Published by :

EARLY VISUAL MEDIA LAB
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STEREOSCOPY ON THE SILVER SCREEN: THE ANALYTICON AND EARLY CINEMA IN EDINBURGH, SCOTLAND

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INTERNATIONAL JOURNAL ON STEREO & IMMERSIVE MEDIA, Vol. 4 Issue no. 1
pp. 112-127
DOI: 10.24140/ijsim.v4.n1.06
ijsim.ulusofona.pt

Conflict of Interest

This work was supported by the Arts and Humanities Research Council under grant number AH/L503915/1.

Acknowledgements

I wish to thank Dr Ian Goode and Dr Ian Craven.

Abstract

The Modern Marvel Company was incorporated in Edinburgh in 1897, with a remit to educate and entertain. Driven by the influence exerted by local learned societies, the popularisation of science, and radical changes in pedagogy, the company exploited various optical technologies to fulfil an ideal of universal education. The cinematograph and the Analyticon regularly shared the same bill; the latter was a stereoscopic technology built upon the principle of polarised light that depended upon a silver screen to work. Within the context of Edinburgh, stereoscopy directly shaped the ideological and aesthetic character of early cinema, giving local exhibitions a distinctiveness from the rest of Scotland and further afield. This paper adopts tropes of traditional technological history by detailing the Analyticon's technical workings, but it also adopts the principles of New Cinema History by situating this technology within nuanced local and national contexts. In doing so, this paper offers a fuller understanding of early cinema's aesthetic, social and cultural significance in Edinburgh, and its relationship with the wider visual culture of the 1890s.

Keywords: Modern Marvel Company, Analyticon, Stereoscopy, Scotland, Education, Early Cinema.

Introduction

The teacher, however wisely chosen and well qualified, has not at his command the means of imparting knowledge. He may pour it in by the ear, or extract it from the printed page, or exhibit it in caricature in the miserable embellishments of the school-book, but unless he teaches through the eye, the great instrument of knowledge… no satisfactory instruction can be conveyed (1856, p. 195). David Brewster, *The Stereoscope: Its History, Theory, and Construction*.

Progressive educators will welcome this opportunity to instruct their classes in any of the above subjects by means of first-class motion pictures. Education thus imparted is never likely to be forgotten, and pupils who are slow in memorizing text-book instructions absorb the same knowledge very readily and rapidly when conveyed by moving pictures, which teach us as no words can do (1910). George Kleine, *Catalogue of Educational Motion Picture Films*

Writing some fifty-four years apart and in different continents, both David Brewster and George Kleine display a positivist belief in the supremacy of the eye as a means of assimilating information and of acquiring knowledge about the world. For Brewster, the eye is 'the great instrument of knowledge', and for Kleine, the mass-medium mechanical eye of the cinema democratises this knowledge on a national scale. The physiological composition of the eye, and the way it processes the external world, underpinned philosophical debates and optical technologies throughout the nineteenth century. The kaleidoscope, thaumatrope, phénakistiscope, zoetrope, mutoscope, stereoscope, photograph, cinematograph, and a host of other technologies, all exploited or mimicked theories about the physiological workings of the eye. The kaleidoscope playfully experimented between visual chaos and order; additive colour technologies mimicked the colour ranges and workings of human cone cells; stereoscopic technologies provided simulacra of binocular vision; and inventions such as the zoetrope and the cinematograph exploited the principle of persistence of vision. Each of these technologies engaged in philosophical debates about the nature of the self and its relation with the external world, spanning the embryonic disciplines of biology, chemistry and physics. Both Brewster and Kleine engaged in these debates and sought to ideologise the human eye, to strengthen the rhetoric and perceived potential of visual education.

This paper will explore such issues within the specific context of film exhibition during the late 1890s in Edinburgh, Scotland. Early cinema in Scotland was multifarious and complex, shaped largely by disparate and distinct locales. Lacking a centralised or national infrastructure for cinema, exhibitors were more attuned to local societal values. Within the context of nineteenth century Edinburgh, I will discuss the reciprocal relationship between local learned societies and film exhibitors, with both parties recognising the pedagogical, commercial, and popularising potential of educational entertainment programmes. Writing in an American context, film historian Jennifer Lynn Peterson contends that the educational remit for cinema hit its peak broadly between 1910 and 1913 (2013, p. 102). Edinburgh deviates from this periodisation, with an educational focus evident in the earliest years of cinema. The Modern Marvel Company exhibited films together with a stereoscopic system branded as the Analyticon, and a still

colour photography process called the Krōmskōp; as will be illustrated in due course, the former of these technologies was technically dependent upon a silver screen to work. I will argue that the Analyticon helped to shape the overarching ideology of the company's programmes and their aesthetic signature, creating a cinematic experience that was largely unique to the city of Edinburgh.

