterations in the method of treating exhibitors, taking care that the business aspects of the undertaking are assiduously pushed and promoted as the pleasure attractions are assiduously advertised and eulogised...[150]

The news from the French exhibition was further devalued because of the negative stand taken by the French over the Boer War, which was widely reported in the English press. It also had some bearing on how many crossed the Channel to view it.

The value of comparing education systems did not appear to be undermined by the demand for entertainment or the international enmities. J. H. Reynolds, the Director of Manchester Technical School was so impressed by the quality of the American education exhibit that he sought permission to transfer their display to Manchester. His petition was successful and the entire presentation was relocated to the Central School in Whitworth Street, thus making it accessible to a wider English audience. This decision was mindful of criticism of a recent education exhibition held in London and containing the work of a number of School Boards, which was largely ignored because of the difficulties encountered by those who had to travel from the provinces to attend. [151]

CONCLUSIONS

The last two major exhibitions at the end of the century were significant because they helped to illustrate the gulf between British and foreign attitudes towards manufacturing, education and trade. In London at the Inventions Exhibition in 1885 England had been the champion of the newly emerging electricity industry. By the time of the Chicago and Paris events America, France and Germany had recognised the value of this technology and fully embraced it. Their desire to develop expertise and manufacturing capability in this area was symptomatic of their confidence and ambition. It confirmed the existence a new world industrial order in which Britain's competitors had grown in strength and

sophistication. [152] Trade dominated the thoughts of the majority of nations who participated. They were keenly aware of the opportunities available to them to increase the size of their market share. The French and the Germans, despite mutual distrust, considered both events sufficiently important enough to share the Chicago, and more importantly the Paris venue with each other. In contrast the British appeared to be tired of the concept of exhibitions and limited the scale of their participation. It could be argued that there were other factors that influenced their decision not to take part as fully as they could have done. In America the problems associated with travelling across the Atlantic and the trade tariff [153] were regarded as influential and in France, a negative reaction to the Boer War by the Europeans also restricted their involvement. [154] There was also some doubt in English minds about the wisdom of exposing new ideas to international scrutiny and the value of exhibitions for promoting trade. These factors alone cannot explain the apathy of British manufacturers.

There were other powerful inducements to attend both events which should have forced them to ignore these difficulties. Chief amongst them was the opportunity presented at exhibitions to gather data on foreign activities. The British were as eager as they had been in 1867 on collecting information from abroad, particularly on trade and educational matters. Michael Sadler, Director of the Education Department's Office of Special Inquiries and Reports, and others reported on education in the United States at the behest of the Education Department. German provision was examined in detail by many commentators on education. [155] Robert Morant investigated French schools in the mid 1890s and was deeply impressed by what he saw. [156] Collectively Sadler's team discovered that there was a marked difference between English practice and that found abroad, particularly in technical education. It was also noted that the contrast between the highly structured education systems in other countries and that found

in England was stark. Any inadequacy in this respect was clearly exposed in Chicago.

The English were, however, intent on dealing with the internal tensions in their existing educational system, now in a state of crisis, rather than pay heed to information from abroad. A dispute between London School Board (L.S.B.) and the London Technical Education Board (L.T.E.B.) who disagreed about the right to support higher grade schools in the metropolis lay at the heart of the difficulties they were facing. [157] William Garnett, Secretary to the Technical Education Board and Sir John Gorst, Vice President of the Council placed the matter before T. B. Cockerton (a government auditor) following an investigation at the Science and Art Department. [158] He determined that the London School Board could only use grant aid for elementary education and surcharged it accordingly. The Cockerton Judgment, as it became known, halted the expansion of higher grade schools. [159] Thomas J. Macnamara, Liberal M.P. for North Camberwell (1900) [160] suggested that the effect of this would be profound because higher grade schools had

> ...offered opportunities to children who would otherwise have been restricted to purely elementary work; now except for a few favoured children these restrictions were being re-imposed. Today many a potential Faraday is washing bottles in the public house backyard...many a Herschel is scaring crows on the countryside; many a potential Watt is crying "Xtra Speshul" through the gutters at midnight and many a potential Arkwright is scavenging the floors of the Lancashire cotton mills. [161]

The Cockerton Judgment, despite recent advances, exposed anomalies in the secondary system which demanded to be addressed. The first step towards reform had been taken when the Board of Education was created in 1899 to manage educational affairs in England and Wales. It was formed by a merging the Education Department with the Science and Art Department and the educational sections of the Charity Commission. [162] The momentum for change was continued by Evelyn Cecil, M.P. for Aston Manor. He convened a private meeting of members

of the House of Commons interested in education which included James Yoxall, Ernest Grey and Thomas J. Macnamara, all of whom had been or were currently representatives of the National Union of Teachers. The group, known as the Parliamentary Education Group (P.E.G.) agreed to discuss the education question without the interference of party politics. They concluded that it was possible to construct legislation to unify elementary, secondary and technical education which could be funded partly by local rates. They also suggested that School Boards should be replaced by councils and county boroughs.

Balfour, the Conservative leader in the Commons, who knew little of schools and schooling was encouraged by the work of the P.E.G. He needed this incentive because some of his earlier experiences with legislation had not been successful. He had unwittingly aborted the 1896 Education Bill submitted by Sir John Gorst. The Bill, which attempted to curtail the activities School Boards, was '...in many ways a dress rehearsal for the 1902 Education Act...' [163] However, he knew that the education issue '...while somewhat confusing could not be dealt with any longer by piecemeal legislation...' [164] Balfour had announced to a meeting in Manchester that '...the existing educational system of this country is chaotic, is ineffectual, is utterly behind the age, makes us the laughing stock of every advanced nation...and...puts us behind not only our American cousins, but the German and the Frenchman and the Italian..' [165] He believed that it was '...not consistent with the duty of a British Government to allow that state of things longer to continue...' [166] He turned to Robert Morant and others for help in drafting a suitable legislation and introduced his own Education Bill to Parliament in a motion first read on March 24 th 1902. The Bill abolished the Technical Instruction Acts of 1889 and 1891 and part of the Local Taxation Act 1890, and replaced School Boards with Local Education Authorities. [167] Whisky money was retained and revenue from the rates could be used to maintain elementary

voluntary schools and to provided or aid '...higher education beyond that which is merely Technical and Manual, which was all that the Technical Instruction Act allowed. [168] Musgrave contends that the 1902 Act began the process of creating a system of secondary education which was populated by schools that favoured the classics and character building. [169] They imitated the public school and therefore '...perpetuated its bias against science and industry...' [170] The expansion of technical education which had begun in earnest during the last years of the century was effectively halted. [171]

Perhaps the system might have evolved in a another direction had the English paid more attention to the testimony from the two final exhibitions of the century. However, the evidence from them was devalued, not simply because of distance or the Boer War or arguments about their potential for trade, but a belief that the concentration on entertainment in Chicago and Paris had trivialised them to the extent that they could not be taken seriously. This English were therefore unaware of the changing position of technical education in an exhibition context nor, indeed, of Commercial education, which in the wake of the tariff question, was now emerging as the key issue in international relations..

FOOTNOTES : 4

1) M. E. Sadler on behalf of the Board of Education, 'A contrast between German and American ideals in Education', Special Reports on Educational Subjects, , Vol. 2, 1902, p. 433.