Learned Societies and the Popularisation of Science in Victorian Edinburgh

Situated on the pinnacle of Calton Hill in Edinburgh, the Dugald Stewart Monument is a formal recognition of the moral philosopher's contribution to modern thought, and the part he played in making the city an emblem of the Scottish Enlightenment. Completed in 1830, its Corinthian-inspired columns are arranged in a circular pattern upon a podium, providing a towering visual focal point that overlooks the city's main thoroughfare of Princes Street. Its distinctive architecture contributed to the colloquial designation of Edinburgh as the 'Athens of the North'. Running parallel to Princes Street, yet out of view from Calton Hill, is a statue of the scientist James Clerk Maxell on George Street. In a seated position, he holds a colour wheel in both hands. The scene interweaves pensiveness with domesticity; in contemplation, Maxwell is comfortably seated with one leg crossed over the other, with his pet dog resting underneath. On the pedestal on which Maxwell resides are low relief side panels, which interlace Greek mythology with modern day physics. To the left of the panel is the god of light, Apollo. He fires a single beam of light towards Isaac Newton in the centre, whose prism transforms it into a rainbow. The red beam continues through a second prism and on to the goddess of the dawn, Eos. Situated to the south of the city is the statue of David Brewster, within the King's Buildings Campus of the University of Edinburgh. In academic robe and standing in an upright yet informal posture, Brewster holds open a book with his left hand and gestures forward with his right palm held upward.

These physical monuments are but several examples that formally recognise the intellectual and cultural mark philosophers and scientists have left on the city of Edinburgh, and further afield. Dugald Stewart was a founding member of the Royal Society of Edinburgh in 1783, and held the Chair of Moral Philosophy at the University of Edinburgh. James Clerk Maxwell was an active member of the Royal Society of Edinburgh some decades later, where he delivered seminal research papers on the principles of additive colour, upon which future plethoric colour technologies such as the Krōmskōp would be founded. David Brewster was the President of the Royal Society of Edinburgh from 1864-1868, and Principal of the University of Edinburgh from 1859-1868. Brewster published prolifically, both in the popular press and academic journals, wherein he wrote predominantly on optical instruments such as the kaleidoscope and stereoscope.

Amongst Edinburgh's distinguished philosophers and scientists, David Brewster especially played a central role in popularising science, and promoting the universal potential and appeal of object learning. In *The Stereoscope: Its History, Theory, and Construction* (1856), Brewster promotes a democratic ideal of education, positioning it as the foundation of society:

> To acquire a general knowledge of the works of God and of man – of things common and uncommon – of the miracles of nature and of art, is the first step in the education of the people. Without such knowledge, the humblest of our race is unfit for any place in the social scale (p. 193).

Brewster explicitly lambasts those who seek to restrict, divide or politicise education, declaring that one who is against secular education 'prefers power to duty, and, if he ever possessed it, divests himself of the character of a statesman and a patriot' (p. 194). Brewster stresses a moral imperative for universal education, positing that optical technologies such as the stereoscope play an integral role towards such an end.

The stereoscope's educational potential is bolstered by its seemingly unmediated, or even enhanced, connection with reality. For instance, when discussing enlarged stereoscopic photographs of grains of sand, Brewster argues that it enables the viewer 'a better idea of their excellence than if he saw them with his own eyes, or had them in his own hands' (p. 192). Brewster repeatedly enthuses about the light sensitive and permanent nature of photographic emulsion, arguing that through the stereograph, 'the sun will thus become the historiographer of the future, and in the fidelity of his pencil and the accuracy of his chronicle, truth itself will be embalmed and history cease to be fabulous' (p. 181). Thus, a cornucopia of educational subjects is made available for examination, 'painted by the very light which streamed from them' (p. 197). Brewster describes this connection between subject, light, image, and viewer, as 'peculiarly tender' (p. 182). Experience, knowledge, and light, are all perfectly embalmed for the benefit of the future student, accessible to all through the superior and timeless eye of the stereoscope.