2) Exhibitions were held in Launceston 189, Hobart 1894, Brisbane 1897, Kingston 1891, Kimberly 1893 and Guatemala 1897.

3) H. T. Wood (B) 'Chicago and its Exhibition', Nineteenth Century, Vol XXXI, 1892, Sampson Low Marston, London, p. 556

4) The National Commission was composed of 113 members drawn from the all the American States

5) Columbus discovered the Bahamas and Cuba in 1492 but did not set foot on American soil until 1497.

6) A. Lewis, An early encounter with tomorrow: Europeans, Chicago's Loop and the Worlds Columbian Exposition, University of Illinois Press, Urbana, 1997, p. 168

7) H. T. Wood (B), op. cit., p. 556

8) The Times, September 4 th, 1890

9) Located on the South side of Chicago, Jackson Park was three times bigger than the site used in for the Paris Exhibition held in 1889.

10) The more outlandish suggestions included building a huge structure that would dwarf the Eiffel Tower or a an edifice that would move from the horizontal to the vertical by the use of winching cables. Non were commissioned.

11) Foreign Office Miscellaneous Series, Report on the inauguration and condition of the world's Columbian Exposition, H.M.S.O., London, N° 292, June 1893, p. 496

12) The countries which had exhibits in the Manufacturing and Liberal Arts display included America, England, France, Germany, Canada and Mexico

13) The Brazilian Pavilion cost £18000, the French £10000 and the Swedes spent £8000

14) A. Lewis, op.cit., p. 167

15) Ibid., p. 179

16) Ibid., p. 177

17) The Times, September 14 th, 1895. Comment by H. T. Wood

18) A. Lewis, op.cit., p. 181

19) J. Allwood, Great Exhibitions, Studio Vista, London, 1977, p. 86

20) A. Lewis, op.cit., p. 174

21) H. T. Wood (B), op. cit., p. 560

22) Ibid.

23) Foreign Office Miscellaneous Series, Report on the plans for the world's Columbian Exposition, N° 256, H.M.S.O., London, October 1892, p. 477

24) H. T. Wood (B), op. cit., p. 563

25) Foreign Office Miscellaneous Series, N° 292, op. cit., p. 491

26) They spent a total of four million francs

27) The Times, May 2 nd, 1893

28) Foreign Office Miscellaneous Series, Report on the close of the world's Columbian Exposition, H.M.S.O., London, N° 314, January 1895, p. 518

29) Ibid., p. 519

30) The Times, September 14 th, 1895. The Germans also sent two military bands to entertain their guests. Comment by H. T. Wood

31) The Times, Jan 5 th, 1893

32) H. T. Wood (B), op. cit., p. 565

33) The Times, September 14 th, 1895. Comment by H. T. Wood

34) J. Allwood op.cit., p. 87

35) G. W. G. Ferris commissioned a 250 ft giant revolving vertical wheel, resting on 135 ft towers, which supported passenger cars on its periphery. It was the largest steel casting in the world at that time. The whole structure weighed 2,300 tons.

36) Paris received £126000 in 1867 and £67000 in 1878, Philadelphia £40000 in 1876 and Vienna £28000 in 1889

37) Edis also designed the London School Board office extension in 1893

38) The Times, October 17 th, 1892

39) The Times, Jan 5 th, 1893

40) The Times August 31 st 1893. Chicago was the most expensive exhibition to participate in. It cost each of the 179 exhibitors an average of £1000 to take part.

41) H. T. Wood (B), op. cit., p. 562

42) A. Lewis, op.cit., p. 174

43) H. T. Wood (B), op. cit., p. 562

44) Ibid. American fruit growers already had to charge more for their canned goods as a result of the McKinley Tariff. The imported tin plate they used for their cans was more expensive.

45) Ibid., p. 565

46) The Times, May 7 th, 1894

47) H. T. Wood (B), op. cit., p. 565

48) The space allocated to the British amounted to about an eighth of the total floor space available

49) The china and pottery display was greatly admired

50) The Times, Jan 5 th, 1893

51) The Times, Jan 5 th, 1893

52) Ibid.

53) Foreign Office Miscellaneous Series, No 314, op. cit., p. 513

54) The Times, Jan 5 th, 1893

55) Foreign Office Miscellaneous Series, No 292, op. cit., p. 491. The majority of the work was undertaken in the last few days before the inauguration.

56) This situation occurred in at least 140 out of 200 buildings.

57) The number of invited guest reached 2000 in total

58) The Times, May 2 nd, 1893

59) Ibid.

60) The Times, September 14 th, 1895. Comment by H. T. Wood

61) Foreign Office Miscellaneous Series, No 314, op. cit., pp. 527-30. See table for a breakdown of costs

62) Report of the Commissioners of Education, Vol. 1, 1892-93, p. 641

63) Ibid., pp. 439-441. The education section was presided over by Charles Bonney.

64) Thurston was from Cornell University and Ordway was from Tulane University

65) Report of the Commissioners of Education, Vol. 1, 1892-93, p. 641

66) Ibid., p. 455.

67) Stephen Waetzoldt, Ibid., p. 458.

68) Ibid., p. 652

69) Ibid., p. 639

70) Ibid., p. 569

71) The Prussian exhibit was so large that it required five rooms by itself

72) Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 455

73) Ibid., Vol. 1, 1892-93, p. 1169

74) The Times, February 16 th, 1893

75) Report of the Commissioners of Education, Vol. 1, 1892-93, p. 1173

76) The only technical education on display was confined to that provided by normal training schools.

77) A comment made by Selim H. Peabody

78) Report of the Commissioners of Education, Vol. 1, 1892-93, p. 647

79), Ibid., p. 550. A comment by Stephen Waetzoldt

80) Ibid., p. 549 Waetzoldt offered others reasons for the lack of a technical education exhibit . He cited lack money and administrative division as pertinent

81) Manual schools were represented at most exhibitions. In Chicago examples from America, Salicis from France and Sloyd from Sweden were featured

82) Dr. John Eaton, Report of the Commissioners of Education, Vol. 1, 1892-93, p. 453

83) Ibid.

84) Selim H. Peabody, Ibid., 455 and 1222

85) Ibid., 457

86) Ibid., 656

87) The San Francisco event was located on a site that covered 160 acres and it attracted over 1, 300, 000 visitors during the time it was open.

88) Foreign Office Miscellaneous Series, N° 292, op. cit., p. 499

89) Report of the Commissioners of Education, Vol. 1, 1892-93, p. 1015. A comment by John Eaton

90) Foreign Office Miscellaneous Series, N° 314, op. cit., p. 523

91) The Times, May 7 th, 1894. These opinions were heavily influenced by men such as Henry Trueman Wood.

92) The Times, September 14 th, 1895. Comment by H. T. Wood

93) The Times, May 7 th, 1894

94) Ibid., August 27 th, 1893

95) Foreign Office Miscellaneous Series, Nº 314, op. cit., p. 533

96) The Times, September 14 th, 1895

97) The decision to hold the event was made in July 1892

98) The Times, September 14 th, 1895

99) Ibid.

100) Ibid., April 13 th, 1900

101) Ibid., April 14 th, 1900

102) Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1680

103) The Times, May 13 th, 1895

104) Ibid., April 13 th, 1900

105) Ibid.

106) J. Allwood, op.cit., p. 101

107) Designed in the Neo classic style of Chicago.

108) J. Allwood, op.cit., p. 101

109) This new status was partly based on the success of the Chicago event

110) The Times, April 16 th, 1900

111) J. Allwood, op.cit., p. 102

112) Ibid., p. 101

113) P. Greenhaulgh, Ephemeral Vistas, p. 83

114) J. Allwood, op.cit., p. 106

115) The Times, February 1 st, 1900

116) Ibid., February 5 th 1898

117) J. Allwood op.cit., p. 100

118) P. Greenhaulgh, op.cit., p. 124

119) The Times, December 17 th, 1898

120) The Marquis of Salisbury forwarded his comments to R. W. Fithen, secretary of the Association of Chambers of Commerce

121) The Times, June 26 th, 1900

122) Ibid.

123) Ibid.

124) The Times May 28 th, 1900

125) Ibid., May 8 th, 1898

126) Ibid., April 16 th, 1900

127) Ibid. Millerand was a Socialist

128) Ibid.

129) Many came from Germany including some from of the armed forces

130) K. W. Luckhurst, The Studio Publications, London, 1951, p. 221. The Paris event cost over one hundred million francs but only received seventy million francs in gate receipts.

131) J. H. Reynolds, Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1700.

132) Ibid., p. 1703

133) Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1661

134) J. H. Reynolds , op.cit., p. 1703.

135) J. H. Reynolds, Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1700. George George of the Longton Science School had strong opinions on the quality of American education.

136) Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1667

137) Howard J. Rogers, Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1682

138) Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1661

139) Howard J. Rogers, Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1682

140) Ibid.

141) Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1691. Fabian Ware Representative of the Education Committee of the British Royal Commission.

142) Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1682

143) Howard J. Rogers, op.cit., p. 1680

144) Ibid., p. 1682

145) Gustave Lanson, Report of the Commissioners of Education, Vol. 2, 1899-1900, p. 1688

146) The Times, September 14 th, 1895

147) So called because contained the largest gathering art nouveau artists ever assembled in one place

148) The Times, September 19 th, 1895

149) Ibid., September 14 th, 1895

150) Ibid., September 19 th, 1895

151) It was opened on January 13 th at the Imperial Institute by the Prince of Wales.

152) This was Balfour's viewpoint

153) It did not deter the Germans or the French.

154) The desire to win the competitions at both events was as strong as ever.

155) M. Sanderson, The Missing Stratum: Technical school education in England 1900-1990s, The Athlone Press, New Jersey, 1994, p. 14. The Germans were important because they were the chief foreign influence.

156) Robert Laurie Morant (1863-1920) was educated at Winchester and Oxford. In 1886 he became tutor to the Siamese Minister in London and between 1888 and 1893 held a similar position with the Crown Prince. He was appointed as an Assistant Director in the office of Special Inquiries and Reports in the Education Department in 1895 and in 1902 was made a Permanent Secretary.

157) P. R. Sharp, The public financing of secondary and technical education in Victorian England, (M.Ed) University of Leeds, 1973, p.428. Higher grade schools catered pupils who had finished elementary school and represented an expansion of the secondary system.

158) Garnett and Gorst acted on behalf of the London Technical Education Board.

159) S. J. Curtis, History of Education in Great Britain, University Tutorial Press, London, 1957, pp. 314-15

160) Macnamara had been a teacher in Lancaster and Huddersfield, a Board school headmaster, president of the NUT between 1896-97, editor of the Schoolmaster and also a member of the London School Board.

161) Robin Betts (F) (quoting Macnamara) , 'Dr. Macnamara and the Education Act of 1902' Journal of Education Administration and History, Vol. 25:2, 1993, p. 115

162) The first president was the Duke of Devonshire who established a Committee on the Co-ordination of Technological Education with Swire Smith and Philip Magnus amongst its members One of their more significant acts was to found the T (technical) Branch in 1901.

163) N. D. Daglish, 'Planning the Education Bill of 1896', History of Education, 'Planning the Education Bill of 1896', Vol. 16, N° 2, David and Charles, Newton Abbot, 1987

164) P. Gibson, Dr. A. J. Mundella and foreign Education systems 1867-1897, (Ph.D)University of Liverpool, 1988, p. 251

165) Schoolmaster, October 18 th, 1902, p. 593

166) Ibid.

167) G. R. S. Taylor, The Education Acts of 1902 (England and Wales) and 1903 with notes for the use of members of councils and committees and others administering the acts..., Routledge, London, 1902, p. 3. Local Education Authorities were under the control of Borough and Urban District Councils.

168) Ibid.

169) P. W. Musgrave, Technical Change the Labour Force and Education: A study of the British and German iron and steel industries 1860 1964, Pergamon Press, London, 1967, p. 180

170) Ibid., p. 261

171) Michael Argles, South Kensington to Robbins: An account of English Technical and Scientific Education since 1851, Longmans, London, 1964, p. 61 and E. J. R. Eaglesham, The Foundations of Twentieth Century Education in England, Routledge and Kegan Paul, London, 1967, p. 62

Section 5 : The Absence of Continuity

(I.C.E. Report 17)

You cannot have a big exhibition held in Paris and England standing outside it. It may or may not be a good thing to have an exhibition and to exhibit at it, but there is no question whatever that if there is an exhibition and your rivals are showing at it, you have got to show too. [1]

THE INTERNATIONAL EXHIBITIONS COMMITTEE I.E.C.

Introduction

Wise politicians recognise the value of history in helping to clarify important issues. For the first time a systematic and thorough investigation of the place of exhibitions in the development of trade (and by association that of technical education) was sought early in the new century. The International Exhibitions Committee (I.E.C.) was established as a result of a departmental Minute issued on October 23 rd 1906 by David Lloyd George, President of the Board of Trade. Lloyd George, a solicitor by profession, was unencumbered by the assumptions of both the landed aristocracy or manufacturing class. He suggested that it was necessary to undertake some form of research into the link between international exhibitions and the well being of British trade. An investigative committee was formed in response to this request. Its terms of reference were to inquire and report

> ...as to the nature and extent of the benefit accruing to British Arts, Industries and Trade from the participation of this country in Great Exhibition; whether the results have been such as to warrant His Majesty's Government in giving financial support to similar exhibitions in future; and if so , what steps, if any are desirable in order to secure the maximum advantage from any public money expended on this object. [2]

The Committee determined that it would explore direct benefits such as an increase in sales, indirect benefits including the maintenance of trading position and others categorised as educational, social and political benefits. The I.E.C. decided to examine only those exhibitions which were '...officially initiated and organised by, or under the auspices of the Government of the country which it is held...' [3] It also expressed an interest in looking at exhibitions which '...derive their claim to an international character mainly from the fact that they open to the

products of more than one nation...' [4] It explored this complex issue by reporting on the level of British participation in past events, by trying to ascertain the general effect of exhibitions on industry and debating what policy should be adopted for the future.

Personnel

Nine members were appointed to the Committee. Sir Alfred Bateman was nominated as the chairman. His colleagues included Sir James Kitson and Sir Swire Smith who were already highly familiar with the technical education debate. The others were A Wilson Fox from the Board of Trade, Charles A. Harris from the Colonial Office, Algernon Law from the Foreign Office, Malcolm Ramsey from the Treasury, Sir Isidore Spielmann and Samuel J. Waring. The Secretary was U. F. Wintour. They held thirty meetings and delivered their final report to Parliament on August 17 th 1907.