The framing of the stereoscope as an analytical and pedagogical tool, in the latter half of the nineteenth century, coalesced with local, national and international agendas. Learned societies in Edinburgh embraced visual technologies as a means to enhance and disseminate research, whilst the broader popularisation of science emboldened a growing belief in the commercial and pedagogical values of object teaching. Diving bells, electrical currents, nitrogen gas, x-rays, the cinematograph, colour photography, and the stereoscope were all, at one point or another, novel and spectacular public attractions in and of themselves, in addition to being sources of legitimate research and education. Such popular attractions strengthened the stirrings of a pedagogical revolution, which sought to transcend the confines of traditional text books in favour of direct observation and experience. Childhood historian Meredith Bak discusses the rising popularity of the object lesson, stating, 'its emphasis on careful observation and close analysis very closely resembled scientific methods of inquiry' (2012, p. 156). Bak expands this line of thought in her monograph *Playful Visions* (2020), arguing that optical toys gave children a sense of mastery over their environment and a greater awareness of their perceptual limitations, thereby readying them to counterbalance the disorientating effects of modernity in later life. For Bak, optical technologies played a formative role in the development of the child into adulthood, by cultivating their observational powers. Learned societies

and early film exhibitors in Edinburgh were conscious of the public interest in science and changes in pedagogical beliefs, and formed a reciprocal relationship that heavily characterised the earliest years of cinema in the Scottish capital.

Editions of the *Official Year-Book of the Scientific & Learned Societies of Great Britain and Ireland* reveal an especially strong interest in photography in Edinburgh, compared with the rest of Scotland. This is evident in both the number of photographic societies and the disparate applications of photography. According to the 1896 edition of the yearbooks, there were six photographic societies in Edinburgh, compared with only three in Glasgow, one in Aberdeen, one in Dundee, and one in Inverness.[1] In addition to dedicated photography clubs, many scientific societies were also interested in the development and potential of photography. For example, J.B. Mears read a paper for the Scottish Natural History Society, entitled, 'Photography and Nature' (1905); J. Thomson delivered 'Photomicrography and Photomicrometry' for the Scottish Microscopical Society (1906); and J. McKessak presented 'Architectural Photography' for the Edinburgh Architectural Society Association (1904). In addition to the disparate societies interested in the application of photography for analytical ends, many others used it as an illustrative tool. For example, 'Photographs from the Malay Peninsula' was presented by N. Annandale for the Royal Physical Society of Edinburgh (1904). By the beginnings of cinema in Edinburgh, diverse learned societies in the city positioned optical technologies as a means of analysis and illustration, which, in part, shaped the practices of local film exhibitors.

Learned societies were amongst the first institutions in Edinburgh to endorse and exploit film. In late 1896, the Edinburgh Photographic Society organised a film screening to close a lecture on camera lenses. The *Edinburgh Evening News* reported that the cinematograph immediately helped to boost the size of the society, with thirty-five new signatures being recorded for membership by the end of the session (3 December 1896, p. 2). Several months later, Edinburgh's Philosophical Institution incorporated film into an eclectic programme that was comprised of music, theatricals, Rontgen rays, and other attractions. In this instance, the cinematograph was enlisted as a fundraising tool, forming part of a bazaar organised by the society in recognition of its fiftieth anniversary (3 March 1997, p. 1). In September 1897, film was incorporated into a lecture organised by the McAdam's Shorthand and Type-Writing Institution, which was held in the Albert Hall on Shandwick Place, and presided over by the headmaster of George Watson Ladies' College (19 September 1897, p. 1). The following month, the cinematograph was adopted by the Edinburgh Field Naturalists' and Microscopical Society, forming part of an exhibition that was comprised of natural history specimens, Rontgen rays, argon, helium, and the Krōmskōp (23 October 1897, p. 1). Such communities exploited film as a means of promotion, engaging the public, fundraising, and technological curiosity.

Popular filmmakers and exhibitors in Edinburgh were directly involved with learned societies. In 1903, James Elrick Fraser delivered a paper for the Edinburgh Field Naturalists' and Microscopical Society, entitled, 'The Cinematograph as an Aid to Nature Study'. Fraser's paper was accompanied with self-produced photographs and films of a bird sanctuary on Bass Rock, which later became a headline feature of his public exhibitions (Figure 1). In 1902, the exhibitor James Buncle delivered a paper for the Edinburgh Photographic Society, which was reprinted in its entirety in *The British Journal of Photography*. Entitled, 'The Bioscope', Buncle's paper traced the lineage of the cinematograph back to the experiments of Edward Muybridge in the 1870s, explaining the theory of persistence of vision and the mechanical workings of the cinematograph. There was common ground between local film exhibitors and learned societies, as both valued the educational, illustrative, and popular potential of the cinematograph.