Witnesses

The Committee gathered evidence by sending out two Circulars to potential witnesses and by interviewing some of the respondents. Circular N° 1 was for general use but Circular N° 2 was issued to Chambers of Commerce and manufacturers only. [5] Both were simple and to the point, seeking opinions on '...the value of Great International Exhibitions as a means of increasing their trade with foreign countries...' [6] Fifty six witnesses were examined on separate days between November I st 1906 and July 18 th 1907. [7] Testimony was sought from manufacturers including Sir Boverton Redwood, Bennet H. Brough, W. H. Felton, F. T. Ford, and H. J. Powell, who represented some of the thirty four industries whose agents gave evidence to the Committee. [8] Delegates from the mechanical engineering profession, including Arthur Greenwood and George Jennings were

amongst this group. Thirteen individuals who had participated in earlier exhibitions including Sir Isidore Spielmann (Paris 1900), G. Collins Levey (Philadelphia 1876 and Paris 1878), Lord Justice Fletcher Moulton (Paris 1900), Lucien Scrailler (Paris 1900) and Lord Avery Stone (Paris 1900) were invited to contribute. The London Chamber of Commerce provided three witnesses. The Board of Trade, the Science and Art Department, Bradford Chamber of Commerce, the Diplomatic Corps and a South Kensington museum each provided a single witness. [9] The combined statements of all the witnesses were contained in 312 pages of evidence attached to the final Report

The Committee also sent an extensive questionnaire (containing 19 questions) to Foreign Office representatives abroad asking them to provide

- A list of those exhibitions in which the foreign government had been involved and the reasons why it had participated.
- The details of grants made by the foreign government to various organisations that took part in the exhibitions , the rules that regulated that these organisations, the personnel involved and how the money was spent.
- The cost of the pavillion and the price it was sold for when the exhibition closed.
- Information on how exhibits were obtained and the rules governing their selection and subsequent display
- The technical details regarding packaging, transportation, display, insurance of exhibits and who was liable for these costs.
- Details of how space was allocated and awards.
- Information on the willingness of manufacturers to take part.

- The plans to hold future international exhibitions in that country.
- Details of the local impact of exhibitions on British Trade.

They were asked to gather only those details relating to exhibitions which had occurred in the previous twenty years. Responses were furnished by H. M. representatives in Austria, Hungary, Belgium , France, Germany, Italy, Switzerland, United States and Japan. Information on France was supplied by H. M. Commercial Attaché in Paris.

The Report of the I.E.C.

The final report was only 25 pages in length but it addressed the issue being examined in full. When investigating British participation in past events the Committee established that since 1853 the Government had spent £640,000 on the 22 exhibitions in which it had been involved. [10] They concluded that the level of participation was not governed by '...any continuous or clearly defined principles...' [11] but was usually determined by political considerations. The British sections were organised either by a temporary Royal Commission, the Science and Art Department or the London Chamber of Commerce. There was some disagreement amongst the witnesses about the value of the temporary Royal Commissions. Sir William Preece observed that they were highly regarded by foreign governments and therefore suggested that they had significant role to play. [12] Preece had been associated with at least 25 exhibitions including those in Paris in 1867,1878 and 1900, the Chicago exhibition in 1893 and the Health and Inventions exhibitions. [13] In contrast Henry Trueman Wood concluded that a Royal Commission was '...a singularly cumbrous instrument for the purpose and most unsuited for the work. [14] He described it is as '...a very bad executive instrument.' [15] The Committee, despite some criticisms of its own, favoured the

position adopted by Preece and recommended that '...for all really large exhibitions in which the Government decide to participate there should as a general rule be a Royal Commission...' [16]

Bateman and his colleagues established that successive governments had been unwilling to offer much support, both financially and otherwise, to those who wished to take part in exhibitions. Generally, individual British exhibitors had to meet their own expenses and coordinate the details associated with their participation. This was in marked contrast to foreign practice. In the majority of other countries

> ...the formation of the national exhibit has usually been undertaken directly by the Government as part of a clearly defined national policy, having for its object the systematic and complete representation of the arts and industries of the country. [17]

In France the organisation was undertaken collectively by the exhibitors themselves through the Comite Francais des Expositions a l'Etranger. The Comite was only open to those who had achieved high awards at previous exhibitions or who had acted as jurors. The French Government was represented by a Commissioner General who was appointed by Ministry of Commerce. In Germany the organisation was in the hands of a single individual who was nominated by the Imperial Chancellor and appointed by the Emperor. He was in control of large sums of money. Extraordinary care was also taken by the German Government '...in collecting and arranging the German exhibits...' [18] In both countries Government grants were also provided for

> ...the dispatch of workmen's missions to study the progress made by foreign countries in various branches of industry. Similar arrangements , it is understood are also made by other countries, but no such missions have been officially organised by H. M. Government. In the case of the Paris Exhibition of 1867 and 1878, an organisation was formed by the Society of Arts for the purpose of facilitating visits of artizans to the Exhibitions, and interesting reports on the results of these visits were subsequently published by that body. No assistance, however appears to have been given to these undertakings from the official grants at the disposal of the Royal Commissioners for either of those Exhibitions. [19]

In contrast the I.C.E. stated that a '...considerable amount of criticism has been directed during the course of our enquiry to the general management of the British sections.' [20] No single authority was in charge and there was usually a delay in appointing the Royal Commission. The executive officers to whom the management had been '...entrusted in the past, have to some extent failed to get in proper touch with the exhibitors or appreciate their grievances.' [21] Little practical information was given when they were invited to participate in the exhibition. Space was assigned on an ad hoc basis. Displays had to be assembled without the help of the specialist teams allocated to exhibitors from other countries. There was no uniform system of selection or harmonisation of effort. The Committee determined that part of the blame lay with exhibitors themselves. Previous attempts to assemble a coordinated exhibit had been thwarted because

> ...the tendency of British manufacturers is towards individualism rather than collectivism in such matters, and that considerable difficulty is experienced in obtaining collective displays from many branches of industry. [22]

Henry Trueman Wood argued in his evidence that this was inevitable because the English people were by nature, individualistic and therefore it would be '...absolutely impossible to induce British exhibitors to join in the collective exhibits.' [23] Thus British effort was charecterised by a dependence '...upon the voluntary effort of individuals.' [24]

A Royal Pavilion or a building used as the headquarters of the Commissioner General was a common feature of the British section at most exhibitions. A large part of the grant was devoted to the cost of building and maintaining this facility and the Committee were bound ask if the expenditure '...was justified by the results obtained.' [25] It concluded that '...a portion at least of the cost of these buildings might more usefully have been spent in the provision of additional facilities for exhibitors...' [26]

After Bateman and his colleagues had examined the Official Reports of various Royal Commissions they concluded that there was an absence of continuity between exhibitions. They noted that the participation of Great Britain

> ...in each successive Exhibition would...appear to have been treated as if it were an entirely new problem, unconnected with those that had gone before, and little if any attempt seems to have been made to apply to one Exhibition the lessons the lessons derived from another...[27]

Each organising body had to start again and every time that an exhibition was held the whole thing had to be '...treated as if had never been held before.' [28] One consequence of this policy was that when the work of a Commission was '...wound up, all the information which it has collected is lost.' [29] The overall lack of structure affected the quality of display. It the light of this evidence the Committee judged that '..the British sections at all the more recent Exhibitions have not afforded an adequate and satisfactory representation of the nations industries.' [30]

The I.E.C. concluded that international exhibitions '...were not universally favoured by manufacturers in this country.' [31] The reluctance of British industrialists to participate had increased as the century drew to a close. Bateman and his colleagues observed that a number of factors, apart from limited

government support and poor organisation, led to the development of this attitude. They believed that the novelty had '...worn off...' [32] because:

Popular amusement had become an essential '...part of the life of modern Exhibitions...' [33] A notion common amongst manufacturers was that exhibitions, particularly those held abroad, were

> ...nowadays prompted and kept open less with a view to the furtherance of trade interests than with the object of attracting visitors and achieving financial success from the receipt of the gate money. [34]

The organisers appeared to want to attract pleasure seekers rather than those with more serious intent. There were many references attesting to this development in the Minutes of Evidence including the statement by Preece that an exhibition in Paris without a side show '...would scarcely be acceptable...' [35]

Awards once so treasured, had become devalued because of the indiscriminate manner in which they were bestowed.

Exhibits required time to prepare and removed vital employees away from essential work at home.

Some manufactures still feared that there was a danger of goods being copied. This was not universally regarded as a serious threat because new ideas were readily shared through scientific and manufacturing societies. The Committee noted that it

> ...must be borne in mind that at the present day the facilities for keeping in touch with new inventions or developments in other countries are very much greater than in the days of earlier Exhibitions and that the opportunities for obtaining information with regard to new designs or new ideas in any particular trade are by no means confined to Exhibitions. [36]

Other forms of advertising had replaced the exhibition as a means of promoting goods.

The trouble and cost of creating an exhibit was not always compensated for by a corresponding increase in trade because of protective import tariffs.

There was no doubt that in the opinion of the many industrialists the combination of all these factors '...materially diminished the value of exhibiting as a means of obtaining orders for their goods...' [37] However, the Committee argued that in order to have continued success every effort should be made '...to maintain and improve the reputation of British manufacturers as a whole...' [38] Participation in exhibitions was therefore regarded by Bateman and his colleagues as '...a national necessity...' [39] , though the long held view that exhibitions provided a means by which progress in technical education could be appraised was not mentioned. Taking account the significance of British exports they warned that failure to take part would be detrimental to British interests '...as a manufacturing country.' [40]

Recommendations

Trade was now the key issue and although Bateman and his colleagues could not offer definitive proof that exhibitions increased it, they concluded that the central question was not

> ...whether to exhibit, but whether under modern conditions we can afford not to exhibit. We think that the evidence which we have obtained affords convincing proof that the answer to this question is in the negative. [41]

Having determined that non participation was unacceptable, they set about identifying the key issues that needed to be addressed in order to achieve the maximum benefit from exhibitions. They deemed it necessary to appoint '...a permanent official whose duty it should be to collect full information respecting past exhibitions, and to evolve a proper system for application in the future.' [42] The Committee insisted that part of the role of this official should be to assess the

potential value of any invitation to participate in an exhibition and that he should be

> ...the man who is to take the lead in the organisation of even the largest exhibition. We think it absolutely essential that he should at an early stage of the preparations for the exhibition visit the exhibition ground and superintend the details of organisation on the spot; and that later, when the exhibition is opened, he should be there to control the staff and to give the exhibitors any assistance they may require and also the benefits of his experience and advice. [43]

To help in the organisation of future events the Committee identified some broad guidelines of its own for the allocation of space, the instillation and supervision of exhibits, insurance for exhibitors, the nature of the national pavilion, decoration and what constituted suitable entertainment. [44] The I.E.C. also recommended that the permanent official should have suitably high standing to eliminate '..any danger of his being placed in an unduly subordinate position.' [45] The Board of Trade offered to provide administrative support and make the intelligence it gathered available to the individual nominated for this position. The Committee also recommended that Royal Commissions be retained as the principal organising body for large exhibitions with the permanent official acting as Secretary and Commissioner General. However it advocated that membership Commission should be limited with more manufacturers being encouraged to take part.

Reaction to the report of the I.E.C.

On July 8 th 1908 The Times announced that in

> ...pursuance of the recommendations of the Departmental Committee on International Exhibitions , the Board of trade have decided to form a new branch of their Commercial Department, to deal with matters relating to the participation of this country in future international exhibitions, and to superintend the organisation of British exhibits in connection therewith. [46]

Wintour was given the post of officer in charge of the exhibition branch. [47] Sir Isidore Spielmann was invited to become the honourary director of the art section.

CONCLUSIONS

The International Exhibitions Committee was not convened to prove the link between technical education and the industrial health of Britain. However, if the connection was as powerful as some had claimed, then the very the nature of the investigation it was undertaking would confirm this association. The work Bateman and his colleagues embarked upon was composed of all the necessary elements to validate this claim. It was a comprehensive study which had commerce at its heart and focussed on some of the events that were important in the development of this notion. Yet it was removed enough from them to be invested with a degree of objectivity, regardless of the presence on the committee of old hands such as Kitson and Smith. Like the earlier investigations into technical education it used international comparison as device to measure progress in Britain. Despite the potential opportunity to address this associate issue, developing any form of meaningful conclusion was going to be difficult for Bateman. He recognised that the incomplete nature of the information available to him would complicate his task. The evidence regarding British participation in Exhibitions was '...for the most part of a very vague and uncertain nature.' [48] The details contained in Official Reports were often incomplete and economic conditions varied between countries. He was therefore not in a position to conclude, when reporting on the first two of the three benefits he was exploring, that participation in exhibitions resulted in direct benefits to industry such as an increase in sales, but was able to state that there were significant indirect commercial advantages. It was in the third of these benefits Bateman and his

colleagues were trying identify, which encompassed educational, social and political issues , that the technical education link would be found if it was there at all. They were only able to confirm what had been known for a long time by the advocates of technical education, that exhibitions were important as a spur to innovation and had an educational value. A number of witnesses, including Preece, testified that they '...encourage national emulation...advertise novelties, they excite invention, they impart knowledge , and they tend very much indeed to promote the progress of industry, craftsmanship and art.' [49] Others such as Bennet H. Burrows, Secretary of the Iron and Steel Institute, suggested that '...exhibitions afford an opportunity to British manufacturers of learning useful lessons .' [50] He based this opinion partly upon observations he had made as a juror in the 1900 Paris exhibition. He noted that the development of British high speed tools had been accelerated because of new products exhibited at the French event by Taylor and White, an American company. The effect was so immediate that even before the exhibition closed Armstrong, Whitworth and Company managed to produce similar, but much improved items. [51] Bateman and his colleagues stated that even if there was little spur to innovation or no lessons to be learned from exhibitions, the political considerations alone '...would very often themselves justify an expense of public money...' [52] They were even able to conclude that much of the progress

> which has been made in the technical and industrial education of both our own and other nations is attributable to Exhibitions and evidence is not wanting to show the fact is fully appreciated by the Government of other countries. [53]

What the evidence presented to them did not confirm was the link between technical education and industrial health so vigorously promoted during the previous sixty years by a significant and durable minority. It was apparent from their investigations that growth in trade was more dependent on a number of other factors including the attitudes of industrialists towards maintaining existing

and developing new markets, the importance of advertising and improvements in the production process. Attitudes towards potential customers, innovation, public image and strength though collectivism were also significant factors. Bateman and his colleagues noted that the Americans, French and Germans had recognised the significance of exhibitions in providing some of the opportunities mentioned above and therefore invested heavily in them. They wanted the British to do the same.