The Modern Marvel Company was established in Edinburgh in 1897, and dominated the local film exhibition market until the opening years of the twentieth century. They were the first to embark on prolonged residencies in major halls; they offered public exhibitions at a more frequent rate than their competitors; and were publicised to a greater extent in the local press.[2] The company's Memorandum of Association declares that its primary objective is 'to give scientific demonstrations', followed by, 'to provide and promote entertainments in public or in private', and, 'to exploit scientific instruments and apparatuses appropriate to the purpose of popular entertainment or technical education' (1897). The company initially exhibited a wide range of technologies and phenomena, such as X-rays and nitrogen gas, before adopting a sustained focus on colour photography, the cinematograph, and stereography. The following section will detail Modern Marvel's adoption and branding of a stereographic system called the Analyticon, which would go on to greatly shape both the aesthetic and ideology of early cinema in Edinburgh.

The Modern Marvel Company and the Analyticon

By the time the Modern Marvel Company was incorporated in 1897, the potential of the stereoscope envisioned by David Brewster in 1856 had not come to fruition. The technology had become tarnished with connotations of hyperbole and indecency. Thomas Bolas in 'Stereoscopic Effects on the Lantern Screen' (1896), a five-part essay published in the *Optical Magic Lantern Journal*, bemoans the technical deficiencies of ubiquitous anaglyphic systems. Bolas foregrounds the relative ease of offering anaglyphic projections, as any lanternist could purchase coloured glass filters for the lantern at a cost of sixpence, and corresponding observing glasses from a typical toy shop for only a penny (p. 23). However, Bolas also stresses the importance of the density of the glass and its colour; he laments the 'copper ruby and signal red' in wide circulation to be 'one of the worst for general purposes', and proposes with resigned frustration that 'gold pink and yellowish green' is far superior (p. 124). In addition to technical deficiencies, there were also concerns about the stereoscope's morality. In 'Selling Stereoscopy, 1890-1915: Penny Arcades, Automatic Machines and American Salesmen' (2008), cultural historian John Plunkett points out that by the 1890s, the stereoscope had become associated with salaciousness and corruption, stating that within the context of Britain 'the

1) There were fourteen others in mostly small towns across the central belt and lower Highlands, indicating a strong interest among rural communities in the burgeoning technology.

2) George Baird's manuscript *Edinburgh Theatres, Cinemas and Circuses 1820-1963* offers a rich and ambitious overview of entertainment venues and exhibitors in Edinburgh, within which Modern Marvel and its contemporaries feature.

EGYPTIAN HALLS,
75 QUEEN STREET (WEST END),
near CHARLOTTE SQUARE.
SELECT CINEMATOGRAPH EXHIBITION
OF
ROYAL VISIT PICTURES
BIRDS of the BASS ROCK and other NEW SUBJECTS.
THIS AFTERNOON and EVENING,
at 3 and 8 P.M.
Admission, 1s.; Reserved Seats, 2s.
By FRASER & ELRICK, Practical Cinematographers,
93 HANOVER STREET.

Fig. 1 Advertisement for a film exhibition by Fraser & Elrick, with *Birds of the Bass Rock* a principle attraction (*The Scotsman*, 25 May 1903, p. 1).

stereoscope was not a philosophical toy, but a moral threat' (p. 250). Plunkett argues that large American companies such as Underwood & Underwood changed the fortunes of the stereoscope through its aggressive door-to-door sales techniques, which successfully targeted a middle- and upper-class clientele in both America and Britain. However, within the context of Edinburgh, the sources Plunkett cites date from 1902, by which point the Modern Marvel Company had already offered stereoscopic projections successfully years prior. Distinct from the conclusions drawn by Plunkett, I argue that Underwood & Underwood were not integral to Modern Marvel's success. Rather, it was the influence of local learned societies; changing pedagogical beliefs; the superior technology of the Analyticon (which will be detailed shortly); and the ability to successfully couple education with entertainment.