FOOTNOTES : 5

1) International Exhibitions Committee, Minutes of Evidence, para. 572

2) Ibid., p. 5

3) Ibid., p. 5

4) Ibid.

5) Replies were received from London, Manchester, Bradford and Blackburn Chambers of Commerce

6) International Exhibitions Committee, p. 5

7) Sir Isidore Spielmann was interviewed by the Committee on two occasions

8) Collectively, the industrialists made products ranging from chemicals, iron and steel, motor vehicles, textiles, glass, jewellery, furniture, paper to cycles

9) International Exhibitions Committee, List of Witnesses, pp. iv -vii. See reference for details of all the witnesses who participated and in particular those who had connections to various exhibitions

10) Ibid., Appendix C, p. 57. The Americans spent half this amount on the Paris exhibition alone.

11) Ibid., p. 16

12) Ibid., Minutes of Evidence, para. 1344. Preece also believed that an appointment to serve on a Commission was an honour, bestowed as reward for service to the country

13 Ibid., para. 1306

14) Ibid., para. 502

15) Ibid., para. 502

16) International Exhibitions Committee, p. 21

17) Ibid., 16

18) Ibid., Appendices, Enclosure No 97, p. 42

19) International Exhibitions Committee, p. 12

20) Ibid., p. 21

21) Ibid.

22) Ibid., p. 18

23) Ibid., Minutes of Evidence, Para. 575 and 582

24) International Exhibitions Committee, p. 16

25) Ibid., p. 20

26) Ibid., p. 21

27) Ibid., p. 17

28) Ibid., Minutes of Evidence, para. 610

29) International Exhibitions Committee, p. 17

30) Ibid.

31) Ibid., p. 7

32) Ibid.

33) Ibid.

34) Ibid.

35) Ibid., Minutes of Evidence, para. 1385

36) International Exhibitions Committee , p. 8

37) Ibid., p., 7

38) Ibid., p.11

39) Ibid., p. 14

40) Ibid., p. 11

41) Ibid., p. 14

42) Ibid., p. 25

43) Ibid., p. 26

44) Ibid., p. 224

45) Ibid., p. 25

46) The Times, July 8 th, 1908

47) Wintour had become secretary of the advisory committee on commercial intelligence after his role as Secretary to the International Exhibitions Committee ended

48) International Exhibitions Committee, p. 15

49) Ibid., Minutes of Evidence, para. 1307

50) Ibid., para. 1441

51) Ibid., para. 1440

52) International Exhibitions Committee, p. 12

53) Ibid.,

CONCLUSIONS

The central thesis of those who promote the notion of failure in Victorian Britain was that opportunities identified by Playfair and his colleagues to address the issue of technical education were missed, thus compounding the spiral of decline. This argument depends wholly on the validity of the claims of the technical eduicationist that the implementation of technical education was vital to continued British success. They insisted that if their message was ignored the industrial and social consequences would be grave. However, if the prophecy of Playfair and his colleagues did not materialise the validity of their cause would be undermined, thus bringing into question the appraisal by those who followed. In addressing the uncertainties associated with this question it is pertinent to ask if the opinions of technical educationsist could be trusted.

Great faith has been placed in the judgement of this group about the state of Britain during the second half of the nineteenth-century. Initially there appeared to be some evidence that they were right. The indication from the 1867 Paris exhibition suggested that the process of decline had already begun in earnest. This pessimistic view was deeply ingrained amongst some contemporary observers. McCloskey contends that few beliefs were so well established in the creed of British economic history as the notion that '...the late Victorians failed...Englishmen and foreigners, late Victorians and moderns have accepted some version of it.' [1] However, as the century progressed the evidence for the accuracy of their prediction becomes less compelling. A number of characteristics of the technical educationist themselves and the activities they chose to be engaged in cast doubt on their abilities. They were few in number and isolated. Indeed on several occasions they were accused of exclusivity and monopolising the debate. Their only common characteristic was an overriding belief in the power of technical education, which they still found difficult to define even at the end of the century.

Their ideas were formulated in the 1850's but they remained active for over 30 years.

This persistence has to be admired because it is a remarkable demonstration of their desire to succeed, regardless of the odds they had to overcome. Curiously their arguments were firmly based in a materialistic view of education with little attachment to higher ideals. The Victorians fully understood this association but the lack of an intellectual component meant that the ideas of the movement would always be subject to a crude evaluation of how much they would cost to implement in relationship to the benefits that would result. This was acceptable as long as the evidence was available.

The Samuelson Commission above all others typifies the modus operandi of the technical educationists. It was formed from those who represented the old industrial order and the political elite in the 80's when the debate about technical education had been widely aired. Betts suggests that this confluence of opinion had unfortunate consequences. He concludes that, soon after the final reports of the Commission were published '...evidence began to accrue that Britain's industrial future might lie not in old industries but in new, and that therefore the technical educationists' oft-repeated advice was of limited and diminishing value...' [2] They were perusing their campaign on '...assumptions that were outdated.' [3] This anomaly has been described as '...one of the most curious, yet neglected features of late nineteenth-century history.' [4] Despite the obvious care and attention with which it was undertaken the Samuelson Commission had critical shortcomings. The seminal work of the technical education movement was a freelance enquiry undertaken by a group dedicated and sincere but unpaid volunteers. The immense scale of what Samuelson and his colleagues were attempting, in relationship to their meagre resources, meant that at best they could only provide an evaluation which was superficial and outdated.

The ideas of the technical educationists, particularly in the formative years after 1851, were based in part on their experiences at exhibitions. This is hardly surprising because the Victorians were fascinated with international comparison, and exhibitions, because of their size and frequency during this period, were an immediate source of information. But were the messages emanating from them reliable? The emergence after the Great Exhibition of a widely accepted formula which was used by those who held such events to guide their work , made the claim that they were powerful indicators of relative strength or weakness more legitimate. It was recognised by many contemporary observers that they could provide knowledge of the products and production processes of other countries, indicate areas of potential commercial growth, foster international business relationships and highlight new and emerging technologies.

There was little doubt amongst the cognoscenti that they could also highlight the relative industrial health of participating nations . At the Paris event in 1867 Playfair used these common features in the service of his cause. As a result of his experiences at the exhibition he was able to convince Lord Taunton of the seriousness of commercial threat to Britain. However if there were inequalities in the points of comparison Playfair had employed to reach this conclusion they would have been invalid. In fact he relied heavily on the results from the various competitions held in Paris (in which the British faired poorly) to re-enforce his arguments. This was unsound because the deliberation of jurors were usually tainted by national interest and bias. There was also a numerical advantage for the host country which normally provided the most jurors and had had the most exhibitors. The scale of the contribution from the participating nations was also critical.