Striking a balance between education and popular entertainment was integral to the success of Modern Marvel, as can be gleaned from local newspaper reports. The *Edinburgh Evening Dispatch* provides a surprisingly blunt and honest review of Modern Marvel's inaugural residency at the Queen Street Hall in 1897. Devoid of the hyperbole typical of its counterparts, the newspaper quipped that the programme was 'more suited to a school entertainment than a mixed audience'. Its educational focus is also evident in the company's marketing strategy, with newspaper advertisements making a direct address to

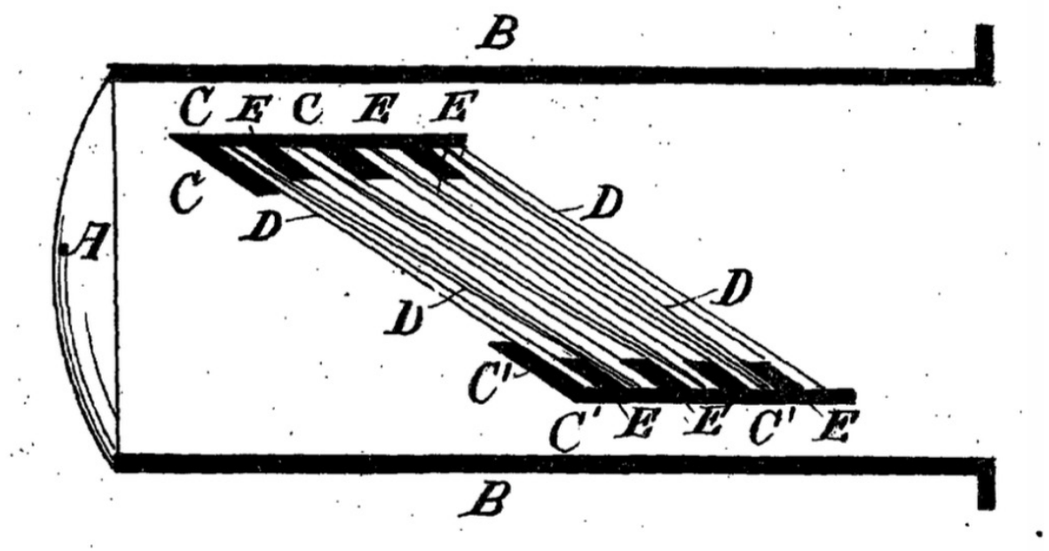


Fig.2 Specification for Anderton's polariser, which would form the technical basis of Modern Marvel's Analyticon.

'Teachers and Heads of Institutions', weighted with the tagline 'Refined. Elegant. Intellectual' (Scotsman, 10 January 1898, p. 1). The Analyticon shared the bill with the cinematograph; the *Dispatch* cited the former as 'the strong card', albeit with the caveat that whilst having 'scientific interest to commend it', it can 'hardly be expected to become at its present stage a popular entertainment' (28 December 1897, p. 4). The following year, Modern Marvel invited Thomas James West to lead the exhibition as a lecturer, who purportedly attracted a 'fair sized audience' (*Scotsman*, 2 January 1899, p. 6). By the following year, the *Scotsman* was enthusing 'from beginning to end the lecture was greatly appreciated by an audience that filled all parts of the building, and at the conclusion Mr West and his assistants were accorded a hearty vote of thanks' (1 January 1900, p.6). Before being hired as a lecturer by Modern Marvel, West had proved himself as a skilled showman and popular orator, having built his reputation through, what film historian Jon Burrows describes as, 'elaborate lecture presentations inspired by the work of the popular astronomer Sir Robert Ball' (2010, p. 352). Companies House returns reveal that Thomas James West was awarded a nominal two shares when he first joined Modern Marvel in 1898, but by the following year, he was the third largest shareholder with 202 shares. By 1903, West was the outright largest shareholder with 402 shares. West's showmanship and increased involvement were integral to the fortunes of Modern Marvel and the Analyticon, and

the fulfilment of the company's primary ambition to educate and entertain.

The technology upon which the Analyticon was built was also integral to its popular reception. *Edinburgh Evening Dispatch* credits it as being the invention of John Anderton (28 December 1897, p. 4), who had patented it as the Lantern Stereoscope in 1891. Anderton was the proprietor of a renowned opticians in Birmingham called Field & Company, which was incorporated in 1808. He succeeded Robert Field in the 1870s, who in turn, had succeeded the founder of the company Philip Carpenter (Stevenson, 2020). The company's largest contracts included the sole rights to manufacture telescopes with the John Dollond trademark, and similar privileges for David Brewster's kaleidoscope and handheld stereoscope (Timmins, 1866, p. 534). With the Lantern Stereoscope, Anderton was rejuvenating a historic relationship between Field & Company and stereoscopy.