The British industrialist were increasingly reluctant to take part in exhibitions particularly after 1867. They blamed the cost of transportation, the state of

international relations, trade tariffs and uncertainty about the value of exhibitions in promoting trade. for their reluctance. The cause of their apathy was more complex. It was possibly based on lack of government support, complacency and the fear industrial espionage. In contrast foreign nations were increasingly willing to participate. National enmities were abandoned and logistical difficulties overcome at the possibility of creating new trading opportunities. Exhibits from other countries also tended to be more professionally managed. This imbalance, which was apparent soon after 1851, was problematic for the technical educationists. Exhibitions were further tarnished in the eyes of the contemporary Englishman because commercial reality on the part of the organisers dictated that the need to amuse was more important than the need to elevate thinking. This became increasingly true of the American and French events as the century drew to a close. These combined factors helped to diminish the usefulness of exhibitions as an unequivocal measure of national standing.

However, the International Exhibitions Committee acknowledged that they could provide an indication of social, technological and above all commercial trends. The technical educationists did not fully understand this. They regarded the impression gained from the 1867 event as fact, without fully admitting the tenuous nature of their evidence . This lack of acuity meant that they failed to recognise the importance of the subtle changes made apparent at subsequent exhibitions. They did not comment on the new technologies on display at the Inventions Exhibition in 1885, all of which were essential in the next century [5], or notice that general and commercial, rather than technical education, were dominant themes in Chicago and Paris. No less an authority than Magnus believed that German commercial strength could not be explained by assuming that there had been a corresponding decline in the efficiency of the British workman, but because of '...the more systematic training they receive from mercantile pursuits.' [6]

The critical period for the technical education movement was from the point after the Paris Exhibition in 1867 when the subject became widely debated to the enactment, through to the Technical Instruction Act in 1889, the first real legislation designed to support it. Some historians claim that the length of time separating these two events indicate that opportunities were missed. The most propitious moment to address the issue came soon after the final the report of the Select Committee on Scientific Instruction. Very little happened apart from more enquiry. It appears that the British, despite a growing realisation that technical education was desirable (but not vital) were reluctant to make the necessary investment.

Was this a short sighted as both the technical educationists and those who inherited their cause allege? This is a harsh judgement. The British failed to act partly because of a deeply ingrained Victorian propensity not to interfere. This has a critical bearing on the debate because of the importance of general education to technical education. The latter was impossible without the former and the British struggled with the concept of State aid for education for over fifty years. The did not take their first major step in this direction until the Education Act of 1870 and were still arguing about how the system should be controlled in the late 1890's. It is hardly surprising that technical education was marginalised from this viewpoint alone.

However, what Playfair and those who followed in his wake had concluded was not entirely without foundation. If the prevailing attitude towards social class had been adjusted the outcome with regard to general and therefore technical education might have been different. In reality this proved to be politically impossible. Power lay with a land owing oligarchy who were largely indifferent, even hostile towards any form of education. Betts noted that Huxley had long regarded any attempt to change this attitude '...as utterly hopeless...' [7] This group

were slowly displaced by those who had fueled Victoria commercial success through manufacturing. These wealthy industrialists became, as Weiner suggests, the new aristocracy and embraced the mores and practices of the current ruling elite instead of charting their own course. Their assimilation helped to perpetuate existing rather than new ideas. The working class, who could have counteracted this trend did not emerge a significant political force until the new century had begun. It is therefore legitimate to contend that years between 1867 and 1889 are not a sign wasted opportunity but an indication of the scale of adjustment required to accommodate technical education, if it had been needed.

The position of Playfair and his colleagues would be further undermined if technical education was found to be less significant in the maintenance of the industrial position of the country than they claimed. In 1867 it appeared from the foreign reports that the single most important factor encouraging industrial advance abroad was technical education. However, both the Samuelson Report and the Royal Commission on the Depression of Trade acknowledged the complexity of the issue. They indicated that foreign rates of pay, hours of work, health and safety procedures, competition in neutral markets and transportation costs all had a bearing and could not be removed from the debate. The Royal Commission on the Depression of Trade assigned very limited importance to technical education and suggested that tariffs were now the major issue. Contradictory evidence about the state of the economy makes the analysis even more convoluted. Donald McCloskey in Did Victorian Britain fail? identifies the one of the key difficulties by stating that the

> ...measurement of how effectively an economy uses the resources available to it is a delicate matter with he best of information. With the poor quality of information available on the late Victorian economy the task has seemed to some too difficult to attempt. [8]

He suggests that this has led some not to search for the reasons why Britain appeared to fail and to regard the fact of failure as proven. [9] McCloskey contends

that the reduction in output sometimes used by those such as Aaron Friedburg [10] as an indictor of decline has a simple explanation. He reasons that if

> .. faltering export demand after 1872 held back the growth of the British economy there would been increasing unemployment as actual output, cut by the insufficiency of aggregate demand, more and more fell behind potential employment. But unemployment after 1877 was stable and did not increase with time: the trade-union figures suggest that unemployment in the period 1872-1907 was lower than it was early in the period. [11]

He continues his argument by stating that the sustained but unremarkable growth of productivity in the 'seventies, 'eighties and nineties was more significant because

> ...it was during these years that the conviction grew on Englishmen that they were falling behind the technology of Germany and especially the United States. As far as can be ascertained however, productivity growth in th United States was of the same order of magnitude as in the United Kingdom: rates of 1 or 1.5 per cent per year are typical of the American as of the British economy at the time . Given the uncertainties of the data for both countries, the most precise defensible statement is that there was little cause for alarm in the behavior of British productivity. [12]

Finally he concludes that unfettered economic growth was not possible because of the limits to the labour supply by emigration. Even some contemporary observers concede that the pessimism of the technical educationists was too bleak. Iddesleigh and his colleagues (but not all of them) believed that the general economic prognosis (with the exception of that for the agricultural community) was very encouraging. These observations help to illustrates how the economic argument used by the technical educationists was too simplistic. It is also suggested that another economic issue, that of free trade, was overlooked by the technical educationists and the adherents of their tradition as a potential causal factors of Britain's economic difficulties. This is an ethic that the Victorians were very reluctant to abandon and clung to it overtly in their business dealings and covertly in their social and political life. There was a strong feeling that protectionism

'...was a bad thing.' [13] However Aldcroft believes it was highly improbable that tariffs

> ...were a major factor in Britain's trade losses. Certainly, they created less favourable trading opportunities and at times, as with the McKinley tariff in America in the early 1890's, they caused a sharp drop in the exports of certain commodities. but overall tariffs only had a marginal effect on the volume of British trade since they were rarely raised to prohibitive levels. In any case the restrictive effects was considerably modified by virtue if the fact that Britain concluded a whole series of trade agreements with foreign countries, nearly all of which contain the most favoured nation clause. [14]

The true significance of the policy of free trade was not an inequality of burden placed on British industry by foreign taxes, as Aldcroft has already illustrated, but a stifling of the spirit of adventure in commercial terms. Protectionism seems to have encouraged domestic industry to

> ...concentrate on the more easily accessible colonial markets for traditional products like cotton goods. The net result of this movement towards the empire was a blunting of the incentives for Britain to remain adaptive and thus competitive. [15]

This has much more bearing on the technical education debate and has indeed been overlooked.

Since Aldcroft and McCloskey first raised doubts about the validity of traditional interpretation of the performance of the economy a mounting volume of evidence has been produced that appears to confirm their revisionist viewpoint and demolish many of the earlier standpoints regarding the alleged phenomenon of British retardation. It is now being claimed, for instance, that '...the overall problem of "failure" (of British entrepreneurs) is now regarded as having been exaggerated.' [16] Recent studies of cotton, steel, coal, and machine tools indicate that the rates technical change and productivity compared well with those of our competitors' [17] while criticism of the quality of production techniques marketing, investment strategies and business structures were largely unwarranted.' [18] To some there is now little left of '...the dismal picture of British economic failure' [19]

painted by earlier historians. They assert, as McCloskey does, that the true picture was an encouraging one, not of an economy stagnating but '...growing rapidly as permitted by the growth of its resources and the effective exploitation of the available technology.' [20] The revisionists also contend that the technical education in Britain was not backward but diverse and widespread, its '...rate of expansion truly breathtaking.' [21] Thus, it appears that there was no decline and there is nothing to explain. However, despite the seemingly damming evidence, the revisionist case is still contentious and one '...requiring further research.' [22]

Betts raised enough doubts about the claims technical educationists to justify a deeper examination of the issue they championed. A number of factors undermine their cause They were a disparate group whose roots lay in the establishment. Their mind set, formed by tradition, could not respond to a changing economy that demanded new industries and different forms of education. [23] They underestimated the need for general education and overlooked the importance of commercial education. The central tenet on which their ideas were forged was based on incomplete testimony. They oversimplified their case and ignored evidence of change that they could not assimilate into their view of the world. Most significantly the doom laden prophecy that they clung to so rigidly proved to be overstated. Aldcroft believes that any sweeping generalisation regarding the experiences and performance of British industry during the last quarter of the nineteenth-century are bound to be misleading because

> ... the impact of foreign competition and the subsequent reactions to it varied considerably from one branch of industry to another. In fact, probably the most significant feature was the wide diversity of experience between industries or sectors though there were of course a number of common characteristics, notably the apparent strength of many of the older established branches of industrial activity and the tendency towards concentration on Imperial markets. It would be inaccurate moreover to argue that British industry as a whole was uncompetitive and inefficient since there were some impressive achievements in these years of increasing international competition. [24]

It is now apparent that the singular view of the world presented by technical educationist did not reflect the complexity of the situation they were commenting upon. There is also enough evidence to suggest that at best they may have misinterpreted the information (largely gathered by themselves) and at worst have been mistaken. Even if they had have been right they certainly underestimated the scale of the changes they were asking for. Weiner contends that despite the heroic aura that was bestowed on industry during the Great Exhibition it marked an end and not a beginning. It was the zenith of what he referred to as '...educated opinion's enthusiasm for industrial capitalism.' [25] There was, he claimed, a powerful core of those who saw the Crystal Palace as the product of a soulless age, waiting to take control. If his interpretation is correct then this is a clear manifestation of what C. P. Snow referred to as two cultures in conflict. McCulloch notes that an unfortunate consequence of this mindset is that it allows the subsequent history of technical education to be presented as a struggle between right and wrong, as a battle between the '...progressives and reactionaries creating a demonology of villains and mediocrities, and a pantheon of tragic heroes...' becoming a '...catalogue of lost opportunities for the progressive cause.' [26]

These factors combined bring into question the interpretation of those who have used the conclusions of men like Playfair to form their own view of the technical education movement in Victorian Britain.

FOOTNOTES : CONCLUSIONS

1) Donald N. McCloskey, 'Did Victorian Britain Fail?' , Economic History Review, Vol. 23, N° 23, 1970, p. 446

2) R. Betts (C), 'Persistent but misguided?: the technical educationists 1867-89, History of Education, Volume 27, N° 3, 1998, p. 273

3) Ibid., p. 268

4) Ibid., p. 273

5) Ibid., pp. 274-75

6) Ibid., p. 276. Betts quotes Magnus

7) Ibid., p. 269

8) Donald. N. McCloskey, op.cit., p. 455

9) Ibid., p. 455

10) Aaron L. Friedberg, The Weary Titan: Britain and the Experience of Relative Decline 1895-1905, Princeton University Press, Princeton, 1988, p. 25

11) Donald N. McCloskey, op.cit., p. 448

12) Ibid., p. 458

13) Aaron L. Friedberg, op.cit., p. 57

14) D. H. Aldcroft, The Development of British Industry and Foreign Competition 1875-1914, George Allen and Unwin, London, 1968, p. 22

15) Aaron L. Friedberg, op.cit., p. 84

16) Michael Sanderson, Education and Economic Decline in Britain, 1870 to the 1990's, Cambridge University Press, 1999, p. 38

17) Ibid.

18) W. B. Stephens, Education in Britain , 1750-1914, London, 1998. See also P. L. Payne, 'Entrepreneurship and British economic decline' in B. Collins and K. Robbins (Ed) British Culture and Economic Decline, Weidenfeld and Nicolson, London, 1990

19) Donald. N. McCloskey, op.cit., p. 459

20) Ibid.

21) Sydney Pollard, Britain's Prime and Britain's Decline, 1870-1914, Edward Arnold, London, 1989, p. 162

22) W. B. Stephens, op.cit., p. 143. See also D. H. Aldcroft, 'Technical and structural factors in British industrial decline' in P. Mathiss and J. A. Davis (Ed), Innovation and Technology in Europe: from the eighteenth century to the present day, Blackwell,1991 and R. Floud and D. N. McCloskey (Eds) Economic History of Britain since 1700, Cambridge University Press, 1994

23) Robin Betts, op.cit., p. 276

24) D. H. Aldcroft, op.cit., pp. 25-36

25) Martin J. Weiner, English Culture and the Decline of the Industrial Spirit 1850-1980, Penguin, Middlesex, 1985, p. 28

26) G. McCulloch, 'Science Education and the Histography of National Decline', History of Education Society Bulletin, Nº 30, 1982, p. 49

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APPENDIX 1

Comparison between some of the protagonists in the technical education debate and their involvement in the key aspects of its development

	1851 Great Exhibition	1867 Paris Exhibition	1867 Report Relative to Technical Education (Taunton)	1867 Additional Enquiries	1867 Select Committee on Scientific Instruction	1874 Royal Commission on Scientific Instruction (Devonshire)	1876 Philadelphia Exhibition	1878 Paris Exhibition	1884 Royal Commission on Technical Instruction (Samuelson)	1884 Health Exhibition	1885 Inventions Exhibition	1885 Royal Commission on the Depression of Trade	1889 Technical Instruction Act	1893 Chicago Exhibition	1900 Paris Exhibition	1908 International Exhibitions Committee
H. Cole	✓	✓			✓	✓										
J. Donnelly					✓	✓			✓						✓	
A. Field					✓				✓							
T. Huxley					✓	✓			✓		✓					
J. Kitson					✓	✓									✓	✓
J. Lubbock						✓			✓			✓	✓		✓	
P. Magnus									✓	✓			✓			
A. J. Mundella			✓		✓	✓		✓		✓	✓		✓			
L. Playfair	✓	✓	✓			✓		✓	✓				✓			
H. Ripley					✓	✓		✓								
H. Roscoe						✓			✓				✓			
B. Samuelson				✓	✓	✓		✓	✓		✓		✓			
J. Slagg									✓			✓				
Swire Smith									✓				✓			✓
W. Woodall									✓							