For stereoscopic technologies to work, it is integral that each eye sees only one of the two photographs being simultaneously presented; each photograph mimics our left and right eye by depicting the scene from slightly different angles, and it is in the fusion of these two separate images in the brain that a sense of depth is created. The Lantern Stereoscope exploited the principle of polarised light to achieve this effect. Light consists of horizontal and vertical planes, and polarisation involves stripping light to one of these two planes through the use of prisms or glass plates. In early-nineteenth century Edinburgh, ground-breaking work on polarisation was achieved by the natural philosopher William Nicol, which is commemorated in his memorial: 'Inventor of the polarizing prism everywhere known by his name'. David Brewster built on Nicol's research, by replacing the prism with an assortment of thin glass plates placed at a 45-degree angle, which became widely known as 'Brewster's angle'. According to Anderton's specifications, the Lantern Stereoscope exploited Brewster's technique to polarise light (Figure 2). Each polariser was placed behind the lens of one of two optical lanterns, perpendicular to each other; through one lantern only light in the vertical plane reached the screen, and in the other only light in the horizontal plane reached the screen. These polarisers and their positions were mimicked in the eye pieces given to each member of the audience, housed in adapted opera glass frames. Thus, each eye of the viewer only sees the image projected through the corresponding polariser from one of the lanterns, and the brain fuses the two photographs together to create a sense of depth.

The Analyticon shaped the aesthetic experiences of early cinema audiences in Edinburgh. The typical cloth or paper screen used by lanternists and film exhibitors was not compatible with the technology, as such materials nullified polarised light; John Anderton's 1891 patent application states that cloth or paper may 'depolarise or elliptically or circularly polarise the images received'. As an alternative, Anderton proposes a screen comprised of crushed glass, metal, or calico covered with silver paper. The *Optical Magic Lantern Journal* explains further:

> In carrying out the Anderton method it is necessary that the screen should have a metallic surface, otherwise the light would be de-polarised, and Mr. Anderton employs a flexible screen covered with silver leaf, and subsequently lacquered. It may be mentioned that even for ordinary lantern work such a screen is far better than the usual screen, as it is more completely opaque, and reflects more light. (Bolas, 1896, p. 117)

Thus, the Analyticon and its attendant silver screen was of benefit to other visual technologies, such as the cinematograph and the Krōmskōp. Advertisements for Anderton's silver screen (Figure 3) claim that it doubles the luminosity of light, whether it be from an oil lamp, incandescent gas, acetylene, limelight or electric arc. Modern Marvel's early exhibitions were aesthetically distinct from those of its local competitors, due to the silver screen and the luminosity of its projections.[3]

Anderton carried out various improvements to the Lantern Stereoscope, which warranted a second patent to be registered in 1898. These included covering the silver screen with 'perpendicular lines or striations' to achieve a more even illumination; cementing the edges of the glass slides to prevent condensation; and slightly varying the angles of the glass slides between each other to prevent refraction. The *Optical Magic Lantern Journal* stated that 'there can be scarcely a doubt as to the Anderton method being on the whole the best and most suitable for a general exhibition' (1896, p. 117), though it did pose concern over its expense, with the silver screen alone costing £7 at that time (p.118). Writing some sixty years after Anderton's experiments in *The Theory of Stereoscopic Transmission*, film theorists Raymond Spottiswoode and Nigel Spottiswoode contend that stereoscopy via polarised light offers 'striking advantages over any other [technology] so far realized' (1953, p. 2). The Analyticon's technical superiority, and its required financial outlay, helped to distance it from the more notorious anaglyphic systems on the market in Victorian Edinburgh.

Local newspaper reviews give us a better insight into how Modern Marvel attempted to further its educational remit under the rubric of entertainment, by combining the Analyticon with popular hand-painted films. The *Edinburgh Evening News* (*EEN*) printed the following:

> Lions, tigers, hippopotami, statuary at South Kensington, chapels in Canterbury Cathedral, and other subjects shown on the screen stand out when seen through the analysers provided with startling vividness. Perhaps the best effect of all was obtained with a photograph of trees in full bloom, where the spectator seemed to be looking away through the stems of trees. The entertainment provided by the Modern Marvel Company, Limited, also includes the cinematograph, and several series of interesting pictures were shown, particularly the coloured sun, moon, and stars dance, by a French danseuse. (29 December 1897, p. 2)

3) Walker & Company in Aberdeen also had a silver screen, but they did not offer stereoscopic projections. In 1900, Walker & Company claimed to have the largest screen in Scotland at 24 square feet, with silver leaf used to achieve the required illumination (*Aberdeen Journal*, 1900. p. 2; *Aberdeen Journal*, 1902, p. 4). Lewis Wright & Anderton's silver screen was available for sale in sizes up to 12 feet square, which suggests that Walker & Company built their own – such a feat is in keeping with the size, stature, and ambition of the company.

The New Silver Lantern Screen.

(PATENT.)

LEWIS WRIGHT & ANDERTON'S

SILVER SCREEN

Will practically more than double the illuminating power of oil lamp, incandescent gas, or acetylene.

If limelight or electric arc be your illuminant, you have at command the means of greatly increasing your light; or if you do not desire such increase, you can retain your present illumination at one half your present expenditure of gases or electricity.

With ordinary oil lamp or incandescent gas burner, a bright 9 feet picture (not disc) is obtainable.

PRICES.

	£	s.	d.
5 feet square with roller and moulding	1	5	0
6 " " "	1	15	0
7 " " "	2	5	0
8 " " "	2	15	0
9 " " "	3	7	6
10 " " "	4	0	0
12 " " "	5	10	0

"I expected a better illumination with it than with an ordinary opaque screen, and I was agreeably surprised to find the increase nearly double what I had expected."—Editor, *Optical Magic Lantern Journal*.

"We were astonished at seeing the enormous increase in brilliancy which is attained by this screen."—*Photographic News*.

Sole Makers— From all Dealers.

R. FIELD & Co., Lantern Manufacturers,

142, Suffolk Street, BIRMINGHAM.

— ESTABLISHED 1817. —

Fig. 3 Advertisement for The New Silver Screen (*Optical Magic Lantern Journal*, 1897, xxii).

The rhetoric used by *EEN* echoes that of David Brewster, written several decades earlier. In *The Stereoscope: Its History, Theory, and Construction*, Brewster offers entire chapters on the pedagogical application of the stereoscope to natural history, statuary and architecture. The *EEN*'s description of 'trees in full bloom, where the spectator seemed to be looking away through the stems of trees' echoes Brewster's enthusiastic ponderings that 'the trees and plants, too, of distant zones, whether naked in their osteology, or luxurious in their foliage, would shew themselves in full relief'. Modern Marvel embodied the promise that Brewster envisioned some decades earlier, and capitalised on the wider popularisation of science and the growing currency of object teaching.

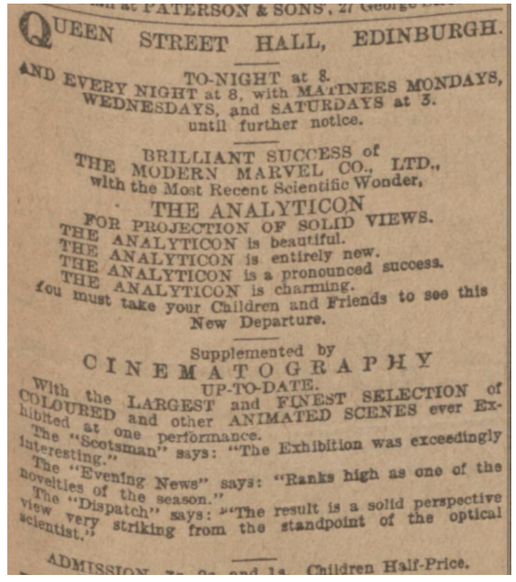
There is a distinct tactile quality across both Brewster's writings and *EEN*'s review. Brewster declares that 'the structures of civilisation… will display themselves in the stereoscope as if the observer were placed at their base, and warmed by the very sun which shone upon their walls' (p. 199), whilst *EEN* enthuses about the Analyticon's ability to make subjects 'stand out' with 'startling vividness'. This tactile dimension continues in Modern Marvel's screening of hand-painted films, of which they claimed to have the 'largest and finest selection… ever exhibited at one performance' (Figure 4). In *Moving Color: Early Film, Mass Culture, Modernism* (2012), Joshua Yumibe discusses the projective dimensionality of hand-painted films, describing the effect of colours that 'seemingly proceed from the surface of the screen toward the viewer… in bas- and even high-relief' (p. 10). It is this tactility that brings together the various elements of Modern Marvel's exhibitions: it strengthens the Analyticon's claim to object-based learning, and enhances the thrill of hand-painted films.

Coda

By 1910, Thomas James West had established three permanent cinemas in England, nine permanent cinemas and three touring companies in Australia, and four touring companies in New Zealand (Burrows, 2010, pp. 357-8). In '*West is Best!*; or, what we can learn from Bournemouth' (2010), Jon Burrows argues that West has been unjustly undermined by British film historians, but for Australian film historians is accepted as 'one of the most important pioneers of the fixed-site cinema business in the southern hemisphere' (p. 357). This article mitigates the paucity of focus on his British ventures, and compliments Burrow's research.

When touring Australia in 1906, West was interviewed by the *Evening News*, which credited him as 'probably the biggest man in the cinematograph business' (16 March 1906, p. 2). West reflects on his time in Britain with Modern Marvel, with one highlight being 'the honour of exhibiting the Analyticon before His majesty the King at the Royal Photographic Society's Exhibition at the Crystal Palace, London'. West also discusses the projection of stereoscopic films, which appears to have been a feature of his Australian shows:

> I had the good fortune to be the first to introduce stereoscopic cinematography, being personally acquainted with the inventor. It shows the pictures in bold relief, and almost any moving objects taken by an up-to-date camera can be projected so that the pictures seem to be solid objects. This will be particularly noticeable in some of the scenes which we show at the Palace, including a ride through Barcelona, a trip through the Engadine, and some Italian jaunts. (*Evening News*, 16 March 1906, p. 2).



QUEEN STREET HALL, EDINBURGH.

TO-NIGHT at 8.
AND EVERY NIGHT at 8, with MATINEES MONDAYS, WEDNESDAYS, and SATURDAYS at 3.
until further notice.

BRILLIANT SUCCESS of
THE MODERN MARVEL CO., LTD.,
with the Most Recent Scientific Wonder,
THE ANALYTICON
FOR PROJECTION OF SOLID VIEWS.
THE ANALYTICON is beautiful.
THE ANALYTICON is entirely new.
THE ANALYTICON is a pronounced success.
THE ANALYTICON is charming.
You must take your Children and Friends to see this New Departure.

Supplemented by
CINEMATOGRAPHY
UP-TO-DATE.
With the LARGEST and FINEST SELECTION of COLOURED and other ANIMATED SCENES ever Exhibited at one performance.
The "Scotsman" says: "The Exhibition was exceedingly interesting."
The "Evening News" says: "Ranks high as one of the novelties of the season."
The "Dispatch" says: "The result is a solid perspective view very striking from the standpoint of the optical scientist."

ADMISSION … Children Half-Price.

Fig. 4 The Analyticon and cinematograph form the central attractions of The Modern Marvel Company's residency at Queen Street Hall (*Edinburgh Evening News*, 29 December 1897, p. 1).

West worked and toured with W. Lyall, who by the 1920s, was credited as a 'well-known Melbourne cinema expert'. In an interview with *The Argus* in 1923, Lyall recalled his time with Modern Marvel and the Analyticon, stating, 'it was thought that the principle would be adapted to the cinema, but the experience proved rather costly owing to the double footage of film and loss of analysers' (15 March 1923, p.14).[4] Whether

4) In a separate article printed in *The Argus*, Lyall discusses the habitual theft of the observing glasses: 'the trouble was the expense of replacing stolen apparatuses. Hundreds disappeared every time they were handed out, and though the cost was only a tithe then of what it would be today, it became prohibitive' (1 March 1923, p.6).

West worked on a stereoscopic film technology with Anderton or another inventor is unknown, and remains a potential subject for further research.

Under the rubric of instructive entertainment, Modern Marvel presented technologies that mimicked or exploited different aspects of the human eye, including the Analyticon, cinematograph, and the Krōmskōp. There has been no space to discuss the Krōmskōp in this article, but like the Analyticon, it was an innovative projective technology with a clear educational value. Optical technologies revolutionised pedagogy and entertainment, within the context of Edinburgh. As with Brewster, West believed in the potential of the eye as a means of assimilating knowledge, and like Kleine, believed in the potential of cinema to democratise this knowledge. Early cinema in Edinburgh has been largely overlooked in the historical record, yet it offers a fascinating example of the idiosyncrasy and diversity of cinema in Scotland, and acts as a microcosm for larger debates about cinema, the popularisation of science, and education.

Modern Marvel and the Analyticon also raises an epistemological problem for the present-day film historian, as we can only conjecture or imagine what stereoscopic projections, or the 'coloured sun, moon, and stars dance, by a French danseuse', on a silver screen might have actually looked like. In small compensation, though, we have discovered an alternative meaning for the ubiquitous neologism 'the silver screen'.

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